

Research article

REPRODUCTIVE AGENCY, WOMEN'S COMMUNITY MOBILISATION AND ENVIRONMENTAL HEALTH EDUCATION IN LOCALISING SUSTAINABLE DEVELOPMENT GOALS 3, 5 AND 6: EVIDENCE FROM CALABAR EDUCATION ZONE, NIGERIA

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ABSTRACT

This study examined women's reproductive agency, family planning role and community mobilisation as pathways for localising Sustainable Development Goals (SDGs) 3, 5 and 6 in Calabar Education Zone, Cross River State, Nigeria. A correlational survey design was used. The population comprised 193,983 women aged 18-55 years, from which 400 women were selected through stratified random sampling; the regression output indicated 398 valid responses. Data were collected with the Roles of Women and Attainment of Sustainable Development Goals Questionnaire and analysed using simple linear regression. Family planning role significantly predicted SDG attainment, $F(1, 396) = 13.13$, $p < .001$, with a small effect ($R = .18$; adjusted $R^2 = .03$). Community mobilisation role was also significant, $F(1, 396) = 8.37$, $p = .004$, with a small effect ($R = .14$; adjusted $R^2 = .02$). Women's community-based environmental health education should be integrated into family planning, WASH and gender-equity programmes. The study positions women as educators, mobilisers and sustainability actors in local SDG implementation.

KEYWORDS

Women; environmental education; sustainable development goals; family planning; community mobilisation; gender equality; WASH; Calabar Education Zone

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Introduction

The attainment of sustainable development goals in any society is reflected in the quality of life and wellbeing of its people. At the community level, this includes access to clean water and sanitation, equitable participation of women and men in decision-making, access to healthcare, household wellbeing, child health and the availability of supportive social institutions. These indicators are directly linked to SDG 3 on good health and wellbeing, SDG 5 on gender equality and SDG 6 on clean water and sanitation. They also have a strong environmental education dimension because knowledge, values and community practices shape how households make decisions about reproductive health, hygiene, sanitation and participation in sustainable development.

Sustainable development is not achieved only through infrastructure or policy statements. It is realised through the everyday practices of people who translate development ideals into household routines, community norms and collective action. Women occupy a strategic position in this process because they often manage household health, water use, food hygiene, child care, sanitation routines and community association activities. When women are informed, empowered and included in community decision-making, they can influence family planning decisions, promote healthy living, support environmental sanitation and mobilise other women for community-based action. The global evidence shows that health, gender equality and WASH outcomes are mutually reinforcing. Acharya et al. (2018) emphasise that health is central to achieving the SDGs because health

disparities intersect with poverty, gender and exclusion. The World Health Organization and United Nations Children's Fund (2023) report that WASH deficits have gendered implications, especially where women and girls carry the burden of water collection and where private sanitation facilities are unavailable. UN Women and the United Nations Department of Economic and Social Affairs (2024) further show that global progress on gender equality remains too slow, with gaps in decision-making, unpaid care work, sexual and reproductive health rights and political representation.

Nigeria's progress towards the SDGs depends heavily on community-level participation, gender-sensitive health education and locally appropriate environmental education. The Nigeria Demographic and Health Survey provides important indicators on fertility, family planning, maternal and child health, women's empowerment and household living conditions (National Population Commission [NPC] & ICF, 2019). Such indicators show that reproductive agency, family planning and community mobilisation cannot be understood only as personal choices. They are also connected to household resources, public health, gender equality and pressure on community infrastructure. Calabar Education Zone is a suitable setting for this investigation because it contains urban, peri-urban and rural communities with varying levels of access to education, health services, water and sanitation infrastructure. Women in the zone participate in households, markets, faith-based groups, school-community activities, cooperative associations and community health programmes. These spaces allow them to function as informal environmental educators and mobilisation agents. However, their influence may be limited by socio-cultural norms, household decision-making structures, poverty and inadequate institutional support.

