

# Residents' Satisfaction with Public Facilities and Neighbourhood Environment in Slum Residential Areas of Jos, Plateau State, Nigeria.

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#### **Abstract**

The high density residential areas of Jos were scaled on the basis of level of environmental decay and general planning in order to select the worst residential slum areas for study. Three areas, Gangare, Angwanrogo and Dadinkowa emerged as study sample. The areas were subjected to assessment using questionnaires with a view to determining the residents' degree of satisfaction with seven loaded factors: public institutions, public facilities, environmental conditions, transportation facilities, recreational facilities, neighbourhood safety and commercial facilities. Results obtained showed a general trend of dissatisfaction of the residents of the areas with all the seven measured factors. The tested hypothesis indicated calculated x<sup>2</sup> value of 13.57 which is greater than the theoretical value, 2.73 at  $\alpha$  0.05 and 1.65 at  $\alpha$  0.01 which implied that there is a significant level of correlation in the degree of satisfaction among the three residential areas. Therefore, the researchers concluded that similar policies and programmes aimed at improving the environmental setting and public facilities will be suitable for all slum residential areas of Jos. Following this, it is recommended among others that, the areas should be declared as Action Plan Areas (APA) for emergency action with priority accorded to provision of access roads, drainages, planned refuse disposal systems, and public enlightenment programmes on the benefits of environmental sanitation. Public Private Partnership (PPP), State and local government authorities are recommended for the implementation process. For sustainability of the programmes and projects, the involvement of members of the communities is also recommended.

**Keywords:** Residents' satisfaction, public facilities, high density, residential areas, loaded factors

### 1. Introduction

Satisfaction of residents of an area with the general residential and environmental conditions is a planning goal as this determines the inhabitants' level of functional efficiency, productivity and general contribution to a nation's development. The various aspects of slum and its immediate and direct implications on nations' development has not only attracted attention of scholars in Nigeria and other developing counties but the world over; infact the literature cannot only be said to be replete on this. Hiraskar and Hiraskar (2013) for instance, submitted that about twenty-five percent population of any city in India live under sub-human conditions of slums.

The dwelling cannot be separated from the environment in which it is situated. Satisfaction and habitability have been conceived as a human concept made up of four sub-systems; the tenant sub-system, the dwelling sub-system, the environmental sub-system and the management sub-system which are inter-dependent and continuously interact with each other (Onibokun, 1974, Ndubueze, 2001). The environmental sub-system (the one directly related to this study) is defined to mean the physical environment in which dwelling is located. Lee and Park (2010) also argued that residential satisfaction deals mainly with perception of housing and neighbourhood satisfaction. Infact, it was noted by Ibem and Azuh (2014) that studies from different countries, including Papua New Guinea (Kaitila, 1993), Nigeria (Ukoha and Beamish, 1997; Jiboye, 2009; Ibem and Amole, 2012), USA (James, 2007) and Malaysia (Salleh, 2008; Mohit et al, 2010; Mohit and Nazyddah, 2011) have shown that residents have been satisfied or dissatisfied with various aspects of their dwelling units and neighbourhoods.

Most slums in Nigeria developed as a result of high urbanization pace leading to conglomeration of people in the urban centres without prior plans, most especially from the second half of the last century. Development of slums in Jos however inclined a bit from this generalized origin as it originated from the economic growth of the city which generated continual migration of labourers and traders from the North and South of the country into the booming tin mining region at the wake of twentieth century; thereby leading to development of sub-standard, unplanned and uncontrolled housing. The settlements continued to develop, especially in the areas reserved for traditional settlements, with limited management and control thereby generating environmental deterioration, inadequate housing and poor infrastructure, hence the growth of slum areas at the different locations in the city.

Hiraskar and Hiraskar (2013) while enlisting effects of slums on town life, observed that the mental outlook of the slum dwellers is affected, the inhabitants lose their ambition, civic interest and wholesome neighbourhood spirit. They finally concluded that slum conditions considerably affect the working conditions of



people in offices, schools, hospitals etcetera. From these opinions and many similar ones, it becomes obvious that the spirit of the productivity of an individual is a factor of many variables; one of which is the satisfaction with the environmental condition where one lives. This research therefore aimed at examining the level of satisfaction of residents in slum residential areas of Jos, Nigeria, with their environment and public facilities.

