

# Geoscience Awareness in Nigeria—A Preliminary Study

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## ABSTRACT

Nigeria (total land area of 923,768 km<sup>2</sup>) is underlain by a crystalline Precambrian basement, Jurassic granites, and Cretaceous to Recent sedimentary rocks, and is prone in places to environmental degradation and geohazards. The country hosts approximately 34 different mineral types in about 855 locations with considerable oil and gas reserves. Given this background and with less than 0.004% of the country's population being professional geoscientists, this study sets out to ascertain, across a broad spectrum of the population, the levels of awareness of the geosciences in relation to: mineral endowments including oil and gas, geohazards, agriculture and food production, water supply, and national development. The survey, which utilized questionnaire and oral interview methods, involved a total of 21,252 respondents comprising students, school teachers, informal traders, professionals, and artisanal miners, drawn from the six geopolitical zones of Nigeria (North-west, North-east, North-central, South-west, South-east, South-south), for comparative purposes. The results show generally low but wide variations in the levels of awareness of the relationship of the geosciences to the highlighted issues among the respondents. For example, the highest awareness of any of the issues was 75.12% by teachers in the South-east zone on the relationship of geosciences and geohazards, while the lowest was recorded among the primary school pupils of the North-east zone on the same issue (0.12%). A noticeable trend revealed by the survey is the relationship of the awareness levels and the literacy level among the respondents on one hand and the geopolitical zones on the other. Also, the awareness level also correlates with the relative intensity of geoscientific activity in the various zones. Appropriate strategies needed to enhance the level of awareness are suggested in the study. © 2012 National Association of Geoscience Teachers. [DOI: 10.5408/10-216.1]

**Key words:** awareness, geopolitical zones, endowment, variations

## INTRODUCTION

Nigeria has a total land area of 923,768 km<sup>2</sup> (Fig. 1) and is underlain mainly by crystalline Precambrian Basement rocks, Jurassic granites, and Cretaceous to Recent sedimentary successions (Elueze and Okunlola, 2003; Fig. 2). This geological heterogeneity has given rise to appreciable mineral endowment comprising over 34 economic mineral types (about 10 metallic and 24 industrial species) occurring in about 855 locations (NGSA, 2007), about 40 barrels (bbl) of oil, and an estimated reserve of over 100 trillion metric tons of gas, making Nigeria a country of considerable geoscientific interest.

Two key factors presuppose that the population should be aware of the relevance of geosciences: (1) mineral endowments account for about 95% of the nation's accruable revenue, and (2) the country's large land area is prone to geologically induced hazards such as landslides, mass wasting, and gully and coastal erosion. This study, therefore, aims to test the level of Nigerians' awareness of the relevance of the geosciences in five key areas, namely: (1) mineral and energy endowment, (2) geohazards, (3) agriculture and food production, (4) water supply for both domestic and irrigation purposes, and (5) the general contribution to economic and national development. These areas have direct impact, to greater or lesser degree, on the lives of all the Nigerian people.

Nigeria presently has about 6,000 registered geoscientists (NMGS, 2008), representing only about 0.004% of the

entire population. Thus, it is important to improve understanding of the perception of the remaining 99.96% of the population on the impact of the geosciences in these areas. Although this survey is preliminary in nature, considering the relatively low number of respondents (21,250), it is believed that the results will provide a baseline reference for a more detailed and broader follow-up survey.

## METHODOLOGY

The survey took place between October 2007 and July 2008. The questionnaire method was adopted, but in some cases oral interviews were carried out. The oral interviews were conducted because of the relatively low literacy level of some of the respondents, especially among the artisanal miners and primary school students in the northern zones. About 15% of the total number of respondents, or 3,187, were interviewed orally were 3,187. About 22,000 questionnaires were distributed and 21,252 (96.59 %) responded. Four main groups of respondents were identified, as follows:

- (1) Students, distinguishing between those at primary, secondary, and tertiary levels, with those in the last category following courses not related to the geosciences.
- (2) Professionals, comprising (a) teachers mainly at primary and secondary level; (b) medical personnel, mainly doctors, pharmacists, and nurses; (c) finance workers, namely bankers, financial consultants, and accountants; and (d) civil servants.
- (3) Artisanal miners.
- (4) Traders in the informal sector, including artisans, market retailers, and distributors.

Received 20 December 2010; accepted 28 January 2012; published online 13 August 2012.

