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THE APPLICATION OF PARTICIPATORY GEOGRAPHICAL INFORMATION SYSTEM IN COMMUNITY DRIVEN DEVELOPMENT PROJECT IN EKITI STATE, NIGERIA

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Abstract:
The inequalities in the spatial distribution of infrastructural facilities have led to exclusion, poverty and lopsidedness in sustainable development. This is worsened by lack of reliable spatial and local data to plan for development issues. This paper employs the benefits of Participatory Geographical Information System to data collection and analysis for decision making in Community Driven Development at Upperland community, Ado- Ekiti in Nigeria. The data used for the study were collected through Participatory Rural Appraisal - Stakeholders' Analysis, Focus Group Discussion, Transect Walk and Voting- while ArcGIS 10.2.2 software was used for analysis such buffering. The results showed that the community people have indigenous spatial knowledge that development planners can rely upon. The study concludes that to have a sustainable community development, planners should tap into motivation, desire, knowledge and networks of local communities.

Keywords: geographical information system, community development plans, global positioning system, focus group discussion, participatory rural appraisal, spatial indigenous knowledge

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1. Introduction

Spatial exclusion is an important component of infrastructural marginalisation and vulnerability. Within the facets of community development, it is increasingly understood that social infrastructural and services play a critical role in addressing exclusion and achieving the goals of poverty reduction, gender equality and sustainable development (Ayeni, 2017). However, an all-encompassing tool to capture the necessary developmental variables looks elusive. The conventional method of development featured a supply- driven approach where projects were poorly targeted with little or no involvement of the targeted benefiting communities in the identification of their basic needs (Ayeni and Odeyemi, 2015). It equally featured a non-participatory mode of delivering services to communities, low or total absence of community participation. Decision making under past developmental strategy was centralised at the top and imposed on the community. There was lack of community participation in the design, implementation and maintenance of projects/ programmes which resulted into misdirected funds, lack of maintenance and low sustainability (Ayeni & Odeyemi, 2015).The new strategy (CDD), is a bottom-up approach where project identification and decisions are taking by the people. CDD is demand - driven and entrust key decision making to the grassroots. There is high participatory mode of services delivery to communities, with the consequences of the introduction of community ownership of projects and participation in all levels of project planning and execution (Narayan, et al, 2000). This paper presents a merger of Participatory Rural Appraisal (PRA), with Geographical Information System (GIS) to determining and locating community project that would help in reducing poverty and thus an elixir to community development.

Carley and Christie (2000) defined sustainable participatory development as a continuing process of mediation among social, economic and environmental needs which results in positive socio-economic change that does not undermine the ecological and social systems upon which communities and society are dependent. Its successful implementation requires integrated policy, planning, and social learning processes; its political viability depends on the full support of the people it affects through their governments, their social institutions and their private activities. From this description, three fundamental tasks can be identified as: strategic and philosophical reflection, research and development to generate new knowledge and appropriate technologies and lastly, to develop institutional, regulatory and human networking capacity. It is evident that government working on its own alone will never resolve the problems and challenges of community development but partnership is required-government

