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Review Article

Improving Waste Management and Public Health Using the Participatory Model in Delta State, Nigeria

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Abstract

Achieving sustainable development goals of environmental sanitation and public health has led to a focus on developing innovative and sustainable approaches to improving public health in low-income areas. The inadequacy of the diffusion model of communication in achieving the desired citizens' behavioural change to improve environmental sanitation in the country has necessitated the need for this study. This study proposes a participatory model for improving waste management and public health in Delta State. Respondents' opinions on the operational perception of the proposed participatory model acknowledged the need for a change in the operational mechanism and approaches to the implementation of the national environmental sanitation policy in the State. With the commencement of the review of the national policy on environmental sanitation to reflect current global concerns, the adoption of the participatory model mechanism for development communication will propagate collective action toward improved environmental sanitation and reduce socio-economic exclusion in Nigeria.

Key words: Development communication, participatory modelling, environmental sanitation, public health, national environmental sanitation policy, Delta State

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INTRODUCTION

Public health has been defined as “the art and science of preventing disease, prolonging life and promoting health through the organized efforts and informed choices of society, organizations (public and private), communities and individuals”^{1,2}. According to Mheidly and Fares³, health communication can be defined as the education and usage of various communication approaches to enlighten and affect individuals and communities in making decisions that enhance public health. Health communication has been an art, often integrating components of multiple development theories and models to promote positive changes in attitudes and behaviours.

Baum *et al.*⁴ defined development communication as the planned implementation of communication technologies and approaches to advance social transformation. The discipline of development communication is governed chiefly by the ideational models of diffusion and participation. These frameworks have distinctive theoretical backgrounds and differ in the underlying philosophies, frameworks, program strategies, measurement tools and goals. Participatory as the word implies means allowing individuals to participate in achieving a given objective⁵. The participatory, group or mediated model is constructed on the core principle of Kurt Lewin who opined that humans are probable to behavioural modification when they are involved in the problem analysis and decision-making process⁶. The participatory model evolved from the diffusion model/theory in recognition of the significance of community participation in development intervention projects⁷⁻⁹. This accumulated into a broad philosophical conviction that individuals have a right to be involved in making decisions that affect their lives¹⁰. The participatory model stresses group inclusion and discourse centred on interpersonal communication channels such as group meetings, workshops, localized “small media” such as community theatre or interactive posters for individual and community empowerment¹¹⁻¹³. This has led to the growth, popularity and utilization of the model in a wide variety of thematic interests and disciplines over the last decade^{14,15}.

Globally, economic diminution occasioned by the direct financial burden of managing sanitation-related illnesses and lost income through reduced or lost productivity has been attributed to poor sanitation¹⁶. Studies have been conducted to estimate the economic costs associated with poor sanitation and public health. In the year 2015, the lack of access to sanitation was estimated to have cost the global economy about 222.9 billion US Dollars, indicating a 22% rise from 182.5 billion US Dollars in 2010, with Africa accounting

for approximately 10% of the global cost¹⁷. According to the Water and Sanitation Programme (WSP) administered by the World Bank, Nigeria loses over 3 billion US Dollars annually due to poor sanitation¹⁸. Also, the costs of poor sanitation are unevenly distributed with the highest economic burden falling inequitably on the poorest, as they are more likely to have poor sanitation and have to pay proportionately more for the negative effects. Globally, about 500,000 deaths of people in low and middle-income countries annually are attributed to poor sanitation¹⁹.

The outbreak of the COVID-19 pandemic has broadly acknowledged the impact of good sanitation policies and practices in strengthening socio-economic development and environmental protection. Attaining the sustainable development goals of environmental sanitation, responsible consumption, sustainable cities and communities in purview, this work aimed at promoting the participatory communication mechanism and the utilization of a proposed model for improved waste management and public health in Delta State. Also, contribute to existing kinds of literature on the utilization of the participatory models in environmental management, as most participatory modelling in the system dynamics tradition has evolved from the business and management fields.