#### 2. Research Method

The research was an extraction from the embodiment of a larger study carried out in Jos in 2014 to determine the implications of slum for physical planning. Twenty-four areas (districts and wards) were identified as displaying slum characteristics on the basis of housing and environmental decay. The areas were further re-grouped into three viz: slums within the central area, slums of intermediate locations, and slums located in the periphery. Slums in each of the three groups were evaluated and weighted on a scale of 1-5, worst to best respectively using five criteria which include general layout and planning, availability of public facilities, level of environmental decay and abandonees, physical condition of houses and observed population concentration. The summation of scores obtained by each area was obtained and the one with the least score in each group selected for study. At the end of the sampling exercise, Dadinkowa, Gangare and Angwanrogo were invariably selected for study to test residents' satisfaction with the facilities and neighbourhood environment. No specific formula was adopted by the researcher in determining the sample size for the study. This was because of the number of sample needed for the data collection and the nature of analysis involved. According to Isreal (1992) and Ibem, Adeboye and Alagbe (2015), if descriptive statistics (e.g. mean and frequencies) are to be used for analysis, then any sample size will suffice. Consequent upon this, 3%, 10% and 5% (depending on the size of the area) of the total housing units identified in the areas were respectively sampled for study using simple random technique. The responses in the three areas were summed up and used to determine the proportion of response (see Table 1).

**Table 1: Sample Selection for the Study.** 

Area	No of dwellings	Sample size	No of questionnaire	Response rate
Dadinkowa	7959	3	239	230 (96.2%)
Gangare	1670	10	167	150 (89.8%)
Angwanrogo	3980	5	199	191 (95.9%)

Source: Authors' Field Survey, 2014

Structured questionnaires were the major instruments of data collection. It was used to collect information on firstly, essentially relevant socio-economic characteristics of the respondents and secondly, the expression of satisfaction on seven factor loaders on neighbourhood environmental conditions and public facilities in their areas using Likert scale of 5-1 respectively for Very satisfied, Satisfied, Dissatisfied, Very dissatisfied, and Indifferent. Hints were provided for the respondents as factor bases for expression of degree of satisfaction. The respondents' characteristics were analyzed using simple descriptive statistical tools. Responses from the three areas studied were averaged and used as the basis of discussion. An hypothesis was tested to ascertain the level of correlation of residents' opinion on one major evaluation variable (sanitary condition) in the three areas. Information was also obtained from relevant secondary sources.

## 3. Data Presentation and Discussion

## 3.1 Socio-Economic Characteristics of Respondents

Table 1 below is a tabulation of responses of the 571 inhabitants of the study areas in respect of 5 essentially selected socio-economic attributes of the respondents. The result reveals that most of the inhabitants (86.7%) fall between the ages of 18 to 65 which is within the range of the official labour force in Nigeria. 47.6% of the residents of the area are females while 52.4 are males. This is in line with the 2006 population census which shows that about 49% of the nation's population are females. Majority of the respondents, up to 41.9% are secondary school certificate or its equivalent (e.g. Grade II, Technical College etc) holders; those with primary education form 19.1% while 29.7% possess tertiary education qualifications. 9.3% do not have any western education background. The educational qualifications and possibly the unemployment and under employment problem in the nation is responsible for the low income group earning less than N30000.00 per month having a larger percentage of 41.0%. Only 21.7% earned above N60, 000.00 as monthly income. Analysis of the household size revealed that as much as 73.9% of the dwellings in the study areas have a household size of 7 persons and above, only 10.5% have 1-3 persons while 15.9% have 4-6%. The researchers deduced there was a reflection of the residents' religious belief who mostly are Muslims (as observed during the field study) in two of the areas (Gangare and Angwanrogo) sampled for the study. Most of the respondents have stayed long (31 years and above) in their areas, thereby are in good position to express their feeling of satisfaction in respect of the neighbourhoods.