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FIGURE 1: Map showing the geopolitical zones of Nigeria.

These four main groups of respondents were chosen because they represent the broad functional groups within the nation’s socioeconomic framework (Gbadegesin, 1996). The survey covered the six geopolitical zones of Nigeria,

comprising 36 states, namely the South-south, (6 states), South-east (5 States), South-west (6 States), North-east (6 states), North-west (7 states), and North-central (6 states) (Fig. 1). For logistical reasons, the distribution was limited to not more than five major towns within each zone. In all, about 21,252 respondents were sampled comprising 3,542 from each zone.

### RESULTS AND DISCUSSION

Results of the survey are presented in Tables I–V and Figs. 3–7. In terms of awareness of the geosciences in relation to mineral endowment (Table I and Fig. 3), the professional group comprising teachers, finance workers, civil servants, and medical workers show the highest level compared to other groups of respondents. Most notably, the finance workers were followed by the medical workers, teachers, and civil servants, in that order. The tertiary level students are the most informed group after those listed above, with the miners and traders following closely. The primary and secondary level students exhibit the least awareness of geosciences in relation to mineral endowment.

Generally, respondents across all the groups from the South-south geopolitical zone show the highest level of awareness. This is followed by respondents from South-east and South-west, especially among the miners. Respondents from the North-central and North-east zone exhibit the least