Participatory model in environmental sanitation and management:

The art of communication is vital to the attainment of developmental project goals, aimed at improving human living conditions, especially in the underdeveloped regions of the world⁹. In recent years, the participatory model has advanced as an instrument used in the examination of environmental frameworks and in creating consensus among stakeholders around ecological issues. The intricate dynamics and contradiction among partners on the most ideal approach to address ecological issues and effectively manage the system exemplify the attributes that make the model a useful tool²⁰. Participation does not suggest the non-involvement of institutional leaders and development planners, rather it advocates for the consideration and assimilation of local public groups’ perspectives in the decision-making process for the developmental process²¹. Therefore, participatory modelling processes in ecological frameworks are challenged by the need to strike a balance between being open and straightforward to stakeholders’ input and recognizing their limitations in participating in all aspects of model-building. A progressive norm has been observed in the union of modellers, scientists, decision-makers and stakeholders to address environmental issues such as water use²², wildlife and forest management^{23,24}.

Participatory model usage in waste management is the provision of a platform that allows for the inclusion of individuals' and communities' participation in waste management, thereby improving environmental sanitation and public health. It is usually a partnership project between governments/institutions and residents or community groups. Participatory waste management strengthens the capacity of communities to take charge of activities in their environment through improved environmental knowledge, more responsible consumption and reduced waste. As knowledge about waste management is seen to have a significant correlation with the willingness to participate in the process of waste management^{25,26}. Here, the government or institutions empower the communities with adequate knowledge and information to instigate an attitudinal and behavioural change of perspective towards waste handling and disposal, which ultimately drives societal change through the adoption of lifestyle changes and technologies that support improved environmental sanitation. And at the same time providing opportunities for economic empowerment through the waste management value chain²⁷.

Studies in the East African countries reported that the various governments adopted the participatory model as the preferred holistic approach to solid waste management in the region, after the realization that government monopoly of the solid waste management sector has not succeeded in meeting expected results. This holistic approach involves the community, private collectors, Community Based Organizations (CBOs), Non-Governmental Organizations (NGOs) and the informal sector working together under a decentralised arrangement²⁸⁻³¹. Examples of such partnerships for waste management activities with recorded achievements include the Japan International Cooperation Agency (JICA) partnership with the Municipality and Rural Management Organization (MRMO) and relevant organizations in Iran³². The Participatory Development Programme in Urban Areas (PDP) partnership with Bill and Melinda Gates Foundation, local governments, waste operators and local communities in establishing an integrated and community-based solid waste management system in Qalyubia Governorate, Egypt³³. Also, the community-university partnership between the University of Victoria (UVic) Canada, the University of São Paulo (USP) and individuals from the recyclers' group in São Paulo to address environmental sustainability, social proscription and handle urban destitution in Brazil³⁴.

The Federal Government in recognition of the important role of environmental sanitation in the maintenance of sound public health and sustainable development enacted the national environmental sanitation policy in the year 2005 as

an integral part of the overall National Development Strategy. The policy is to serve as a veritable instrument for securing a quality environment for good health and social well-being of present and future generations³⁵. Also, special provision for solid waste management, administration, environmental sanitation and punishments in cases of malfeasances was enlisted in the policy document. The failure of the numerous efforts in tackling the predicaments of environmental sanitation has been credited to several influences which consist of deleterious socio-cultural practices, inadequate environmental sanitation education and consciousness^{36,37}, unsatisfactory literacy level, incompetent governance over the years, contempt for the rule of law as well as other forms of indiscipline. In Nigeria, ineffective communication strategies have also been identified as an impediment to achieving national developmental goals³⁸. Similarly, the communication strategy for environmental management which is mainly premised and dominated by the diffusion conceptual model (top to bottom approach) has not yielded the expected outcome of improved environmental sanitation. The Federal Ministry of Environment in acknowledging the shortfalls of the extant National Sanitation Policy in identifying changes in public health practices, developmental challenges in sanitation practice and meeting international best practices commenced the review and update of the policy document in 2015³⁹.