working with business, the community and other civil society at all levels. Today, there is growing awareness that top-down approaches, whether led by the public or private sector, will always be weak compared to stronger, more sustainable, development initiatives that combine bottom-up community involvement with integrated and guided development approaches. Participatory tools, such as, 'participatory rural appraisal' remain very valuable particularly for initiating participation processes, for community/neighbourhood design initiatives and for local confidence building (Miltin and Thompson, 1994). Although, some literatures raised concern about 'participation' that many local people have the beliefs that the real decisions would have been taken before reaching them but the fact remains that development cannot be managed properly without devolving decision making to the community level as the centre may not be able to exert enough and effective control. Participatory models aim to empower the communities through providing help and support for them to control their development. Through this, every community is invited to become an active agent capable of influencing its own destiny. Participation must therefore be seen as a dynamic process where initiatives are taken by the local population, guided by the local population, and by experience in order to use the means and resources (institution and mechanisms) over which it can exercise effectiveness (Olawepo, 2009).The concept of Participatory Rural Appraisal (PRA) includes all methods that invite a community to share, and analyze its knowledge and life conditions within an action oriented research (Chamber, 1994). Such a research is automatically systemic as it focuses on the global ecosystem, biophysical, social and economic components. Early in PRA history, the spatial character of the information became crucial in all forms of analysis and/or decision. PRA methods integrated cartographic modelling tools and gave participatory geography a priority role in the integration of the local population's and the regional planet's perspectives into any resource management approach (Craig, 2002). PGIS is the integration of local knowledge and stakeholders' perspective in the GIS.Change International Conference (2005) defined PGIS 'as an emergent practice in its own right: developing out of participatory approaches to planning and spatial information and communication management. Participatory GIS implies making Geographic Information Technology (GIT), available to disadvantaged groups in society in order to enhance their capacity in generating, managing, analyzing and communicating spatial information. This practice could exert profound impacts on community empowerment, innovation and social change. Indeed, it places control of access and use of culturally sensitive spatial information in the hands of those who generated them and hence, protect traditional knowledge and wisdom from external exploitation.

The following are the significance of the study:

- Since participatory GIS is a field of research that has not been fully focused in the country and especially, in the State, it would represent one of the pioneer studies.
- GIS is a new technology, which can be adopted as a tool for analysing and integrating the spatial and non-spatial data in community development projects. This study derived from combining participation and GIS results and its powerful communication medium which bridge the gap between indigenous technical knowledge and scientific knowledge, thereby increase the capacity of local stakeholders and policy makers to interact, locally, with external agencies like Donor Agencies and the government.
- Lack of spatial information in the community development remains one of the major problems for development practitioners and government officials and local planners. The government can therefore use the spatial distribution of resources and its usage pattern as acquired by PGIS process for proper participation and sustainability of assets created.

The following are the objectives of the study:

- Employing participatory rural appraisal to identify and prioritize micro projects for community development.
- Merging participatory approach with geo- information system to spatial planning.
- Using GIS tool (buffering) to locate the site of the project.

Geographically, Ekiti State is found between longitudes 4^0 45′ to 5^0 45′ East of the Greenwich Meridian and latitudes 7^0 15^i to 8^0 5^i North of the Equator. The State shares boundaries with Kwara State in the North, Kogi state in the North - East, Osun State in the West and Ondo in the South and South- East (Adebayo, 1993). The community under study is Upperland Community about three kilometres to Ado - Ekiti, the State capital. Using Global Positioning System (GPS), it lies between 844950 and 846025 Eastings and 744750 and 746525 Northings.

2. Material and Methods

The primary source of data collection was Participatory Rural appraisal (PRA) which emphasise local knowledge and enable local people to make their own appraisal, analysis and plans. In carrying out this study, the Stakeholder Analysis was used as the participatory technique while the tools used were Historical Profile/ Timeline, Focus Group Discussion (FGD). In order to prioritize the needs in the Community Development Plans (CDP), Voting, as a tool was used.

Stakeholder Technique was used to determine who are the stakeholders in the community so as to ensure effective participation of all concerned, understand beneficiary interests, needs and capabilities and determine to what extent certain groups should participate in project planning, implementation and evaluation. Historical Profile / Timeline was used to give an overview of the key historical events in the community and their importance for the present. It was produced with a group of elders taking cognisance of gender, social class, age and educational background. Transect mapping was carried out by walking through a cross- section of the area, with the aid of a key informant using direct observation, talking to people as we go along and recording information. The system helped to compare main physical features, resources use and problems and opportunities of different zones.