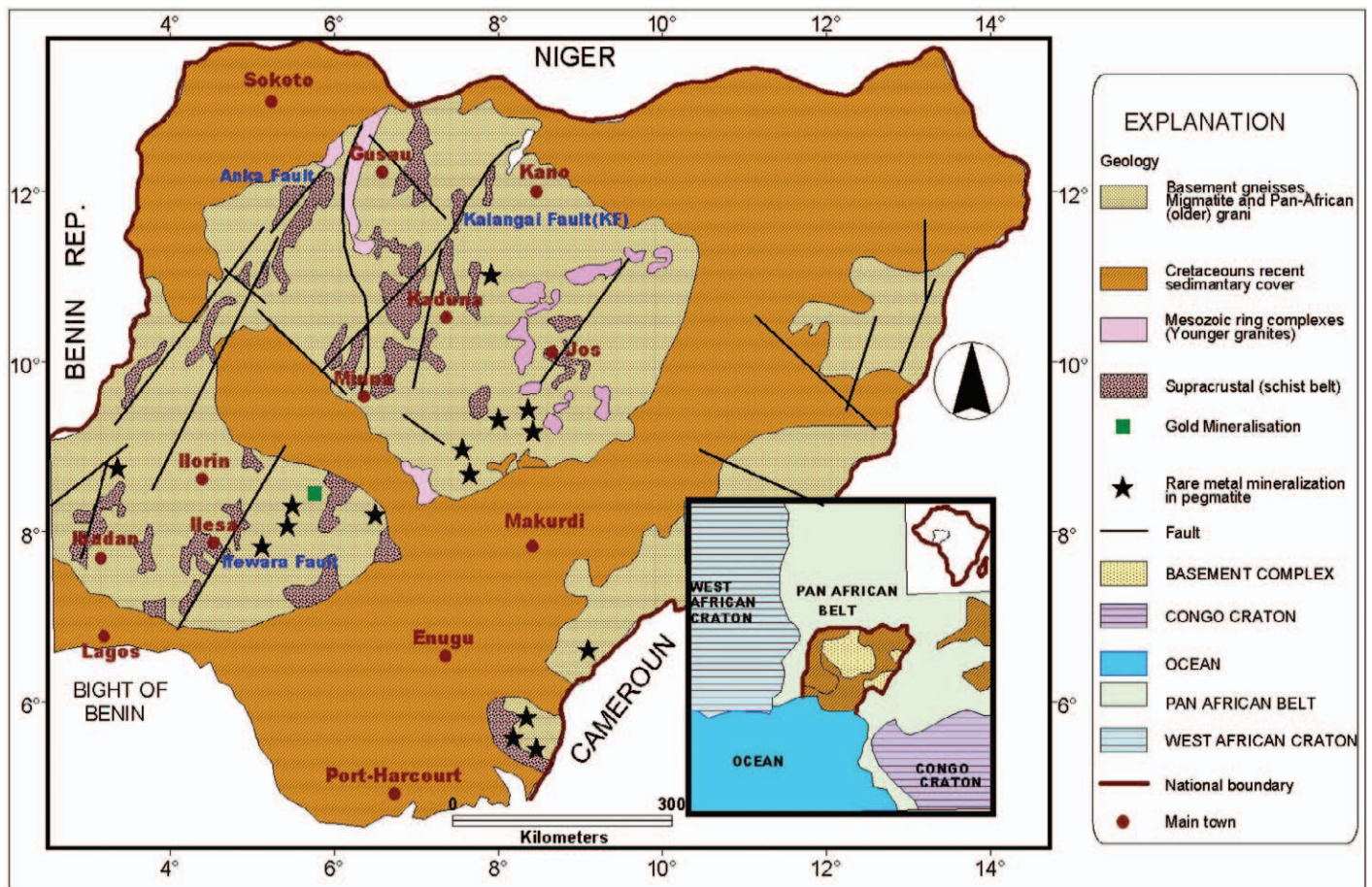


FIGURE 2: Geological map of Nigeria.

TABLE I: Result of awareness level of geosciences in relation to mineral endowment.<sup>1</sup>

Respondents	South-east	South-south	South-west	North-west	North-central	North-east
1. Students						
a. Primary	5.01	18.11	8.22	1.32	1.51	0.7
b. Secondary	15.01	32.07	12.13	2.11	3.21	2.51
c. Tertiary	25-22	53.16	30.34	8.06	8.17	7.87
2. Professional						
a. Teachers	25.61	65.01	35.51	10.13	12.11	15.31
b. Medical	55.56	65.01	58.63	42.1	52.11	50.41
c. Civil Servants	15.02	45.11	25.12	5.06	10.12	6.3
d. Finance	65.24	65.17	57.24	17.11	36.15	28.41
3. Miners	25.21	15.12	42.45	35.24	21.1	21.35
4. Traders	5.23	21.23	10.81	3.31	2.53	1.84

<sup>1</sup>Results shown are percentages.TABLE II: Result of awareness level of geosciences in relation to environmental hazards.<sup>1</sup>

Respondents	South-east	South-south	South-west	North-west	North-central	North-east
1. Students						
a. Primary	1.21	4.53	0.54	0.19	0.19	0.12
b. Secondary	0.41	6.81	0.81	0.18	0.19	0.13
c. Tertiary	0.33	10.2	2.53	0.15	0.81	0.14
2. Professional						
a. Teachers	75.12	32.5	15.22	12.26	12.21	10.13
b. Medical	28.75	38.12	26.47	18.74	12.83	17.86
c. Civil Servants	15.24	10.62	6.87	3.43	2.65	1.84
d. Finance	35.36	32.56	16.45	18.42	18.67	17.81
3. Miners	15.21	12.21	4.24	0.81	8.42	7.21
4. Traders	2.1	8.5	1.21	0.51	0.23	0.37

<sup>1</sup>Results shown are percentages.TABLE III: Result of awareness level of geosciences in relation to agriculture and food supply.<sup>1</sup>

Respondents	South-east	South-south	South-west	North-west	North-central	North-east
1. Students						
a. Primary	0.02	0.01	0.02	0	0.01	0
b. Secondary	0.03	0.01	0.01	0	0.1	0
c. Tertiary	0.04	0.03	0.01	0.02	0.01	0
2. Professional						
a. Teachers	0.84	0.74	0.81	0.11	0.1	0.21
b. Medical	1.23	0.9	0.65	0.52	0.52	0.25
c. Civil Servants	1.21	0.81	0.66	0.18	0.18	0.16
d. Finance	3.42	1.21	1.34	1.85	1.86	1.45
3. Miners	0.01	0.12	0.06	0.15	0.17	0.01
4. Traders	0.01	0.03	0.03	0.01	0.01	0.01

<sup>1</sup>Results shown are percentages.



