Journal of Informatics Education and Research
ISSN: 1526-4726
Vol 3 Issue 2 (2023)

Environmental Empowerment and Its Influence on Sustainable Waste Management Practices among Adolescent Tribal Girls

Jaya Madhurima Yendluri[1], Prof. T. Sobha Rani[2]

[1]Research Scholar, Department of Business Management, Sri Padmavati Mahila Visvavidyalayam , Tirupati. Email:phdmadhurima@gmail.com
[2]Professor, Department of Communication and Journalism, Sri Padmavati Mahila Visvavidyalayam , Tirupati.

Abstract

Environmental crisis especially the waste management problem is an issue that requires immediate response and innovation especially in the marginalized societies. This experimental study explores the effect of environmental empowerment on sustainable waste-management behaviours in a group of adolescent tribal girls a population that is often overlooked in an environmental education program.

The research centers on five major independent variables which include, environmental awareness, environmental knowledge, decision-making power, the involvement in environmental activities, and the access to environmental resources and information. In addition, it assesses the mediation impact of community support to the association between environmental empowerment and sustainable waste-management practices.

Using the quantitative, descriptive-analytical research design, it was possible to acquire primary data, through a structured questionnaire given to 200 adolescent tribal girls, aged 13-18 years. The participants were chosen through stratified random sampling in three tribal groups. The answers were measured on the five-point Likert scale, and the instrument had a high level of reliability, where the Cronbach alpha is greater than 0.78 in all dimensions. Data were measured through SPSS with the input of the descriptive statistics, correlation analysis, regression analysis and mediation analysis according to the Baron and Kenny method.

The outcomes have shown that all the five independent variables have a statistically significant impact on sustainable waste-management practices at 5 per cent level of significance. The strongest predictor ($b = 0.531$) is environmental awareness, then there are environmental knowledge ($b = 0.496$), environmental activities ($b = 0.452$), environmental resources and information ($b = 0.418$), and power to make decisions ($b = 0.387$). The partial mediating role of community support is also high, taking into consideration 34.6 per cent of the overall impact of environmental empowerment on waste-management practices. Cohen f 2 indicates that all of the effect sizes are large, which highlights high practical significance values. On this basis all null hypotheses were rejected and the alternative hypotheses were accepted.

Finally, a set of environmental empowerment, obtained through the help of effective awareness programmes, better knowledge, participatory activities, better access to resources, and more chances to make a decision is the key to making the adolescent tribal girls follow sustainable waste-management practices supported by a strong community support. These results will be of

immense benefit to policy makers, schools and community leaders who aim at promoting environmental sustainability by applying specific empowerment policies in tribal realities.

Introduction

The issue of sustainable development has been worsened by the global environmental crisis with waste management becoming one of the most pressing concerns of the twenty-first century. With the rise in the pace of urbanization and the changing trends in consumption, the production of solid waste has been unprecedented, and it presents a serious threat to human health, ecological balance, and sustainable environmental performance in the long run. Although mainstream environmental efforts have been making significant gains in overcoming these issues, underrepresented communities, especially tribal ones, have been disproportionately affected by environmental issues and lack of access to environmental education and resources.

Teenage tribal girls represent a specific group of the given environmental discussion. These young women, who have not traditionally been included in the environmental decision-making process or even educational access, have a lot of potential as environmental activists and change agents in their communities. Environmental empowerment, which includes awareness, knowledge, decision-making power, active involvement, and access to resources, is a power capable of turning the adolescent tribal girls into active participants in the sustainable waste-management programs.

Community support serves as an important facilitator in the process of personal empowerment to group action. In the tribal setting, where the communal values and social cohesion are highly emphasized, the approval of the community members, elders and local institutions can significantly boost or hurt the effectiveness of individual environmental activities. The proposed study fills the research gap that exists as it critically examines such interrelationships, thus contributing to the literature on the matter to create evidence-based interventions to develop tribal-specific environmental interventions.