For effective use of Focus Group Discussion (FGD), the community was disaggregated into five different age-groups- men, women, elderly, youth and vulnerable one - to identify their preference needs (Plate II). In the course of projects prioritization, "Voting" system was used where each group voted for their most preferred project in order to reduce the level of poverty (Table 1). Satellite imagery of Upperland Community was downloaded from Goggle Earth. Arc View version 10 was used as the GIS software while buffering was used as the analytical tool to locate the site of the project. Buffers are used in site selection, for this study, it was used to determine the extent of flood effects on the community and therefore, determine the length and size of drainage needed to control the effects of floods. PS was used at the PRA stage to the data validation and accuracy checking. Service centres, housing units, road network, were captured so as to well precision points for geo - coding satellite image of the community.

3. PRA and GIS: Limitations and Risks

If proper training ethics are not adhered to in the course of carrying out PRA techniques, it may lead to some limitations, risks and disadvantages. Some of these limitations are:

- Elites hijack of the process at the expense of the community people may lead to a situation where the focussed groups are distanced from decision making process. For the process to be fully participatory and all inclusive, the groups at the community level should have a voice in decision making that concerns their development.

- At times, heterogeneous groups could bring about different and parallel opinions which may impact negatively in the course of using such information generated.
- It usually involves high overhead cost, time and huge human resource in bringing together and sensitizing community people even before the real PRA takes place, thus, many resources are therefore needed in terms of manpower, money and technical skills which may not always be available.
- The size of respondents and participants are usually small. This may therefore lead to wrong representation of ideas, especially, in the area of generalization as the size of the participants may not be representative enough of the population under study. Despite all these shortcomings and others, PRA has been adjudged by researchers and planners as the 'final word' for efficient rural development planning and one of the most reliable sources of data collection especially when it involves rural communities (Chambers, 1994b).

However, it should be noted that GIS has been generally seen as expert driven technology, controlled by State or Central government, research institutions and private corporations. A number of risks and limitations are therefore associated with the application in the service of human centred development. These include amongst others as follows:

1. Only spatial data that are readily converted to digital form can be incorporated into GIS.
2. It is the experts in the field of GIS that would be able to make planning decisions instead of the locals who are directly involved in development issues.
3. It involves huge cost outlay to set up a GIS platform beyond the reach of people, and hence, the costs implication may outweigh the benefits anticipated.

These risks are real, but they can be addressed by deploying GIS in institutional and policy context in which there is a real commitment to incorporating the needs and perspectives of local people in development research and in planning and resource management process (Goet et al, 2001).

4. Results and Discussion

In facilitating projects' initiation and choices, a participatory and all inclusive approach was employed; hence, the community was divided into five different age groups- men, women, elderly, youth and vulnerable. Each age group using Focus Group Discussion (FGD), met and determined their various felt needs. It should be noted that each group was facilitated to hold their discussions at different venues so that the men especially

would not have undue influence on the choice of projects' selection by other groups. This was so as most women would not talk where they have their husbands seated in the same meeting as well as the children too would be disenfranchised in making their voices known and heard as a result of cultural set up. This method therefore promoted the voiceless to have a say in their own developmental strides. At the group stage, each group was facilitated to identify the resource they enjoy in the community. Later, the problems encountered (what they lack) were listed as suggested and the causes of these problems were adequately documented. The effects of the problems, coping mechanisms and possible solutions were identified (Table 1).

An important observation from the collated choice of projects was that the felt needs vary across the various age groups. While the men were concerned more with their environment, that is, roads, culverts and drainages for easy accessibility, women accorded water and electricity highest priority on their scale of preference. The children and the youth considered social projects like stadium where they can play game and practice sporting activities, viewing centre where they can watch football matches involving Chelsea, Arsenal etc and where social functions can take place. Elderly ones wanted projects that would enhance their living conditions like the provision of eye glasses, walking sticks and provision of social security funds.

Table 1: Identification of Community Problems

S/N	Problems	Causes	Effects	Coping Mechanism	Possible Solution
1	Flooding	Lack of drainage	Lack of access to community.	Temporary Planks	Construction of Culvert.
2	Erosion	Lack of drainage	Hindering to Community	Digging of long Trenches.	Construction of Drainages.
3	No electricity	Lack of transformer	Lack of Electricity	Using Generators	Provision & installation of transformer.