Accordingly, this study examines the family planning role of women, the community mobilisation role of women and the attainment of SDGs 3, 5 and 6 in Calabar Education Zone. The argument is that women's agency is developmentally meaningful, but it must be interpreted within wider social, economic and infrastructural conditions because the regression effect sizes are statistically significant but small. The purpose of the study was to examine the relationship between women's roles and the attainment of SDGs 3, 5 and 6 in Calabar Education Zone. Two research questions guided the study. First, how does the family planning role of women relate to the attainment of SDGs 3, 5 and 6? Second, how does the community mobilisation role of women relate to the attainment of the same goals? Two null hypotheses were tested at the 0.05 level of significance: family planning role has no significant relationship with SDG attainment, and community mobilisation role has no significant relationship with SDG attainment.

Literature review

Environmental education provides the knowledge, values and behavioural orientation through which communities understand the consequences of their daily decisions on health, gender justice and environmental sustainability. UNESCO (2020) identifies education for sustainable development as a key enabler of the SDGs because it strengthens local capacity for responsible action, social transformation and sustainable lifestyles. In this study, women's family planning and community mobilisation roles are viewed as community-based environmental education functions. Through household counselling, health talks, women's group meetings, cooperative societies and community sensitisation, women transmit practical knowledge on family wellbeing, sanitation, resource use and gender participation. SDG 3 seeks to ensure healthy lives and promote wellbeing for all. Women contribute to this goal through maternal health awareness, family planning decisions, child health practices, hygiene education and early recognition of health-related risks. World Health Organization (2025) defines family planning as enabling individuals and couples to anticipate and attain their desired number of children and the spacing and timing of births. This connects directly to women's reproductive agency, maternal health, child wellbeing and household sustainability. Acharya et al. (2018) further emphasise that health is a foundation for broader SDG achievement.

SDG 5 focuses on gender equality and empowerment of women and girls. Gender equality is not limited to formal legal rights. It includes household decision-making power, equal participation in community leadership, access to resources and freedom from harmful social norms. Odera and Mulusa (2020) argue that gender equality and women's empowerment are central to SDG delivery, while UN Women and the United Nations Department of Economic and Social Affairs (2024) show that progress remains uneven across countries and indicators. In local communities, women's participation in reproductive health, sanitation and development activities can challenge restrictive norms and expand women's influence. SDG 6 seeks the availability and sustainable management of water and sanitation for all. Its gendered meaning is especially important because women and girls often bear the burden of water collection, domestic hygiene and care work. The World Health Organization and United Nations Children's Fund (2023) highlight that WASH inequalities affect women's safety, dignity and health. In Calabar Education Zone, women's community mobilisation role is therefore relevant to sanitation campaigns, household water treatment behaviour, environmental sanitation days, school-community hygiene education and safe domestic practices. Family planning is a critical pathway through which women contribute to sustainable development. It influences maternal health, household size, child wellbeing, women's education, labour participation and the use of community resources. Kantorová et al. (2020) show that monitoring women's need for family planning, including the proportion of need satisfied by modern methods, is directly relevant to SDG indicator 3.7.1. This means that women's ability to participate in family planning decisions is not only a private matter; it is a measurable development issue within the SDG framework.

In contexts where fertility remains high and contraceptive use is uneven, family planning has implications beyond individual households. Large household size may reduce the resources available for each child, increase pressure on household income, limit women's participation in education and economic activities, and intensify demand for water, sanitation and health services. Mercer et al. (2019), in a sub-national analysis of family planning indicators in Nigeria, found variations in modern contraceptive prevalence, unmet need and demand for family planning across states and demographic groups. This supports the need for localised family planning strategies that respond to the specific realities of Calabar Education Zone. Women's family planning role is also connected to gender equality because it reflects the extent to which women have voice in decisions about their bodies, household futures and reproductive health. When women participate in decisions about fertility and birth spacing, their household agency improves. This can increase opportunities for education, income-generating activities, leadership in community associations and participation in local development initiatives. Family planning should therefore be understood as a rights-based health practice, a gender empowerment mechanism and a sustainability strategy.