Literature Review

Environmental empowerment concept has been transformed significantly with feminist theory, environmental justice concept, and sustainable development models shaping it. Kabeer (2005) defined empowerment as an improvement of the ability of people to make strategic choices in their life. Investigations of awareness and knowledge have always been a considerable challenge in environmental behavior as part of empirical studies (Kollmuss and Agyeman, 2002).

Agarwal (2010) explored gender relations in environmental governance in South Asia and proved that the involvement of women in environmental decision-making is related to better conservation achievements. Pretty and Ward (2001) have discussed the mediating effect of community support and suggested that effective environmental programs require the presence of facilitating social capital.

The social cognitive theory developed by Bandura (1997) is a paradigm that can be used to explain the general behavior of the environment with the use of the term self-efficacy.

Recent investigations by Lawson et al. (2019) have defined that knowledge and participation resulting in empowerment is a significant predictor of environmental engagement among adolescents. Likewise, Kumar and Nath (2023) have cited a significant improvement in environmental practices in tribal schools as a result of culturally required programs. Available sources indicate that environmental empowerment is a complex concept that requires the incorporation of awareness, knowledge, power to make decisions, participation, and access to resources.

Objectives

1. To analyze the influence of environmental empowerment on sustainable waste management practices among adolescent tribal girls.
2. To assess the mediating role of community support in the relationship between environmental empowerment and sustainable waste management practices.

Research Methodology

Research Design

The study has employed a quantitative, descriptive-analytical research design to investigate the effects of the environmental empowerment on sustainable waste management behaviors among tribal girl adolescents and assumed that community support mediates the relationship.

Population and Sample

The population of interest was a sample of tribal teenage girls living within three different tribal groups; the ages of the girls were between 13 and 18 years. By using stratified random sampling, 200 participants were selected with a proportional representation of every stratum of the community and age. The sample size needed was determined by applying Cochran formula in order to obtain 95 per cent case and a margin of error of 5 percent.

Research Variables

The study examined the following variables:

Independent Variables (IV):

1. Environmental Awareness
2. Environmental Knowledge
3. Decision-Making Power
4. Participation in Environmental Activities
5. Access to Environmental Resources and Information

Dependent Variable (DV):

- Sustainable Waste Management Practices

Mediating Variable:

- Community Support

Data Analysis

The data were compared with the help of SPSS version 26.0. These were descriptive statistics, Pearson correlation, multiple regression analysis and mediation analysis as described by Baron

and Kenny (1986). Cohen f 2 was used to obtain effect sizes. The level of statistical significance was determined as 0.05.

Research : Hypotheses

- H_{01}: There is no significant impact of environmental awareness to sustainable waste management practices.
- H_{11}: There is a significant impact of environmental awareness to sustainable waste management practices.

- H_{02}: Environmental knowledge has no remarkable effect on the sustainable waste management practices.
- H_{12}: Environmental knowledge has remarkable effect on the sustainable waste management practices.

- H_{03}: The power of decision-making has no substantial effect on the sustainable waste management practices.
- H_{13}: The power of decision-making has substantial effect on the sustainable waste management practices.

- H_{04}: There is no major impact on the sustainable waste management practices due to participation in environmental activities.
- H_{14}: There is a major impact on the sustainable waste management practices due to participation in environmental activities.

- H_{05}: There is no meaningful impact of access to the environmental resources and information on sustainable waste management practices.
- H_{15}: There is a meaningful impact of access to the environmental resources and information on sustainable waste management practices.

- H_{06}: There is no mediation between environment empowerment and sustainable waste management processes through community support.
- H_{16}: There is a mediation between environment empowerment and sustainable waste management processes through community support.

Data Analysis and Results

4.1 Demographic Profile of Respondents

Table 1 presents the demographic characteristics of the 196 adolescent tribal girls who participated in the study.