Source: Field Work, 2014.

At the age group level, the identified needs were drawn into diagrams for proper identification by the community members. In the course of listing the priority projects of the community to solve the most pressing problems, 'Voting' exercise was used (Plate I). This is a system where each community member was given three stones besides the diagram of each of most prioritized project or, puts two for a project and the remaining one for another. The voter may put a stone besides a project for three different projects. The first scenario means, that the voter shows the highest preference for only one project, while the second scenario shows a higher preference for one with

two stones and lower preference for the one with only one stone. The third voter shows equal preference for the three projects chosen (Plate II). In the final priority projects in the community development plan, all the five groups' election results were read out by a representative of each of the groups, and a matrix table (rows and columns) was constructed (Table: II).

Table 2: Pra- Needs Identification and Prioritization

S/N	Needs Identification	Elderly	Men	Women	Youths	Vuln	Total	Ranking
1	Const. of a block of 3 classrooms.	10	11	20	15	12	68	6th
2	Const. of drainages.	21	25	35	93	11	185	2nd
3	Const. of health centre.	16	19	15	19	12	81	4th
4	Channelization of river course	25	28	39	86	12	190	1st
5.	Grading of roads	11	16	17	22	16	82	3rd
6	Extension of electricity	12	18	06	18	16	70	5th
7	Supplies of hospital equipment	10	14	11	13	10	58	7th

Source: Field work: 2014.

In conducting transect walk and Transect Mapping, some members of the community joined the researcher on a transect walk and therefore was able to evolve a community map for the community (Plate IV). A resource map showing existing resource available, the green areas and other important landmarks was generated. Through this method, spatial data such as land use, settlement pattern and people's perception of these areas were investigated and discussed in detail. This, indeed, allowed the generation of an overview of the community and at the same time, drew our attention to unusual characteristics like the use of the river (River Oke) that transverse the community. Community sketch map was drawn on a sheet of paper showing the boundary, distribution of road network, housing units, water stream and other important features (Plate IV). A sort of social mapping was used to generate information on health and socio-economic activities. All these were combined together and used as a community plan and the livelihood activities (Plate IV).

Having prioritized the projects in the Community Development Plan (Table II), channelization of Oke river course was the most felt need to control the flooding/ ecological problem in the community. Buffering, the creation of a zone of interest around an entity or a set of an entity, was used around the river course of 50m width. Since this is a vector data GIS, the input feature was represented by line while the output coverage was a polygon (Fig 1).The course of the river was buffered by 50m (Fig 1.) width so as to channelize the river for proper discharge of its contents. In order to safeguard both human and material losses, no one is allowed to build or erect any

structure within the buffer zone. This was done to forestall any damages to human lives and properties that could arise from the effects of flooding. From this feature, a proper engineering costing can be done to calculate the cost of the project.

Plate I: A cross section of the participants at community (Upperland) sensitization, Ado - Ekiti
Source: Fieldwork, 2014.

Plate II: People queuing for Voting at Upperland community, Ado -Ekiti
Source: Field work, 2014

Plate III: Women group voting for their projects choice at Upperland, Ado- Ekiti
Source: Field work, 2014.