Delta State has a population of over 4 million persons⁴⁰ and an estimated 2 million tons of municipal solid waste generated annually. Increasing waste generation along with insufficient resources and capacities for waste management has led to unsustainable practices such as the increase in the number of illegal waste dumpsites, air pollution from waste burning and waste putrefaction and aquatic pollution of freshwater bodies cumulating in environmental damage⁴¹. In compliance with the national environmental sanitation policy, the Delta State Government established the Delta State Waste Management Board under the Delta State Ministry of Environment and enacted the Delta State Waste Management Law. The utilization of the diffusion model of communication in waste management as generally practised in the state and across the country, which is "a top to bottom approach" majorly utilizing the mass media channel of communication, has yielded little results to be desired in the attitudinal and behavioural change of citizens in their day to day solid waste handling, disposal and environmental sanitation as evident in the indiscriminate disposal of solid waste, presence of illegal open dumpsites, blocked water drainage system resulting in flooding and breeding sites for pathogens etc., in the state^{25,42}. The identified exclusion of communities in the decision-

making process on environmental management has led to their deficiency of information on the ideology and benefits of environmental sanitation. This has led to their perception of waste management and environmental sanitation as the exclusive responsibility of government and the private service providers (PSPs) are perceived as agents of government for citizen's exploitation through revenue collection. Consequently, citizens must be coerced into participating in environmental sanitation through various task-force established by the government.

Methodology of study: The study utilized the instrumentation of oral interviews, structured questionnaires and focus group discussions with individuals, households and environmental health professionals, in obtaining opinions and information for the development of the proposed participatory model for improved waste management and public health in Delta State. The stratified sampling method was used in selecting the respondents among the stakeholders across the state. One thousand individuals were selected from residents in localities and peri-urban areas with poor environmental sanitation and belonging to the low-income class. The localities were first identified and then individuals and households were selected. While one hundred individuals were selected from the pool of environmental health professionals comprising environmental sanitation officers, environmental managers and waste management service providers in the state.

Survey instruments were administered face-to-face to respondents by the researchers and field officers. Respondents with literacy incompetency particularly those in rural areas were assisted in transcribing their responses to the questionnaire. Also, focus group discussions were moderated by the researchers. Interview questions were centred on environmental sanitation management and public health communication. Respondents were assured of the non-disclosure of personal information or identifiable data.

Proposed model for improved environmental sanitation in Delta State: The increasing recognition of the inability of the large-scale, top-down approaches to produce desired development outcomes, academics and practitioners have sought solutions to the development impasse through the bottom-up, participatory and community-based approaches that involve participants in their development programs^{43,44}. Despite the renewed emphasis on the focused role of local citizens in the conceptualization, designing and execution of sustainable developmental goal initiatives and projects, there is a paucity of literature on studies that have demonstrated

how to incorporate local knowledge and skills with the expertise of persons external to the local environment in context⁴⁵. The role of participatory management is not always about envisioning what an organization will require in the future, but steering it away from what has unsuccessfully worked previously^{9,46}. Therefore, there is a need for a change in perspective from the ideology of citizens' compulsion to participate in environmental sanitation to engaging the communities in the management of their urban environment as co-managers and strengthening their capacity to improve on it.

Providing sanitation solutions for consumers, especially in developing nations is a complex challenge. Having in perspective the goal of the national environmental sanitation policy, which is to ensure a clean and healthy environment by adopting efficient, sustainable and cost-effective strategies to safeguard public health and wellbeing, a participatory model for improved environmental sanitation in Delta State is proposed in Fig. 1. The key actors or stakeholders in the proposed model are Government and various agencies/authorities, private sector/waste managers and the communities. As the proposed model seeks to integrate the expertise of local citizens, campaign researchers and campaign practitioners.