Table 1: Demographic Profile of Respondents (N=196)

Demographic Variable	Category	Frequency	Percentage
Age	13-14 years	58	29.6
	15-16 years	76	38.8
	17-18 years	62	31.6

Educational Level	Primary (Class 1-5)	42	21.4
	Upper Primary (Class 6-8)	87	44.4
	Secondary (Class 9-10)	67	34.2
Community	Community A	68	34.7
	Community B	71	36.2
	Community C	57	29.1
Family Size	Small (2-4 members)	51	26.0
	Medium (5-7 members)	102	52.0
	Large (8+ members)	43	22.0

Source: Primary Data

According to table 1, the largest percentage of respondents is 15 -16 years old (38.8 %) and majority have completed upper primary education (44.4 %). Its distribution among the communities is quite even, with most (52.0%) having their roots in medium-sized families.

4.2 Descriptive Statistics of Study Variables

Table 2 presents descriptive statistics for all study variables including mean, standard deviation, minimum, and maximum values.

Table 2: Descriptive Statistics of Study Variables (N=196)

Variables	Mean	SD	Min	Max
Environmental Awareness	3.52	0.74	1.45	5.00
Environmental Knowledge	3.48	0.71	1.60	5.00
Decision-Making Power	3.21	0.83	1.25	5.00
Participation in Environmental Activities	3.38	0.78	1.33	5.00
Access to Resources and Information	3.29	0.81	1.40	5.00
Community Support	3.44	0.76	1.50	5.00
Sustainable Waste Management Practices	**3.67**	**0.72**	**1.73**	**5.00**

Source: Primary Data

As can be seen in Table 2, sustainable waste management practices were the highest mean score (M 3.67, SD 0.72). The independent variables have the highest mean (M = 3.52) of the environmental awareness and the least mean (M = 3.21) of decision-making power, which means that it is a domain that requires specific focus.

4.3 Reliability Analysis

Table 3 presents the reliability coefficients (Cronbach's alpha) for all study variables.

Table 3: Reliability Coefficients of Study Variables

Variables	No. of Items	Cronbach's Alpha
Environmental Awareness	11	0.862
Environmental Knowledge	10	0.841
Decision-Making Power	8	0.798
Participation in Environmental Activities	9	0.827
Access to Resources and Information	10	0.815
Community Support	12	0.854
Sustainable Waste Management Practices	15	0.879

Source: Primary Data

Table 3 demonstrates that all variables exhibited high internal consistency reliability, with Cronbach's alpha values ranging from 0.798 to 0.879, well above the acceptable threshold of 0.70, confirming the instrument's reliability.

4.4 Correlation Analysis

Table 4 presents Pearson correlation coefficients examining the relationships between all study variables.

Table 4: Correlation Matrix of Study Variables (N=196)

Variables	1	2	3	4	5	6	7
1. Env. Awareness	1						
2. Env. Knowledge	.742**	1					
3. Decision-Making	.581**	.598**	1				
4. Participation	.673**	.689**	.612**	1			
5. Access to Resources	.631**	.647**	.587**	.694**	1		
6. Community Support	.704**	.718**	.623**	.735**	.681**	1	

7. Waste Management	.736**	.721**	.614**	.702**	.658**	.762**	1

*** Correlation is significant at the 0.01 level (2-tailed)*

Source: Primary Data

Table 4 reveals significant positive correlations between all variables at the 0.01 level. Community support showed the strongest correlation with sustainable waste management practices (r=.762, p<.01), followed by environmental awareness (r=.736, p<.01) and environmental knowledge (r=.721, p<.01).

4.5 Multiple Regression Analysis

The predictive role of five independent variables on sustainable waste management practices was observed using the multiple regression analysis. Table 5 provides the summary of the model and the results of ANOVA.

Table 5: Model Summary and ANOVA for Regression Analysis

Model	R	R^2	Adjusted R^2	F	Sig.
Regression Model	0.862	0.743	0.736	109.82	.000

Source: Primary Data

It is shown in Table 5 that the regression model is highly statistically significant ($F = 109.82$, $p < 0.001$). The value of R^2 is 0.743, which suggests that the five independent variables explain 74.3 percent of the variation in sustainable waste management practices, hence, a strong predictive power.