**Table 2: Socio-Economic Characteristics of Residents** 

	Frequency (n=571)	% of total
Age of Respondents (Years)		
Below 18	19	3.3
18-65	495	86.7
Above 65	57	10.0
Gender		
Female	272	47.6
Male	299	52.4
<b>Highest Level of Education</b>		
Primary	109	19.1
Secondary and equivalent	239	41.9
Tertiary	170	29.7
Non	53	9.3
Average Monthly Income (N)		
Below 30,000	234	41.0
30,000 - 60,000	213	37.3
60001 and above	124	21.7
Household Size		
1-3 persons	60	10.5
4-6	89	15.6
7-9	270	47.3
10 and above	152	26.6
<b>Duration of Stay in the Area</b>		
0-10	41	7.2
11-20	61	10.7
21-30	70	12.3
31-40	129	22.5
41 and above	270	47.3

## 3.2 Analysis of Respondents' Satisfaction

The assessment of the satisfaction level of the residents was investigated using seven loaded factors. Each of the loaded factors was further assessed under sub-assessment factors weighted on Likert scale. Respondents were provided with determining factors that should guide their choice of level of satisfaction. For instance, the walkable distance to school and provision of facilities in the schools, etc for public institutions; frequency and reliability of supply etc for public utilities etcetera.

The result obtained in respect of public institutions as revealed in the averages in Table 3 shows that residents of the slum residential areas of Jos are mostly not satisfied with public institutions in their areas. While only about 20-24% were either very satisfied or satisfied in each of the institutions investigated, over 70% were either not satisfied or were very dissatisfied in all the three public institutions. This implies the problems of the public institutions in the areas are critical. This is in line with the submission of Ndubueze (2001) that where more than 50 percent of respondents are dissatisfied, the problem is critical.



**Table 3: Residents' Satisfaction with Public Institutions** 

Institution	Degree of	Gangare		Angwanrog	0	Dadinkowa		Average	
	satisfaction	Frequency	%	Frequency	%	Frequency	%	Frequency	%
		(n = 150)		(n = 191)		(n = 230)		(n = 571)	
a	Very satisfied	25	16.7	10	5.2	12	5.2	47	8.2
Nursery/Prima ry School	Satisfied	34	22.7	28	14.7	27	11.7	89	15.6
//P	Dissatisfied	61	40.7	95	49.7	97	42.2	253	44.3
rsery/F School	Very	30	20.0	58	30.4	74	32.2	162	28.4
furs / S	dissatisfied								
Ŋ ry	Indifferent	0	0.0	0	0.0	20	8.7	20	3.5
	Very satisfied	19	12.7	00	0.0	23	10.0	42	7.4
	Satisfied	27	18.0	19	9.9	39	17.0	85	14.9
Secondary	Dissatisfied	35	23.3	27	14.1	63	27.4	125	21.9
pud loc	Very	69	46.0	145	75.9	105	45.6	319	55.8
Second	dissatisfied								
N N	Indifferent	0	0.0	00	0.0	00	0.0	00	0.0
	Very satisfied	13	8.7	17	8.9	8	3.5	38	6.7
	Satisfied	38	25.3	24	12.6	18	17.8	80	14.0
80	Dissatisfied	41	27.3	52	27.2	72	31.3	165	28.9
th liti	Very	58	38.7	98	51.3	132	57.4	288	50.4
Health Facilities	dissatisfied								
HH	Indifferent	00	0.0	00	0.0	00	0.0	00	0.0

Source: Authors' Field Survey, 2014

Information was obtained on two major public utilities, electricity and pipe-borne water. In the case of electricity, 78.4% were not satisfied while a little above 21% were either highly satisfied or satisfied. For water, 64.0% expressed their dissatisfaction while 35.1% were satisfied. This also implies a critical situation in line with the study of Ndubueze (2001). The frequency of supply, reliability of supply and the quality of the product supplied are the hints provided as determinants of satisfaction level of respondents. See Table 4.

Table 4: Residents' Satisfaction with Public Utilities

Utility	Degree of	Gangare		Angwanrogo	Angwanrogo			Average	
	satisfaction	Frequency	%	Frequency	%	Frequency	%	Frequency	%
	Very satisfied	11	7.3	34	17.8	00	0.0	45	7.9
	Satisfied	42	28.0	24	12.6	12	5.2	78	13.7
ity	Dissatisfied	88	58.7	36	18.8	50	21.7	174	30.5
Electricity	Very	9	6.0	97	50.8	168	73.1	274	47.9
lec	dissatisfied								
田	Indifferent	00	0.0	00	0.0	00	0.0	00	0.0
<u>e</u>	Very satisfied	23	15.3	10	5.3	32	13.9	65	11.4
borne	Satisfied	23	15.3	51	26.7	61	26.5	135	23.7
٩	Dissatisfied	91	60.7	72	37.6	88	38.3	251	43.9
i i	Very	13	8.7	53	27.8	49	21.3	115	20.1
Pipe Water	dissatisfied								
P ≥	Indifferent	-	0.0	5	2.6	00	0.0	5	0.9