Government, agencies and municipal authorities: Good governance provides the needed framework for participatory development. As it is the function of the government to create a suitable platform for encouraging participation. The government should take responsibility for the provision of a proper template for economic growth through efficient administrative structures and encourage individual competencies. The government, environmental agencies and municipal authorities have key responsibilities in the participatory mechanism:

- Prepare the template for the implementation of the mechanism after researching the different communities' indigenous strategies for environmental sanitation
- The Ministry of Environment/Agencies engages experts and Development Agencies in the organization of workshops/pieces of training for capacity building for Health and Environment Officers and provides funding for the projects
- Kick starts the implementation of the mechanism by reaching out to the people through information dissemination and enlightenment campaigns. As the socio-cultural and attitude problems in waste

management can be addressed gradually through public education to sensitize the communities. Mbeng *et al.*⁴⁵ identified communities' access to information as critical for the success of waste management in urban councils

- Get involved in organizing the communities, districts and localities into taking responsibility/charge of their environment. By putting people and their knowledge first and by involving them in policy decisions and implementation
- Create a proper market environment and enhancements of market mechanisms that will promote the growth of the waste recycling market. Explore the potentials in the long-standing traditional informal waste collection, separation and recycling, thereby creating a cash flow system for financial empowerment
- Encourage private sector direct financial investments in waste management and environmental sanitation projects by providing business incentives such as tax waivers, ease of access to land acquisition, etc.

Waste managers/recyclers: These are made up of mainly the private sector participants (PSPs):

- **Knowledge exchange:** Contribute to the development of the participatory mechanism template by providing the government and communities with updated information on industrial needs and technological developments on waste conversion and utilization. As this will contribute to proper waste management
- Connects directly with the communities in instructing and organizing them for participatory activities in waste management and sanitation

- **Financial investment:** Waste management corporations and recycling companies are encouraged to make financial investments directly or through corporate social investments⁴⁷ in the establishing of waste recycling infrastructures and business clusters and providing the communities with needed Personal Protective Equipment (PPE) for an integrated and community-based solid waste management system

People/communities: The generalized goal of community participation is not just a reflection of contemporary views concerning respect for all cultures, rather each society must endeavour to outline its strategy for development premised on its own culture and environment and should not attempt to blindly execute program and policies which have recorded success in regions with an entirely diverse cultural background²¹:

- Must be open to the assimilation of recent ideology and methodology on environmental management and sanitation. As the negative factors of attitude and culture have prevented in some cases the very important element of public participation⁴⁸⁻⁵⁰
- Take responsibility for their environment by improving their environment sanitation practices, having been empowered with the necessary knowledge/information
- Partner with the government/agencies and the private sector participants (PSPs) for improved and sustainable environmental management
- Organize themselves into groups/associations involved in waste collection and sorting activities, partner with the Government and Private sector in developing the waste market for their economic gains

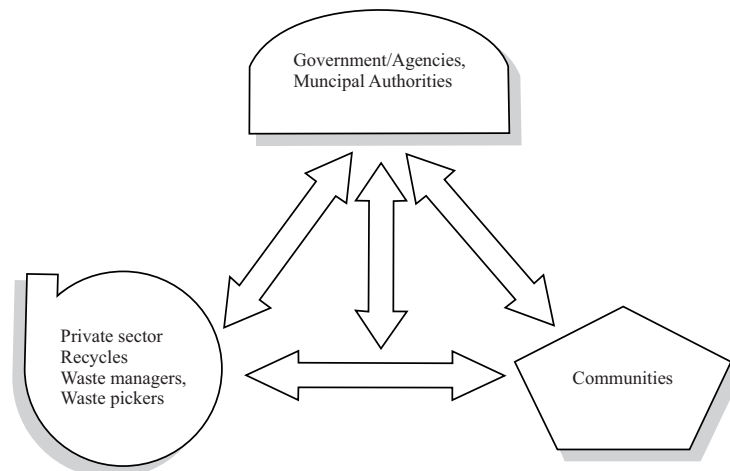


Fig. 1: Illustration of proposed participatory model for improved environmental sanitation in Delta State

Expected outcome of the proposed participatory model: The participatory model approach to development aims at achieving specific development goals while producing empowering outcomes such as broader stakeholder participation in decision-making, promoting social justice and empowering the local communities through the value chain inherent in the participation process⁵¹⁻⁵³. The adoption of the participatory conceptual model for development communication is expected to yield the following outcomes:

- **Knowledge mobilization:** It is the local community that knows the local environment, it is their knowledge that will help build sustainable waste management. The participatory environmental mechanism provides a bridge between environmental management programmes and the relevant stakeholders in the community, thereby promoting social inclusion, increased knowledge and responsiveness about waste co-management issues and resource recovery
- Development of an integrated environmental sanitation management strategy through the participation of all stakeholders and the establishment of sustainable structures for the recovery and recycling of waste
- Participatory sustainable waste management offers an alternative for safe managing of non-contaminating recyclable solid waste materials, which have been shown as potent resources for income generation and economic growth. Through communities' participation in recyclable material collection, they are now able to improve their earnings, whilst concurrently contributing to improving environmental health and sustainable development of the local environment

Operational perception of the participatory model: Opinion survey outcome as shown in Table 1 and 2, shows there is a general dissatisfaction among individuals and environmental health professionals with the level of environmental sanitation in Delta State. While the majority of the individuals (68.30%) opined that improving environmental sanitation is the fundamental responsibility of the government, the environmental health professionals (83%) thought that it is a shared responsibility between government and individuals/communities. The majority of the respondents (67.60%) expressed dissatisfaction with the approach to communicating information on environmental sanitation. Solid waste was recognized as a source of income by the respondents (100%), with the majority of them admitting to having traded in their unused bottles and scrap metals in exchange for money and new items. With the provision of the right incentives, the majority of the respondents (64.60%)

indicated a willingness to participate in harnessing job opportunities and financial gains in the solid waste management value chain. The acknowledgment of the need for a change in the operational mechanism and approaches to the implementation of the national environmental sanitation policy in the state by the Environmental Health Professionals, substantiates the need for the adoption of the participatory model.

Challenges to implementing the participatory model: Major identified challenges are political interference in Institutional administration and value-action gap among citizens. According to Kabera *et al.*²⁸, political interference weakens environmental management institutions and creates a community that is difficult to work with for environmental management. Political interference caused by personal interests has resulted in the appointment of persons to head Environmental Agencies and Waste Management Boards mainly based on political gratification rather than competence. As such they are unable to provide the intellectual and leadership capability needed by these Institutions to achieve development goals. Government must show political will and action by committing to a national strategy on environmental sanitation to meet the target set out in the Sustainable Development Goals (SDG6).

The value-action gap also referred to as the attitude-behaviour gap, KAP-gap (knowledge-attitudes-practice gap) or belief-behaviour gap is the space that occurs when the values (personal and cultural) or attitudes of an individual do not correlate to their actions⁵⁴. As shown in Table 1, individuals/households have expressed their dissatisfaction with the poor level of environmental sanitation, but have demonstrated poor behavioural adjustment to improve the situation despite knowledge of its implication on public health. This is attributed to the individuals' level of environmental consciousness³⁶ and their opinion on improving environmental sanitation as the sole responsibility of the government. A typical example can be seen in the reluctance to utilize waste management facilities such as waste collection bins where provided for the reason of inconvenience, resulting in waste littering and environmental nuisance.

Recommendations: The effectiveness of the participatory mechanism is premised on its ability to equate a balance between informal and formal perspectives, thereby ensuring that a joint identity and perception are achieved, which guarantees the success of the process⁵⁵. This is achieved by first identifying the underlying factors which influence the attitude and perspective of the public (informal sector)

Table 1: Survey response of individuals/households

Parameters	Response	Percentage (%)
Are you satisfied with the level of environmental sanitation in Delta State?		
Yes	-	-
No	1000	100
Who should take responsibility for improving environmental sanitation in Delta State?		
Government	683	68.30
Individuals and communities	59	5.90
Shared responsibility between government and individuals/communities	258	25.80
Are you satisfied with the approach of communicating “innovations in environmental sanitation and health” to the public in Delta State?		
Yes	-	-
No	676	67.60
Undecided	324	32.40
Do you see solid waste as a potential source of income?		
Yes	1000	100
No	-	-
If provided with the right incentives will you participate in the solid waste management value chain?		
Yes	644	64.40
No	107	10.70
Undecided	249	24.90