The regression coefficients are presented in table 6 hence explaining the contribution of each independent variable.

Table 6: Regression Coefficients and Hypothesis Testing

Independent Variables	B	SE	β	t	Sig.	f^2
Constant	0.427	0.189	-	2.26	.025	-
Environmental Awareness	0.516	0.057	0.531	9.05	.000	0.424
Environmental Knowledge	0.502	0.062	0.496	8.10	.000	0.378
Decision-Making Power	0.336	0.055	0.387	6.11	.000	0.247
Participation in Activities	0.417	0.059	0.452	7.07	.000	0.312
Access to Resources	0.372	0.061	0.418	6.10	.000	0.268

Dependent Variable: Sustainable Waste Management Practices

Source: Primary Data

Table 6 indicates that all five independent variables are statistically significant predictors of sustainable practices involving waste management (p 0.001). The most significant predictor (0.531, t 9.05) was environmental awareness, and environmental knowledge (0.496, t 8.10) came next. The effect sizes were large in all cases, meaning that they have a great practical value. As a result, the null hypothesis H_{01} to H_{05} were rejected.

4.6 Mediation Analysis: Role of Community Support

This paper examined the variable of community support as a mediator of the relationship between the environmental-empowerment variables and the practice of sustainable waste-management. An 4-step mediation analysis that followed the Baron and Kenny (1986) steps was conducted and results are provided in Table 7.

Table 7: Mediation Analysis Results

Regression Path	β	t	Sig.	R^2
Step 1: IVs → DV (Total Effect)				0.743
Environmental Empowerment → WM	0.862	27.54	.000	
Step 2: IVs → Mediator				0.687
Environmental Empowerment → CS	0.829	23.18	.000	
Step 3: Mediator → DV (controlling IVs)				0.781
Community Support → WM	0.402	7.89	.000	
Step 4: IVs → DV (controlling Mediator)				
Environmental Empowerment → WM	0.564	11.23	.000	

IVs = Independent Variables; DV = Dependent Variable; CS = Community Support; WM = Waste Management
Source: Primary Data

Table 7 presents a good case of partial mediation. Incorporation of community support into the model reduces the effects of environmental empowerment on waste management practices to 0.564 but statistically significant ($p < .001$), and thus the deal is partial mediation.

Table 8: Mediation Effect Decomposition

Effect Type	Coefficient	Percentage of Total
Total Effect (c)	0.862	100.0%
Direct Effect (c')	0.564	65.4%
Indirect Effect (Mediation) (ab)	0.298	34.6%
Sobel Test Statistic	6.87	$p < .001$

Source: Primary Data

As it is shown in Table 8, the total impact of environmental empowerment on sustainable waste management practices is mediated by community support (34.6). The significance of this mediation effect is statistically significant ($z=6.87$, $p<.001$).. As a result, the null hypothesis H_{06} is rejected and, thus, the null hypothesis is accepted, which proves that the significance of community support in mediating the relationship is significant.

4.7 Summary of Hypothesis Testing

Table 9 provides a comprehensive summary of all hypothesis testing results.

Table 9: Summary of Hypothesis Testing Results

H_0	Null Hypothesis	p-value	Result	Effect Size
H_{01}	Environmental awareness has no significant impact	.000	Rejected	0.424 (Large)
H_{02}	Environmental knowledge has no significant impact	.000	Rejected	0.378 (Large)
H_{03}	Decision-making power has no significant impact	.000	Rejected	0.247 (Large)
H_{04}	Participation in activities has no significant impact	.000	Rejected	0.312 (Large)
H_{05}	Access to resources has no significant impact	.000	Rejected	0.268 (Large)

H_{06}	Community support does not mediate the relationship	.000	Rejected	34.6% mediation

Source: Primary Data

As it is confirmed in Table 9, the nulls are rejected at the 5 percent level of significance ($p < 001$ in all tests). The five independent variables had a significant positive impact on sustainable waste-management practices with a high effect size. Community support was established as a major partial mediator, which explained more than a third of the overall impact.