Source: Authors' Field Survey, 2014

The third loaded factor is the environmental conditions. The result shows that residents of the areas studied bothered less about noise compared to other environmental variables measured. 94.8%, 91.0% and 57.4% expressed their dissatisfaction with the refuse disposal system, environmental sanitation and neighbourhood noise respectively. Only 0.8% was satisfied with the refuse disposal system while 6.4% were satisfied with the environmental conditions. It was observed that open dump system was the common refuse disposal system in all the three areas studied. Up to 22.1% were indifferent to issue of noise in their areas. (See Table 5). This is not different from the first two factors where responses of the residents imply a critical situation.



**Table 5: Residents' Satisfaction with Environmental Conditions** 

Issue	Degree of	Gangare		Angwanrogo	)	Dadinkowa		Average	
	satisfaction	Frequency	%	Frequency	%	Frequency	%	Frequency	%
	Very satisfied	0	0.0	3	1.6	0	0.0	3	0.5
	Satisfied	0	0.0	2	1.0	0	0.0	2	0.3
-	Dissatisfied	28	18.6	13	6.8	48	20.8	89	15.6
oss	Very	119	79.4	173	90.6	160	69.6	452	79.2
Refuse Disposal	dissatisfied								
R D	Indifferent	3	2.0	0	0.0	22	9.6	25	4.4
al	Very satisfied	0	0.0	2	1.0	0	0.0	2	0.3
Environmental Sanitation	Satisfied	7	4.7	13	6.8	15	6.5	35	6.1
on	Dissatisfied	21	14.0	27	14.1	40	17.4	88	15.5
Environm	Very	119	79.3	149	78.1	163	70.9	431	75.5
nvi ani	dissatisfied								
E S	Indifferent	3	2.0	0	0.0	12	5.2	15	2.6
the	Very satisfied	0	0.0	0	0.0	49	21.3	49	8.6
th	Satisfied	0	0.0	2	1.0	66	28.7	68	11.9
in	Dissatisfied	41	27.3	17	8.9	75	32.6	133	23.3
e hbc	Very	0	0.0	155	81.2	40	17.4	195	34.1
Noise in th neighbourhoo d	dissatisfied								
Zžv	Indifferent	109	72.7	17	8.9	0	0.0	126	22.1

Source: Authors' Field Survey, 2014

Having hinted the respondents to use availability and quality of access roads to various homes, types and quality of parking facilities in the areas and the presence or absence and/or quality of the drainage, as guides for expression of their satisfaction on this factor, the result obtained as shown in Table 6 indicated that in each of the three sub-assessment factors, over 50% were dissatisfied. and less than 15% were either highly satisfied or simply satisfied. The implication of this is that respondents, despite mostly found in the low socio-economic cadre, were not contented with the access roads (mostly observed as untarred) and the parking system (commonly seen as on-street) in the course of the field work. The criticality of the problem too therefore, is justified on the scale of Ndubueze (2001).

**Table 6: Residents Satisfaction with Transportation Facilities** 

Facility	Degree of	Gangare	•	Angwanrog	0	Dadinkowa		Average	
	satisfaction	Frequency	%	Frequency	%	Frequency	%	Frequency	%
	Very satisfied	12	8.0	0	0.0	8	3.5	20	3.5
	Satisfied	27	18.0	10	5.2	28	12.2	65	11.4
SSS	Dissatisfied	50	33.3	19	10.0	63	27.4	132	23.1
Access	Very dissatisfied	61	40.7	162	84.8	118	51.3	341	59.7
A T	Indifferent	0	0.0	0	0.0	13	5.6	13	2.3
	Very satisfied	5	3.4	5	2.6	18	7.8	28	4.9
	Satisfied	12	8.0	3	1.6	38	16.5	53	9.3
Parking facilities	Dissatisfied	38	25.3	54	28.3	35	15.2	127	22.3
ark	Very dissatisfied	83	55.3	110	57.5	119	51.8	312	54.6
P. fa	Indifferent	12	8.0	19	10.0	20	8.7	51	8.9
	Very satisfied	0	0.0	0	0.0	9	3.9	9	1.6
e.	Satisfied	6	4.0	0	0.0	25	10.9	31	5.4
Drainage system	Dissatisfied	14	9.3	41	21.5	69	30.0	124	21.7
Drainag system	Very dissatisfied	118	78.7	145	75.9	127	55.2	390	68.3
D S	Indifferent	12	8.0	5	2.6	0	0.0	17	3.0