Table 2: Survey response of environmental health professionals

Parameters	Response	Percentage (%)
Are you satisfied with the level of environmental sanitation in the state?		
Yes	-	-
No	100	100
Who should take responsibility for improving environmental sanitation?		
Government	17	17
Individuals and communities	-	-
Shared responsibility between government and individuals/communities	83	83
Is there a need for change in the operational mechanism of environmental sanitation in the state?		
Yes	100	100
No	-	-

towards the desired objective/goal outlined by the formal sectors (regulatory agencies etc.), adopting communication strategies that will positively re-orientate the public perception/attitude towards the desired goal and mobilize them for action. What will work in the local environment is not a question of which is the predominant approach, rather it is the need of tailoring project goals to meet the needs of the local community needs and find the most suitable mechanisms to achieve the set objectives.

Participatory capacity development: The participatory approach creates a system that allows for social equity, community empowerment and expanded participation in decision-making for sustainable development projects. In the process of community participation and shared responsibilities in waste management and improving environmental sanitation, new opportunities are discovered along with the waste management value-chain such as waste sorting, waste trading, recycling of reusable materials etc., through which local groups/communities can utilize to improve their lives economically. This will contribute immensely to correcting the individuals' and households'

perception of improving environmental sanitation as the sole responsibility of the government.

Waste management policy: Waste management policies have a powerful effect on communities. Generally, the rural poor communities bear the burden of the detrimental environmental and health effects of poor waste management, as dumpsites of various forms of waste are situated in these communities. With the high level (76%) expression of interest in participating in the solid waste management value-chain by individual respondents, it is a necessity for waste management policies to reflect the benefits of waste management to the communities and their local environment through the transformation of these dumpsites to clusters of industries involved in waste recycling and utilization. Thus providing opportunities for host communities to participate and be empowered in the waste management value chain while improving environmental sanitation and public health.

Participatory solid waste management projects: Pilot projects for the participatory mechanism should be established in selected communities and sub-urban

settlements in the state and the experiences and knowledge obtained from the pilot projects will be used in formulating an effective and sustainable mechanism for the state. A typical example of such pilot projects urgently needed for improving environmental sanitation in Delta State is the polythene waste management project and the vegetative waste digester projects.

Micro-credit: The monetary benefits made by the informal recyclers are reliant on the acquiring cost of the waste traders/intermediaries who control the market cost²⁷. For informal recyclers to connect directly with the recycling industries, they should have the capacity to supply large quantities of material. Micro-credit is vital in assisting these groups to overcome these challenges during collective commercialisation. There is a need for a funding mechanism that provides small loans, which allow groups to survive until payment from the industry arrives. This removes the need of engaging market middlemen, sustains income within the system and creates opportunities for apprenticeship and self-empowerment.

CONCLUSION

The art of communication is vital to the attainment of developmental project goals, aimed at improving human living conditions, especially in underdeveloped regions of the world. Waste management is one of the most visible urban services whose effectiveness and sustainability serve as an indicator of good local governance, sound municipal management and successful urban reforms. Recent deliberations on governance systems have viewed participative management as a veritable alternative to the traditional bureaucratic hierarchical system, mobilizes collective action, facilitates communities' empowerment and achieves significant human and ecological development outcomes. The ongoing review of the National Sanitation Policy offers an opportunity for a paradigm shift from what has previously not worked to exploring other probable options. With increasing constraints on the economy and the desire of the government in achieving set targets for sustainable development, there is a need for the adoption of a conceptual model for development communication that is capable of promoting social change and attracting financial and infrastructural investments. The participatory model utilization in waste management is an efficient, sustainable and cost-effective approach to improving environmental sanitation.

SIGNIFICANCE STATEMENT

This study has proposed a participatory model for solid waste management and shown how it can be utilized in improving environmental sanitation in Delta State, Nigeria. Also, the study adds to the literature on the application of the participatory model of communication in the thematic field of environmental management. This study will assist researchers in designing implementation approaches that are centred on the target individuals, particularly at the rural level in achieving sustainable development.

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