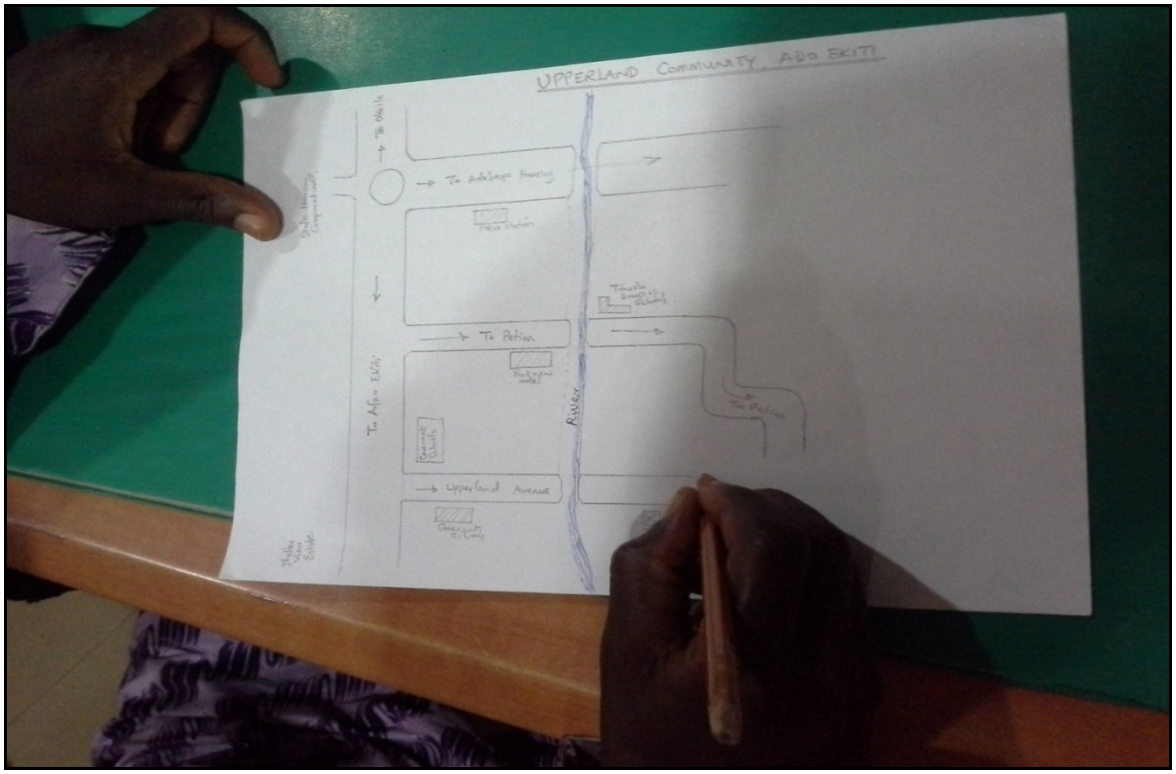

Plate IV: Community Map being drawn by a representative of Upperland Community
Source: Field work, 2014.