Source: Authors' Field Survey, 2014

Availability of recreational facilities and level of equipment with required facilities were the hints on the assessment of recreational satisfaction in the areas studied. The mean score indicated that almost 50 % were very dissatisfied with another 19.3% dissatisfied. Those that were satisfied and highly satisfied were 16.4% while 16.3% were indifferent to this measure. This perhaps is as a result of the low level of education and poor economic status of most respondents who only struggle to make ends meet and have less appreciation for recreation. The problem is also rated as critical.



Table 7: Residents' Satisfaction with Recreation Facilities

Facility	Degree of	Gangare	Gangare		Angwanrogo		Dadinkowa		Average	
	satisfaction	Frequency	%	Frequency	%	Frequency	%	Frequency	%	
	Very satisfied	0	0.0	6	3.1	5	2.2	11	1.9	
_	Satisfied	24	16.0	6	3.1	43	18.7	83	14.5	
Recreation	Dissatisfied	39	26.0	23	12.1	48	20.9	110	19.3	
Recreatic	Very	64	42.7	140	73.3	80	34.8	284	49.7	
ecr	dissatisfied									
R fa	Indifferent	23	15.3	16	8.4	54	23.4	93	16.3	

Source: Authors' Field Survey, 2014

Another factor loader assessed was the neighbourhood safety giving security provisions, crime rate and violence as hints. 16.2% were indifferent to the issue, about average, 50.8% were very dissatisfied while 19.3% were dissatisfied. 13.7% of the respondents were however either satisfied or highly satisfied. This may imply that the crime rate in the areas is high and provisions for the provision for safety of lives and property is low. This is in line with earlier studies where Oladosu et al (2014) noted that the intensity of violence was high in the high density residential areas of Jos which correspond with the slum areas sampled for this study.

Table 8: Residents' Satisfaction with Neighbourhood Safety

Issue	Degree of	Gangare		Angwanrogo		Dadinkowa		Average	
	satisfaction	Frequency	%	Frequency	%	Frequency	%	Frequency	%
р	Very satisfied	0	0.0	0	0.0	5	2.2	5	0.9
and Rate	Satisfied	24	16.0	6	3.1	43	18.7	73	12.8
	Dissatisfied	39	26.0	23	12.0	48	20.9	110	19.3
Crime Violence	Very	64	42.7	146	73.3	80	34.8	290	50.8
Crime	dissatisfied								
0 >	Indifferent	23	15.3	16	8.4	54	23.4	93	16.2

Source: Authors' Field Survey, 2014

The seventh main factor adopted for investigation of residents expression of satisfaction in this study, is the commercial facility most especially market. The proximity, condition and level of organization of markets were the hints provided. As shown in Table 9, those that were satisfied with this measure were less than 15% while majority 45.5% and 32.4% were respectively dissatisfied and very dissatisfied. 8.4% showed no concern about this. This result is not surprising as low income people usually require markets for domestic shopping which were mostly observed to be on-road in the areas. Ibem and Azuh (2014) similarly observed that respondents of their study were least satisfied with proximity of their homes to shopping facilities, health care facilities and the prices of goods and services within and around the housing estates.

Table 9: Residents' Satisfaction with Commercial Services

Facility	Degree of	Gangare		Angwanrogo	Angwanrogo		Dadinkowa		Average	
	satisfaction	Frequency	%	Frequency	%	Frequency	%	Frequency	%	
	Very satisfied	29	19.3	4	2.1	0	0.0	33	5.8	
	Satisfied	20	13.3	15	7.9	10	4.4	45	7.9	
8	Dissatisfied	60	40.0	48	25.1	77	33.5	185	32.4	
Markets	Very	41	27.4	119	62.3	100	43.5	260	45.5	
[ar]	dissatisfied									
≥	Indifferent	0	0.0	5	2.6	43	18.7	48	8.4	

Source: Authors' Field Survey, 2014

## 3.3 Testing of Hypothesis

Null hypothesis (Ho): There is no significant correlation in the level of residents' satisfaction with sanitary conditions in the three slum areas.