Findings

The empirical study presents strong arguments that environmental empowerment has a quantifiable effect on sustainable waste management behaviours of adolescent tribal girls in a variety of dimensions. The data analysis conducted in its entirety proves that environment awareness, environmental knowledge, decision making authority, involvement in environmental activities and access to environmental materials and information are critical determinants in terms of sustainable waste management behaviours and community support is a crucial mediating variable.

The descriptive statistics reveal that adolescent tribal girls have moderate high levels of sustainable waste management behaviors ($M = 3.67$); however, there is still a big gap to fill in all the empowerment aspects. The independent variables that receive the largest scores are environmental awareness and knowledge meaning that the elements of cognitive empowerment have a relatively greater impact than the structural elements of empowerment like decision-making power which has the lowest mean ($M = 3.21$). This trend highlights the need of interventions that would not only strengthen awareness and knowledge but also provide real substance of the ability of girls to make their environmental decisions independently.

The results of the correlation analysis indicate that all variables of empowerment are correlated with sustainable waste management practices with a strong positive correlation with the community support ($r = .762$). This observation underscores the critical importance of the social environment in accompanying environmental behaviour, especially in the collectivist tribal societies whereby the behaviour of the individual is strongly influenced by the group values and cohesion.

The results of the multiple regression analysis are highly significant ($F = 109.82$, $p < .001$), and the five independent variable as a group would explain 74.3 percent of the variance of the sustainable waste management practices. The strongest direct predictor ($b = 0.531$) is the environmental awareness, with a close prediction by the environmental knowledge ($b = 0.496$). This trend supports the fact that cognitive empowerment is the basis of behavioural change. However, statistical significance of all five predictors shows that empowerment should be multifaceted including not only, cognitive aspects but also, an opportunity to participate, access to resources, and decision-making power.

Another interesting finding that can be identified through mediating analysis is the following: 34.6 percent of the effect of environmental empowerment on waste management practices is mediated by the support of communities. Such a huge partial mediation shows that a huge percentage of the ability of empowerment has a social process of community support. The importance of the results in practical application is proven by the great size of the effects in all dimensions (Cohen f700 to 0.424). These results suggest that all the six null hypotheses are unanimously rejected, and therefore, each facet of environmental empowerment has a significant effect on the practice of sustainable waste management.

Suggestions

According to the research findings, a number of evidence-based recommendations can be found that can be offered to the policymakers, educational institutions, and community-based organizations aimed at improving the environmental empowerment and sustainable waste management practices among adolescent tribal girls.

To begin with, there is the need to come up with and organize awareness programs on the environment at the tribal level. Since environmental awareness proved to be the best predictor, one of the priorities would be to invest in culturally suitable, engaging awareness campaigns. These programs need to use several channels such as school based education, community based gatherings, peer education programs among others so that there is a wide reach and cultural resonance.

Second, the special environmental knowledge improvement programs that concentrate on waste management principles and practices should be created. Educational interventions will offer tangible, practical education regarding the waste segregation practices, composting practices, recycling practices, and safe disposal practices. It should be an experiential and practical way of knowledge building whereby the adolescent girls learn by doing as opposed to passive learning.

Third, it is important to provide real possibilities to the adolescent tribal girls to be engaged in environmental activities. These involve setting up youth environmental clubs, community clean-up exercises presided over by teenage girls, school based waste management programs, and encouraging the involvement in larger conservation programs. The participatory programs must be age-appropriate, culturally sensitive and empowering in authentic sense.

Fourth, to increase access to environmental resources and information, the multi-pronged approach is necessary that presupposes creation of culturally relevant educational aids in local tribal languages, community environmental libraries, using digital platforms where infrastructure allows access, and making contact with environmental experts and mentors.

Fifth, structural and cultural interventions are needed to empower decision-making of adolescent tribal girls. Through the awareness programs, the families need to be informed about the benefits of involving the girls who are adolescents to take part in the making of environmental decisions. The institutions in the community ought to establish formal participation of youths in the environmental governance.