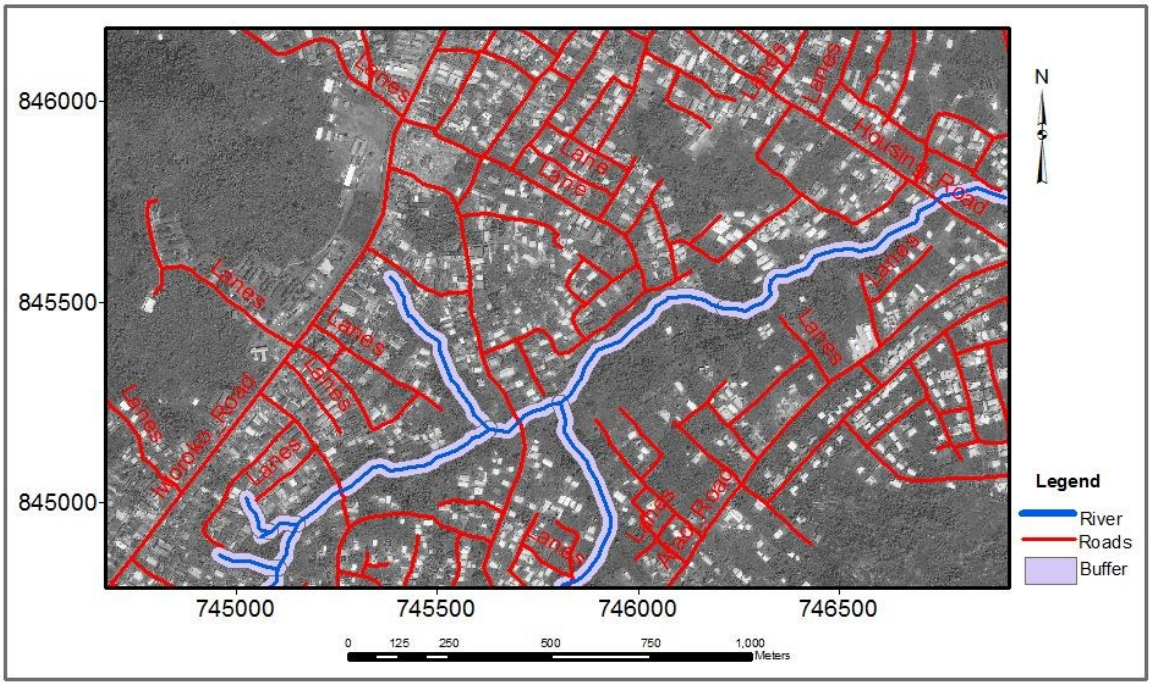

Figure 1: 50m Buffer zones (grey) around the river Oke (blue)

Source: Field work, 2014.

It was revealed from the study that participatory approach to developmental strategies would go a long way to fulfil the priority needs and project goal of the communities who are the end - users of these assets. Sense of ownership and belongingness would be built into the projects' implementation and sustainability at the initial planning stage of the life cycle of the projects. It made projects pro- poor, pro- nature, pro - jobs, pro - women and pro- children.

Streams in both urban and rural settings are typically out of balance due to human interaction with the environment so that there is excessive erosion or excessive deposition. Excessive erosion in Upperland Community, Ado Local Government Area (LGA), was caused by increased run-off from paved surfaces, such as roads and upstream construction thereby leading to excessive deposition from human activities like commerce, construction of roads and buildings. From the study, GIS analytical tool- buffering- was used to demarcate area of ecological disaster. This was done by buffering some 50m radius of floodable area in which structures were not allowed to be developed through necessary government policies and construction standard ethics. This would act as safeguard to both human, animal and structural assets. Because of lack of data, urban planners use direct ways to analyze terrain. GIS can help overcome the absence of basic terrain data in managing floodable area, thus, using buffering can be used to demarcate disaster areas (Rosario, Giustide and Ramon, 2008).

5. Conclusion

The recognition that local participation is a critical goal of development has contributed to the popularity in a set of techniques designed to increase local participation and knowledge in planning process. Identified as PRA, this trend is marked by the use of a variety of high-end technologies, including GIS. That is, a PGIS is required to ensure local knowledge and participation in a variety of planning initiatives. This synergy of interest has resulted in a growth of GIS tools. Although, participation can be advanced through the use of GIS, this paper concludes by suggesting that research on the availability of these tools should not serve as a substitute for critical analyses of their use and effectiveness by local communities.

6. Recommendations

The government at the three tiers should mainstream the concept, practices and principles of participatory and all-inclusiveness approach (Community Driven Development) to their developmental strategies. The trend of projects dispensation by the governments has majorly be that of non-participation of would-be end-users. Such projects and programmes lacked the element of ownership hence, could not be sustained. Governments used the 'supply- driven' and 'top-down' approaches to plan and implement projects and programmes. Usually, the users of these projects did not see the projects as their own since they were not brought into the planning stage, hence, there would sometimes be civil protests against the implementation of such projects. Even, the ones that were in implementation stage were destroyed and vandalized by the host communities. The new trend should be concept of community budgeting and planning where the government in power allowed the community members to discuss about their own felt- needs. They participated at the planning stage and such method had been more rewarding than for the government to just dole out projects to her subjects whether it met their demands or not. In preparing the State annual budgets, Communities' needs should be collated to form the main basis of preparing such budgets. Although, Participatory approach in community driven development was not a policy area, but a model or tool of development which primarily could lead to empowerment of the urban poor and poor communities.

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