Alternative hypothesis  $(H_1)$ : There is a significant correlation in the level of residents' satisfaction with sanitary conditions in the three slum areas.

The hypothesis was tested using chi-square  $(x^2)$  statistical tool. This is because chi-square test is used with categorical data to see whether any difference that exist in frequencies between sets of results is due to chance. Data used for testing this hypothesis is extracted from Table 5.



Degree of satisfaction	Gangare	Angwanrogo	Dadinkowa	Row total
Very satisfied	0	2	0	2
Satisfied	7	13	15	35
Fairly satisfied	21	27	40	88
Not satisfied	119	149	163	431
Indifferent	3	0	12	15
Column total	150	191	230	Grand total = 571

#### 3.3.1 Computation for the Test

Cell	Fo	Fe	Fo – Fe	$(Fo - Fe)^2$	$(Fo - Fe)^2 \div Fe$
1	0	0	0	0	0
2	7	9.19	- 2.19	4.8	0.52
3	21	23.10	- 2.1	4.41	0.19
4	119	136.30	- 17.3	299.3	2.2
5	3	3.90	- 0.9	0.81	0.21
6	2	0.90	1.33	1.77	2.64
7	13	11.71	1.29	1.66	0.14
8	27	29.40	- 2.4	5.76	0.2
9	149	144.2	4.8	23.04	0.16
10	0	0	0	0	0
11	0	0	0	0	0
12	15	14.1	0.9	0.81	0.06
13	40	35.4	4.6	21.16	0.6
14	163	173.6	10.6	112.36	0.65
15	12	6.0	6.0	36.0	6.0

Degree of freedom (df) = 8

Calculated  $x^2$  value = 13.57

Expected or Theoretical  $x^2$  value at  $\alpha 0.05 = 2.73$ 

Expected or Theoretical  $x^2$  value at  $\alpha 0.01 = 1.65$ 

#### 3.3.2 Decision

The calculated  $x^2$  value, 13.57 is greater than the theoretical value 2.73 at  $\alpha$  0.05 and 1.65 at  $\alpha$  0.01. Thus, the null hypothesis is rejected and the alternative hypothesis is accepted. There is therefore a significant level of correlation in the degree of residents' satisfaction with the sanitary conditions of the slum environment in Jos.

#### 4. Conclusion

The study investigated the satisfaction of residents of slum residential areas with public facilities and their neighbourhood environment in Jos. Analysis of the socio-economic characteristics of the respondents revealed that majority of the inhabitants of slum residential areas of Jos are in the low income group, earning less than thirty thousand naira per month, Similarly, they are mostly secondary school certificate holders, with a large proportion (47.3%) having large (7-9) household sizes, and they most of them have sufficiently stayed long (30 years and above) in the areas.

Results of the residents' satisfaction obtained from the study showed that residents expressed their general dissatisfaction with both the public facilities and the environment. The responses to all the measured indices were rated as critical in line with the earlier study of Nwabueze (2001). The implication of this is that the productivity of the inhabitants of the slum residential areas of Jos and their contributions to the national output and development may not be at desired optimum. There is therefore the need for necessary policy and pragmatic actions from the state government and Jos North local government authority to improve on the provision and distribution of public facilities as well as improving the physical environment of the areas.

The authors, as a result of the critical nature of these problems, recommend that the slum residential areas of Jos should be declared—as Action Plan Areas (APA) for emergency action. The plan and its subsequent implementation should accord priority to provision of access roads, drainages and planned refuse disposal systems. Public Private Partnership can be employed for the provision and improvement of facilities in the public institutions. The Jos Metropolitan Development Board (JMDB) and sister organizations in the state should embark on enlightenment programmes on environmental sanitation and should equally ensure effectiveness of residents' compliance with the standing state environmental sanitation day every month-end, which from our observations, have hitherto not been taken with much seriousness by both the authorities and the state inhabitants We also recommend that for sustainability of programmes and projects targeted towards improvement of the



areas, as recommended in this study and as may be added, residents of the areas should be involved in their implementations and maintenance.

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