Community mobilisation is another pathway through which women influence SDG attainment. It refers to the process by which community members identify shared problems, create awareness, organise collective action and sustain behaviour change. Women's meetings, religious associations, cooperative groups, market associations and local health campaigns can become channels for environmental health education. MacPhail et al. (2019) show that community mobilisation can promote gender equity and health risk reduction through communication, empathy, respect, critical consciousness and social cohesion. Although their study focused on a different setting, the process elements are relevant to women's mobilisation in Calabar Education Zone. Participatory women's groups can also strengthen agency. Gram et al. (2018) found that community mobilisation through participatory women's groups had long-term implications for women's agency within the household. This finding is important because agency is needed if women are to translate knowledge into action. Women may attend health talks or sanitation campaigns, but they need household voice, social support and access to services to implement family planning choices, improve hygiene practices or participate in community decision-making. The role of women in health systems also deserves attention. World Health Organization (2019) reports that the global health and social workforce is substantially delivered by women but often led by men. This gender imbalance shows that women frequently provide care and social support while remaining under-represented in

leadership and decision-making. In community settings, the same pattern may occur: women mobilise households, support health campaigns and participate in sanitation activities, yet their contribution may not be adequately recognised or resourced. This strengthens the case for treating women as sustainability actors rather than merely programme beneficiaries.

The United Nations (2024) notes that SDG progress remains uneven and that accelerated local action is required. This reinforces the relevance of community-level studies such as the present one. Global reports provide broad indicators, but the implementation of SDGs occurs in households, schools, health centres, markets, streets and community associations. Women's family planning and mobilisation roles are therefore important because they bridge the gap between international targets and local practices. Without local actors who translate policy into behaviour, SDG targets remain distant from everyday life. Environmental education is also linked to ecotourism and community sustainability because tourism-ready communities require clean environments, healthy households, inclusive participation and ethical service cultures. In Cross River State, scholarship on tourism education and hospitality development emphasises that tourism is not only an economic activity but also a learning system through which citizens understand place, culture, responsibility and the environment (Eneyo, 2025a, 2025b, 2025e, 2025f; Eneyo & Eneyo, 2025). This perspective supports the present study because family planning, sanitation and mobilisation are part of the social foundation upon which sustainable destination communities are built.

Previous studies on tourism and environmental management in Calabar and the wider South-South region further show that community wellbeing, spatial organisation and environmental quality influence tourism development. Studies on hotel distribution, petrol-filling-station location, tourism support services, eateries and plastic-waste generation highlight the importance of spatial planning, sanitation behaviour and environmental responsibility in urban destinations (Eneyo, Bassey, & Ekpenyong, 2017; Eneyo & Ekpenyong, 2018a, 2018b; Eneyo, Ajake, & Ekpenyong, 2018; Eneyo, Ajake, Offiong, Ushie, & Akpan, 2022). These works provide a useful environmental-management background for interpreting women's mobilisation around WASH, household hygiene and community cleanliness. Cultural and niche tourism studies in Cross River State also demonstrate that community identity, festivals, heritage narratives and visitor flows depend on local participation and social cohesion. Research on the slave-history theatre, Calabar Carnival, Iboku Boat Regatta and visitor variation at tourism attractions shows that sustainable tourism development is shaped by cultural knowledge, marketing, infrastructure, safety, visitor perception and community livelihoods (Eneyo & Ekong, 2019; Eneyo, Attah, et al., 2022; Eneyo & Essien, 2023; Eneyo & Itu, 2024). Similarly, studies on the nightclub economy and sustainable livelihoods around the Cross River National Park show that local environmental and socio-economic conditions affect tourism-related livelihoods (Eneyo, Oba, Ochiche, Essien, & Antai, 2021; Eneyo, 2025c, 2025d). These studies strengthen the rationale for connecting women's SDG roles with environmental education, ecotourism readiness and community sustainability. The conceptual framework of this study is that women's family planning role and community mobilisation role are independent variables that relate to the attainment of SDGs 3, 5 and 6. The dependent variable is understood through three linked dimensions: wellbeing and healthy living, gender equality, and access to clean water and sanitation. Environmental education functions as a cross-cutting pathway because it transforms information into household and community practice. The relationship is also shaped by socio-cultural norms, income level, access to healthcare, education, household decision-making and government support.

Methodology

The study adopted a correlational survey design. This design was appropriate because the study sought to determine the nature and strength of the relationship between women's roles and the attainment of SDGs 3, 5 and 6 without manipulating the variables. The design enabled the researcher to examine whether family planning role and community mobilisation role significantly predicted the composite measure of sustainable development

goal attainment among women in Calabar Education Zone. The study was conducted in Calabar Education Zone, Cross River State, Nigeria. The zone is located in the Southern Senatorial District of Cross River State and comprises Akamkpa, Akpabuyo, Bakassi, Biase, Calabar Municipality, Calabar South and Odukpani Local Government Areas. The area includes urban, peri-urban and rural settlements, making it suitable for examining women's roles in sustainable development across different community contexts. Figure 1 presents the study area and supports the geographical localisation of the research.