TABLE IV: Result of awareness level of geosciences in relation to water supply (domestic, irrigation).<sup>1</sup>

Respondents	South-east	South-south	South-west	North-west	North-central	North-east
1. Students						
a. Primary	0.02	0.01	0.03	0.01	0.01	0.01
b. Secondary	0.08	0.02	0.85	0.01	0.01	0.01
c. Tertiary	3.58	1.81	13.85	1.65	1.67	0.89
2. Professional						
a. Teachers	3.61	3.51	13.51	1.89	0.91	1.25
b. Medical	16.5	10.31	19.61	10.61	8.25	6.65
c. Civil Servants	2.1	1.1	5.51	3.21	3.11	1.85
d. Finance	3.2	2.81	3.21	0.61	0.71	0.65
3. Miners	0.8	2.15	0.05	0.05	0.06	0.01
4. Traders	0.08	0.05	0.12	0.08	0.05	0.01

<sup>1</sup>Results shown are percentages.

awareness. In the North-east, especially among the primary school pupils, a near zero awareness level is recorded.

In contrast to this result, respondents from the South-east zone show clearly higher awareness levels compared to those from other zones in terms of the geosciences in relation to geohazards (Table II and Fig. 4). This is followed by respondents from the South-south and South-west. The North-east zone respondents are still the least aware, except for the finance workers who show, quite significantly and against the general trend, a higher level of awareness compared to other respondents in this zone. Among the various groups and unlike the previous observations for the geosciences and mineral endowment awareness, teachers, especially those from the South-east, show highest awareness (75.12%). This is followed by the medical (38.12%), finance (32.56%), miners (12.21%), and civil servants (10.62%), in that order. The traders and the students are the least aware.

Considering the awareness levels of the geosciences in relation to agriculture and food supply (Table III and Fig. 5), the finance workers in all the zones, especially those from South-east zone, show the highest awareness level, followed by the civil servants, medical workers, and teachers, in that order. The miners’ level of awareness is low (0.15%), but still

higher than those of traders (0.03%) and the student group, which is very low (0.01%). The respondents from the South-east geopolitical zone generally exhibit the highest awareness level of this issue, followed by the South-south and South-west respondents, respectively. Again, as in responses concerning other issues, the North-central and North-east zone respondents show the least awareness of geosciences in relation to agriculture and food supply, except as noted earlier among the finance workers in these zones.

In contrast to survey results for other issues, the South-west zone respondents show the highest awareness level of the geosciences in relation to water supply (Table IV and Fig. 6). This high awareness level cuts across all the groups of respondents in this zone, and is followed by those from the South-east and the North-east zones, respectively. The South-south respondents show an awareness level just marginally higher than those from North-west and North-central.

Again, on this issue of the geosciences in relation to water supply, medical workers show the highest level of awareness, followed by teachers and tertiary level students. The finance workers come next, followed by civil servants and miners, with the traders and primary students being the least informed.

TABLE V: Results of awareness level to geosciences contribution to national development.<sup>1</sup>

Respondents	South-east	South-south	South-west	North-west	North-central	North-east
1. Students						
a. Primary	0.01	0.01	0.06	0	0.02	0.02
b. Secondary	0.01	0.01	0.05	0.01	0.01	0.16
c. Tertiary	0.91	0.01	8.31	5.21	3.85	2.54
2. Professional						
a. Teachers	10.1	21.1	34.11	31.65	32.61	30.11
b. Medical	65.3	68.51	68.21	48.22	41.31	40.71
c. Civil Servants	45.2	59.51	35.41	45.21	40.11	38.95
d. Finance	40.11	51.21	49.61	48.11	46.11	50.25
3. Miners	25.1	65.11	63.5	25.11	21.2	18.5
4. Traders	15.1	15.21	16.15	8.35	7.25	4.65

<sup>1</sup>Results shown are percentages.