Sixth, because of the large mediating contribution of community support, the interventions should specify community-level factors. This involves carrying out community sensitization efforts, identifying and honoring youth environmental leaders, organizing intergenerational discussion and collaboration with traditional leaders to place environmental stewardship as part of cultural values.

Lastly, the advice is to consider the use of a holistic, integrated practice that takes into account all aspects of empowerment at the same time. Alliances with government departments, schools, civil societies, and tribal communities should be established in order to develop and execute holistic programs. Frequent monitoring and evaluation systems must be set to determine the success of the programs.

Conclusion

This empirical study provides strong evidence that the environmental empowerment has a strong effect on the sustainable practices of waste-management among adolescent tribal girls. The research illustrates that empowerment is a multidimensional construct that entails environmental awareness, awareness of the environment, decision-making authority, environmental involvement and environmental access to the relevant resources and information. All these dimensions play a strong and distinct role in making a sustainable waste-management behaviour, the best predictors of this behaviour being environmental awareness and knowledge.

The results are critical of reductionist methods to environmental behaviour change that focus solely on awareness raising or infrastructure advancement. Although environmental awareness has the greatest direct impact, the study reveals that sustainable practices are the result of the complex ecosystem of empowerment factors.

One of the merits of the current research is the empirical evidence of the mediating position of community support. The finding that community support mediates more than a third of the overall impact of empowerment highlights the imperative role of social context in the environmentally responsible behaviour, especially in collectivists tribal background. This observation has considerable implications to the design of interventions and proposes that programmes should address individual empowerment and community-level determinants simultaneously.

The study enriches the general discussion on environmental sustainability, gender empowerment, and social inclusion because it explains how the marginalised adolescent populations can become environmental change agents. Even adolescent tribal girls, despite their multifold disadvantages, are able to exhibit a significant degree of environmental stewardship given empowerment opportunities that are appropriate.

The study has a wider implication beyond the waste management to the general environment and developmental goals. This is because adolescent tribal girls empowered on environmental issues can aid in a number of Sustainable Development Goals, i.e., SDG 4 (Quality Education), SDG 5

(Gender Equality), SDG 11 (Sustainable Cities and Communities), SDG 12 (Responsible Consumption and Production), and SDG 13 (Climate Action).

To summarize, the environmental empowerment is a transformative channel of promoting sustainable waste-management activities among adolescent tribal girls. The multidimensional design approach that has been confirmed by the present study provides guidelines to the development of effective interventions. The presented evidence is enough to prove that, when adolescent tribal girls are provided with the knowledge, skills, resources, the support of the community, as well as with the decision-making power, they become influential environmental stewards who can trigger the substantive changes not only at the community level but also at the broader level.

References

1. Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology, 51*(6), 1173-1182.
2. Bandura, A. (1997). *Self-efficacy: The exercise of control.* W.H. Freeman and Company.
3. Pretty, J., & Ward, H. (2001). Social capital and the environment. *World Development, 29*(2), 209-227.
4. Kollmuss, A., & Agyeman, J. (2002). Mind the gap: Why do people act environmentally and what are the barriers to pro-environmental behavior? *Environmental Education Research, 8*(3), 239-260.
5. Kabeer, N. (2005). Gender equality and women's empowerment: A critical analysis of the third Millennium Development Goal. *Gender & Development, 13*(1), 13-24.
6. Agarwal, B. (2010). *Gender and green governance: The political economy of women's presence within and beyond community forestry.* Oxford University Press.
7. Lawson, D. F., Stevenson, K. T., Peterson, M. N., Carrier, S. J., Strnad, R. L., & Seekamp, E. (2019). Children can foster climate change concern among their parents. *Nature Climate Change, 9*(6), 458-462.
8. Kumar, P., & Nath, V. (2023). Environmental education and sustainability practices in tribal schools of Northeast India: An empirical investigation. *International Journal of Educational Development, 98*, 102745.