Figure 1 is included to help international readers understand the spatial frame of the study. The map identifies Calabar Education Zone and the local government areas included in the zone. It also demonstrates that the study is grounded in a defined geographical setting rather than in a generalised discussion of women and sustainable development. Since environmental education and SDG localisation are place-sensitive, the figure strengthens the contextual clarity of the study. The population of the study comprised 193,983 women aged 18-55 years in Calabar Education Zone. A sample of 400 women was selected through stratified random sampling to ensure representation across the local government areas. The regression tables in the study reported total degrees of freedom of 397, indicating that 398 valid responses were used for final statistical analysis. The study is therefore based on the 398 usable questionnaire responses.

Data were collected using the Roles of Women and Attainment of Sustainable Development Goals Questionnaire (RWASDGQ). The questionnaire was structured to obtain information on respondents' demographic characteristics, women's family planning role, women's community mobilisation role and perceived attainment of SDGs 3, 5 and 6. Responses were scored using a four-point Likert-type scale ranging from Strongly Agree to Strongly Disagree. Positively worded items were scored from 4 to 1, while negatively worded items were reverse-scored where applicable. The questionnaire was administered with the support of trained field assistants. Completed copies were checked for completeness and consistency before analysis. Composite scores were computed for family planning role, community mobilisation role and SDG attainment. Simple linear regression was used to test the two hypotheses at the 0.05 level of significance. All statistical values were rounded to two decimal places in line with professional reporting practice, while p-values less than .001 were reported as $p < .001$ rather than $p = .0005$. The study complied with basic ethical expectations for survey research. Participation was voluntary, respondents were informed about the purpose of the study and individual identities were not disclosed. The data were reported in aggregate form. The study has limitations. Because the design is correlational, causal claims cannot be made. Because the data were questionnaire-based, responses may reflect perceptions and social desirability. Nevertheless, the design is appropriate for the study aim and provides useful evidence for environmental education and local SDG planning.

Results and discussion

This section presents the regression results and discusses them in relation to the study objectives. The two predictors - family planning role and community mobilisation role - were tested separately against the composite measure of SDG 3, SDG 5 and SDG 6 attainment. Both models were statistically significant, but the effect sizes were small. The interpretation therefore avoids exaggerated language and explains the results as modest but meaningful associations within a wider social and environmental system.