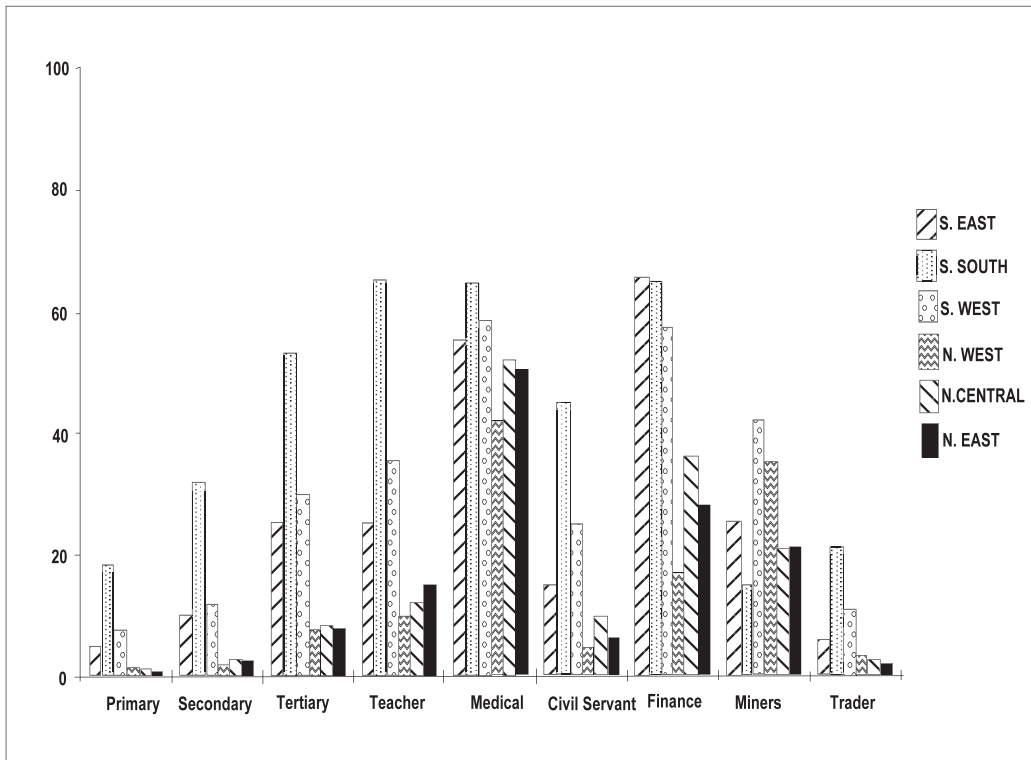


FIGURE 3: Awareness level of geosciences in relation to mineral endowment.

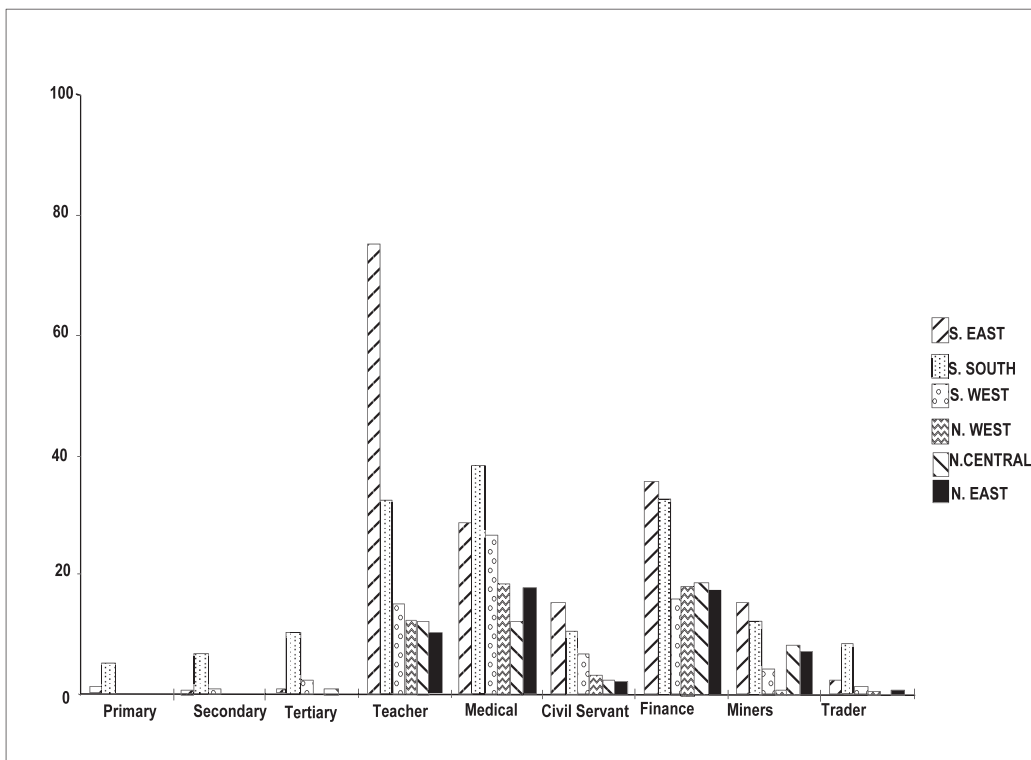


FIGURE 4: Awareness level of geosciences in relation to environmental hazards.