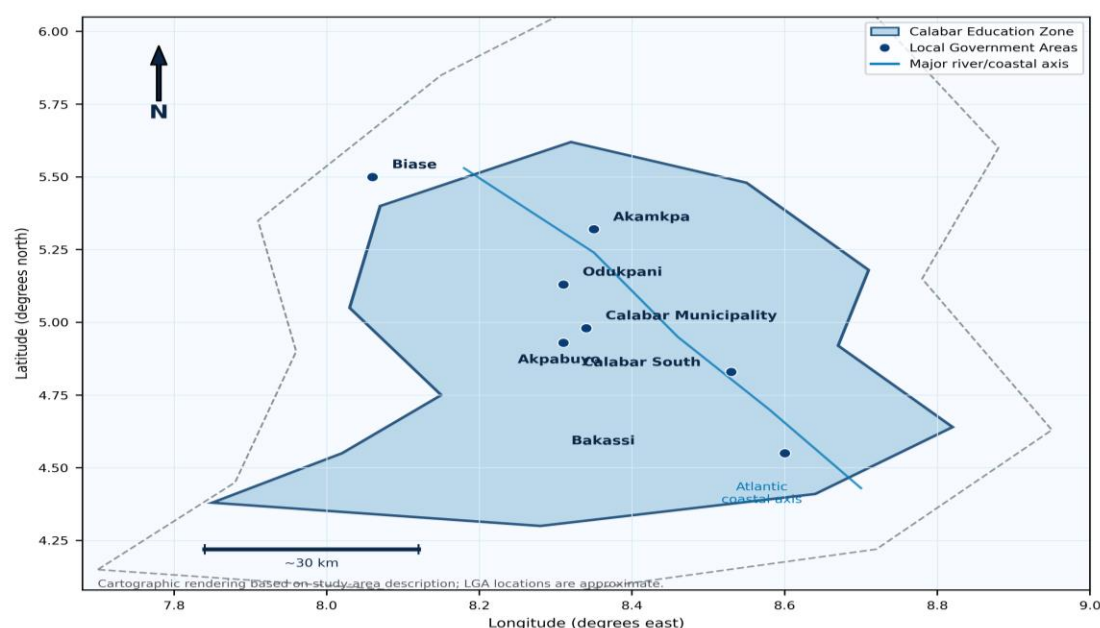


Figure 1. Study area map of Calabar Education Zone, Cross River State, Nigeria

Source: Author GIS analysis (2026).

Figure 1 shows the spatial setting of Calabar Education Zone and the local government areas from which respondents were drawn. The map clarifies that the study covers a mixed zone of urban, peri-urban and rural communities. This is important for interpretation because access to health services, family planning information, water and sanitation infrastructure may vary across such contexts. The map therefore helps to connect the statistical findings to a real geographical and development setting. The figure also reinforces the environmental education dimension of the study. Place matters because household and community practices are shaped by local infrastructure, cultural expectations, school-community relationships, market networks and health-service access. Women's family planning and mobilisation roles operate within this spatial context. Consequently, the map is not merely illustrative; it frames the local conditions under which SDG attainment is being examined.

Family planning role of women and SDG attainment

Table 1 presents the full family planning regression evidence in a single integrated table. It combines the model summary, ANOVA and coefficient information so that the reader can see both the statistical significance of the model and the size of the family planning effect before the interpretation is provided.

Table 1. Simple linear regression of family planning role of women on SDGs 3, 5 and 6 attainment

Model component	Statistic	Value
Model summary	R	0.18
Model summary	R ²	0.03
Model summary	Adjusted R ²	0.03
Model summary	Std. error of estimate	2.18
ANOVA	Regression SS	62.69
ANOVA	Residual SS	1,890.24
ANOVA	Total SS	1,952.94
ANOVA	F(1, 396)	13.13
ANOVA	p-value	< .001
Coefficients	Constant B (SE)	28.79 (1.32)
Coefficients	Family planning B (SE)	0.24 (0.07)
Coefficients	Standardised beta	0.18
Coefficients	t-value	3.62
Coefficients	p-value	< .001

Source: Fieldwork, 2026.

Note. N = 398 valid responses. .

Table 1 presents the simple linear regression of family planning role of women on the attainment of SDGs 3, 5 and 6. The model was statistically significant, $F(1, 396) = 13.13$, $p < .001$. The relationship was positive but small ($R = .18$), and the adjusted R^2 value of .03 indicates that family planning role explained approximately 3.00% of the variation in SDG attainment. The positive coefficient ($B = .24$) means that higher family planning role scores were associated with higher perceived SDG attainment scores. The first null hypothesis is therefore rejected. However, the professional interpretation is that the effect is small even though statistically significant. This distinction is important because statistical significance may be influenced by sample size, whereas practical significance depends on the size of the relationship. The result suggests that women's family planning role contributes to sustainable development outcomes, but it is one of several factors shaping health, gender equality and WASH conditions in the study area.

The finding is consistent with contemporary family planning literature. Kantorová et al. (2020) show that satisfying women's need for modern contraception is central to SDG monitoring, while World Health Organization (2025) explains that family planning supports health, gender equality, education and economic opportunity. In Calabar Education Zone, women's family planning role can promote healthier birth spacing, reduce maternal health risks, improve household planning and enhance women's participation in education and income-generating activities. These outcomes are directly linked to SDG 3 and SDG 5, and indirectly linked to SDG 6 through household resource use and sanitation planning. The result also aligns with Nigerian evidence on family planning variation. Mercer et al. (2019) show that contraceptive prevalence, unmet need and demand for family planning vary sub-nationally in Nigeria. This means that localised interventions are required. In Calabar Education Zone, family planning education should be integrated with environmental health education, household resource management, maternal health services and gender-sensitive counselling. Women's role should not be framed as isolated reproductive behaviour but as part of broader household sustainability.

Community mobilisation role of women and SDG attainment

Table 2 presents the statistical evidence for the second model. As with Table 1, the model summary, ANOVA and coefficient results are combined so that the reader can move coherently from significance testing to practical interpretation.

Table 2. Simple linear regression of community mobilisation role of women on SDGs 3, 5 and 6 attainment

Model component	Statistic	Value
Model summary	R	0.14
Model summary	R^2	0.02
Model summary	Adjusted R^2	0.02
Model summary	Std. error of estimate	2.20
ANOVA	Regression SS	40.42
ANOVA	Residual SS	1,912.52
ANOVA	Total SS	1,952.94
ANOVA	$F(1, 396)$	8.37
ANOVA	p-value	.004
Coefficients	Constant B (SE)	28.64 (1.70)
Coefficients	Community mobilisation B (SE)	0.24 (0.08)
Coefficients	Standardised beta	0.14
Coefficients	t-value	2.89
Coefficients	p-value	.004

Source: Fieldwork, 2026.

Note. $N = 398$ valid responses.

Table 2 presents the simple linear regression of women's community mobilisation role on the attainment of SDGs 3, 5 and 6. The model was statistically significant, $F(1, 396) = 8.37$, $p = .004$. The relationship was positive but small ($R = .14$), and the adjusted R^2 value of .02 indicates that community mobilisation explained approximately 2.00% of the variation in SDG attainment. The positive coefficient ($B = .24$) means that higher mobilisation role scores were associated with higher perceived SDG attainment scores. The second null hypothesis is therefore rejected. The positive coefficient suggests that women's mobilisation is associated with

improved perceived health, gender equality and WASH-related outcomes. However, the result should be interpreted as a small effect. This cautious interpretation strengthens the statistical quality of the study. The finding agrees with community mobilisation literature. MacPhail et al. (2019) show that community mobilisation can create communication, empathy, respect and social cohesion that support gender equality and health behaviour change. Gram et al. (2018) also show that participatory women's groups can influence women's agency in the household. In Calabar Education Zone, women's mobilisation through health talks, cooperative groups, sanitation campaigns, religious associations and community meetings can contribute to SDG 3 by improving health awareness, SDG 5 by strengthening participation and SDG 6 by encouraging sanitation and hygiene practices.

The findings also demonstrate the need to link women's empowerment with environmental education. Many development interventions fail when communities are treated as passive recipients of information. Women's groups can become active learning spaces where environmental health knowledge is discussed, adapted and applied. Through such spaces, communities can learn about birth spacing, maternal health, water safety, latrine use, handwashing, waste disposal, gender-based barriers and the benefits of inclusive decision-making. This learning process is central to environmental education because sustainable communities depend on environmentally responsible citizens. The small effect sizes in both models should be interpreted realistically. Sustainable development is shaped by household income, education, healthcare access, water infrastructure, sanitation facilities, community leadership, cultural norms and government policy. Women's roles matter, but they operate within enabling or constraining conditions. The implication is not that women alone are responsible for achieving the SDGs, but that their roles must be recognised, supported and institutionally strengthened as part of an integrated development system.

Integrated discussion and contribution to knowledge

The two regression models provide a coherent picture of women's community-based contribution to local SDG implementation in Calabar Education Zone. Both family planning role and community mobilisation role significantly predicted the composite SDG attainment variable, but both relationships were small. This means that women's roles are positively connected to health, gender equality and WASH outcomes, while also showing that those outcomes depend on wider social and infrastructural conditions. The interpretation therefore avoids overstating the results and presents them as modest but policy-relevant associations. Family planning emerges as the stronger of the two predictors, although its explanatory value remains small. This is expected because reproductive agency directly affects maternal health, child spacing, household resource planning and women's ability to participate in education and income-generating activities. When women understand and can negotiate family planning, they are better positioned to protect their health, care for children, manage household resources and participate in community development. The result therefore aligns with the literature linking family planning to SDG 3 and gender empowerment.