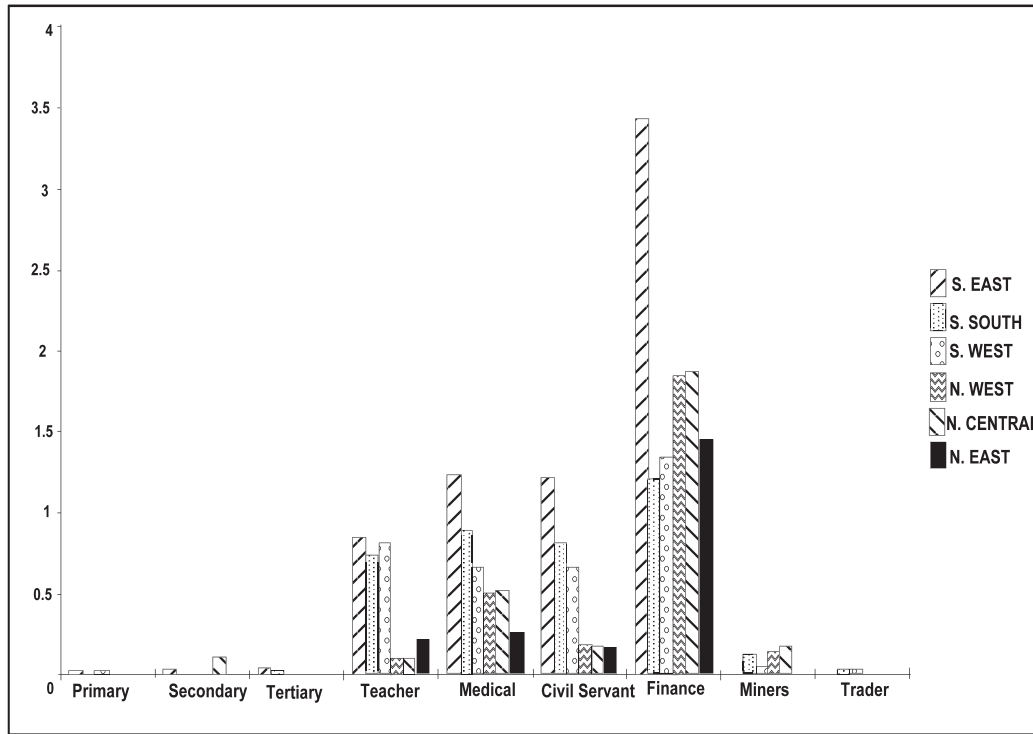


FIGURE 5: Awareness level of geosciences in relation to agriculture and food supply.

Concerning awareness level of geosciences contribution to national development, the primary and secondary school students exhibit very low awareness in all the zones (less than 0.01%). In contrast, the medical workers, especially in the South-south (68.51%), miners in the

South-west and South-south (63.50% and 65.11%, respectively), and civil servants (59.51%) are the most aware among the respondents. The traders and tertiary students' awareness level is low, and only marginally higher than those of the primary and secondary school students.