Community mobilisation also matters because it transforms individual awareness into collective action. A woman may understand sanitation, safe water or maternal health, but change becomes more likely when groups create shared expectations and provide social support. Women's associations, cooperative societies, market networks and faith-based groups can reinforce new practices and reduce the isolation that often prevents women from acting on information. This explains why mobilisation has a significant relationship with SDG attainment even though the effect size is small. The findings demonstrate the importance of environmental health education as a practical development tool. In the context of this study, environmental education is not limited to forest conservation or pollution awareness. It includes education about birth spacing, maternal wellbeing, water safety, latrine use, handwashing, household waste management and gender-responsive decision-making. These are practical areas where women often exercise influence. Strengthening these roles can support healthier households and cleaner community environments.

If Calabar Education Zone is to contribute to sustainable tourism and community development, women's roles in family wellbeing and mobilisation must be connected to sanitation, environmental responsibility, hospitality ethics, visitor safety and cultural pride. Tourism studies in Cross River State have shown that festivals, heritage interpretation, community-based attractions and support services depend on organised local participation and responsible environmental conduct (Eneyo & Ekong, 2019; Eneyo & Essien, 2023; Eneyo, Attah, et al., 2022; Eneyo & Ekpenyong, 2018b). Therefore, women's mobilisation around WASH and household health has relevance beyond public health; it supports the social and environmental conditions required for sustainable host communities.

The same point applies to environmental planning. Research on hotel distribution, petrol stations, eateries, visitor numbers, plastic waste and the night-time hospitality economy in Calabar and neighbouring destinations shows that tourism systems can produce both opportunities and environmental pressures (Eneyo, Bassey, & Ekpenyong, 2017; Eneyo & Ekpenyong, 2018a; Eneyo, Ajake, & Ekpenyong, 2018; Eneyo, Ajake, Offiong, Ushie, & Akpan, 2022; Eneyo, Oba, Ochiche, Essien, & Antai, 2021; Eneyo & Itu, 2024). Women's community-based environmental health education can therefore be positioned as a preventive and adaptive mechanism for strengthening community cleanliness, risk awareness, household resilience and inclusive development. The study also contributes to gender and development scholarship by reframing women's roles as agency rather than burden. Women should not be expected to carry health, sanitation and household sustainability responsibilities without support. Instead, their roles should be institutionally recognised through training, inclusive planning, financial support, access to healthcare and involvement in community monitoring. The significant results show that women's roles matter; the small effect sizes show that those roles need enabling systems to become more powerful.

For ecotourism and community sustainability, the findings have wider implications. Tourism-ready communities require sanitation, public health awareness, social cohesion and gender-inclusive participation. Communities with poor WASH conditions and limited women's participation may struggle to sustain tourism benefits. By supporting women's mobilisation and family wellbeing, local authorities can strengthen the social foundations required for community-based tourism, cultural hospitality and responsible environmental management. The study further contributes by localising the SDG conversation. National and global reports provide useful indicators, but they cannot explain how household practices and community networks shape outcomes in specific education zones. By focusing on Calabar Education Zone, the research shows how reproductive agency and community mobilisation operate in a real Nigerian setting. This provides evidence that can inform local government, schools, health centres, women's groups and civil society organisations.

A final contribution is methodological. The study reports p-values, R-values, adjusted R^2 values and coefficients in a way that separates statistical significance from practical magnitude. The findings confirm that women's family planning and mobilisation roles are entry points for SDG localisation, but they cannot stand alone. Programmes should integrate reproductive health education, WASH promotion, women's leadership development, household dialogue, and public investment in water and sanitation infrastructure. Such integration will make women's roles more effective and reduce the risk of placing responsibility for structural development problems on women without providing resources.

Implications/conclusion

The study has important implications for policy and practice. First, government and non-governmental organisations should integrate family planning education with broader environmental health education. Health talks should not be limited to clinical settings; they should also be delivered through women's associations, schools, markets, faith-based groups and community development meetings. Such integration can make family planning more acceptable, rights-based and connected to household wellbeing. Second, women's community mobilisation networks should be treated as development infrastructure. Women's cooperative groups, savings

associations and community health volunteers can support health awareness, sanitation campaigns, gender dialogue and WASH behaviour change. Providing these groups with training, small grants, educational materials and links to local health facilities can improve their effectiveness. The World Health Organization (2019) has shown that women often deliver care without equivalent leadership recognition; local development practice should avoid repeating this imbalance.

Third, SDG programmes in Calabar Education Zone should include gender-sensitive monitoring. Indicators should track not only infrastructure outputs such as boreholes, sanitation facilities or health campaigns, but also women's participation in decision-making, household agency, access to reproductive health information, sanitation behaviour and leadership in community action. This aligns with United Nations (2024), which stresses the need for accelerated and inclusive SDG implementation.

The study contributes to knowledge by locating SDG attainment within the everyday roles of women in Calabar Education Zone. Many SDG discussions remain at national or international levels, but the outcomes measured by SDGs 3, 5 and 6 are produced and experienced within households and communities. By focusing on family planning and community mobilisation, the study shows how women's agency can bridge global development targets and local sustainability practices. This is particularly important in Cross River State, where environmental education, community health, sanitation and livelihood concerns intersect. The study also contributes to environmental education scholarship by showing that environmental education should not be restricted to classroom-based conservation messages. It also includes community learning about household health, sanitation, reproductive wellbeing, gender-responsive decision-making and sustainable use of shared resources. Women who educate others through health talks, market associations, cooperative meetings, faith-based groups and sanitation campaigns help to build the knowledge and behaviour required for sustainable communities.

The study concludes that the family planning role of women has a significant positive relationship with the attainment of SDGs 3, 5 and 6 in Calabar Education Zone of Cross River State. The relationship is statistically significant but small, indicating that family planning contributes to sustainable development outcomes while operating alongside other social, economic and infrastructural factors. The study also concludes that the community mobilisation role of women has a significant positive relationship with the attainment of SDGs 3, 5 and 6. Women's mobilisation through health education, cooperative action, sanitation awareness and community leadership can improve wellbeing, gender participation and WASH-related practices. Future studies should include additional predictors such as education, income, access to health facilities, household water source, sanitation facility and participation in women's groups.

Recommendations for programme design and future research

Family planning programmes in Calabar Education Zone should be designed as integrated household wellbeing programmes rather than narrowly clinical campaigns. They should include reproductive health information, maternal health counselling, male engagement, household resource planning, sanitation awareness and referral pathways to nearby health facilities. This approach will make family planning more acceptable and more closely connected to SDGs 3, 5 and 6. Community mobilisation programmes should use existing women's groups as implementation partners. These groups already possess social trust and local knowledge, and they can communicate development messages in culturally meaningful ways. Local authorities should provide them with training manuals, monitoring templates, small grants, links to health workers and opportunities to report community needs during local planning meetings.

Schools and adult education centres should also be linked to women's mobilisation activities. Mothers' groups, parent-teacher associations and community health clubs can promote environmental sanitation, safe water use, menstrual hygiene awareness, girls' school retention and respect for women's decision-making. These activities would connect formal education with community-based environmental education. Future research

should adopt mixed-method designs that combine survey data with interviews or focus group discussions. Qualitative evidence would help explain how women negotiate family planning decisions, how mobilisation messages circulate in communities and why some households resist or accept health and sanitation practices. Such evidence would deepen the interpretation of the small but significant regression findings. Future studies should also compare education zones in Cross River State to determine whether the relationships observed in Calabar Education Zone are similar in Ikom, Ogoja and other zones. Comparative research would help identify the cultural, infrastructural and institutional conditions that strengthen or weaken women's contributions to SDG localisation.

Policy researchers should additionally examine how local government budgeting, primary healthcare capacity, community water systems and women's representation in planning committees interact with family planning and mobilisation roles. This would move the analysis from simple associations to a more complete explanation of how household agency, public services and environmental education combine to produce sustainable development outcomes. Such evidence would be useful for government agencies, non-governmental organisations and journal readers interested in practical SDG localisation.

Declarations

Ethical approval: The study involved adult questionnaire respondents. Institutional ethics approval or administrative permission should be inserted before journal submission.

Informed consent: Participation was voluntary, and respondents were informed about the academic purpose of the study before data collection.

Funding: No external funding was reported in the source manuscript.

Conflict of interest: The author declares no conflict of interest.

Data availability: The questionnaire data may be made available by the corresponding author upon reasonable request, subject to ethical and institutional requirements.

Author contribution: Usang Nkanu Onnoghen conceptualised the study, coordinated data collection, analysed the data and prepared the manuscript.

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