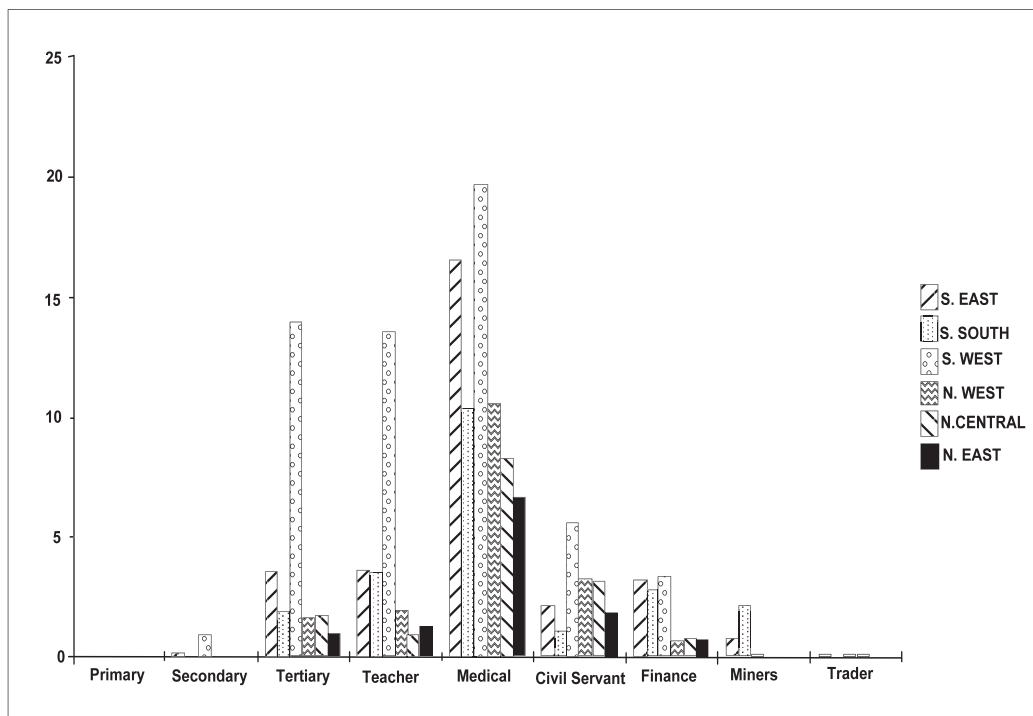


FIGURE 6: Awareness level of geosciences in relation to water supply (domestic, irrigation).

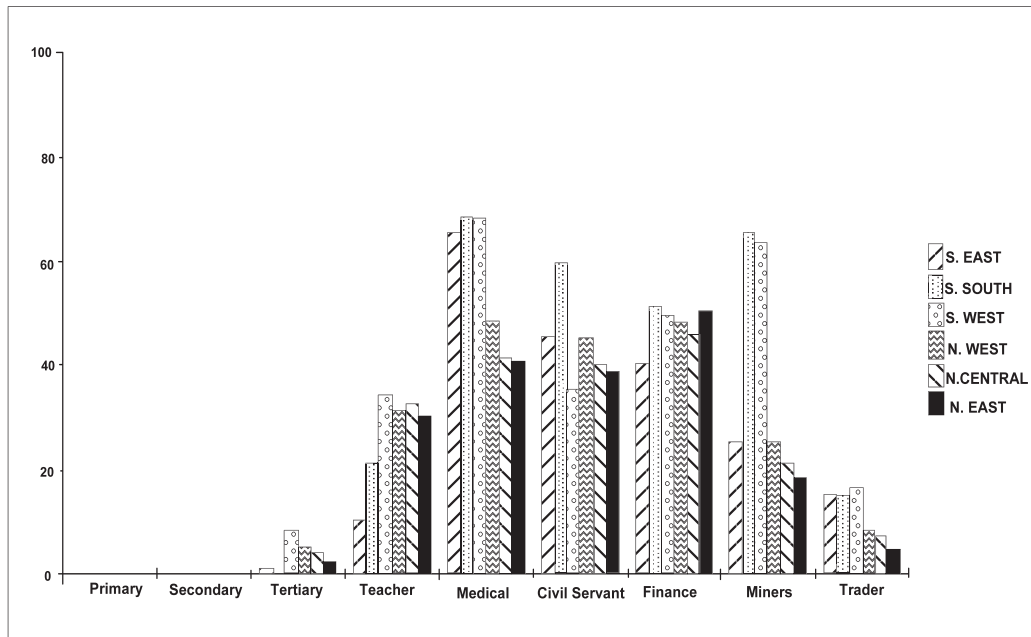


FIGURE 7: Awareness level of geosciences contribution to national development.

Generally, however, respondents from the South-south, South-west, and South-east zones, in that order, are the most informed, followed by the North-west, North-central, and the North-east zones.

Results from this survey have shown that there is generally a low level of awareness of the importance and relevance of the geosciences in Nigeria. For example, the highest percentage of awareness level on any aspect of the survey was 75.12%, recorded among the teachers in the South-east zone on the relationship of the geosciences to geohazards, and also among the medical workers in the South-west zone on the contribution of the geosciences to national development. The lowest was 0.12%, on the same issue among the primary school respondents in the North-west zone. The variation in awareness level is very wide and this trend is common throughout the survey.

On a group-by-group basis, the students, especially at the lower levels, and the traders are the least aware of the roles of the geosciences, while the medical workers and finance workers exhibit the highest levels of awareness. The artisanal miners' levels are also low, except in relation to the association between the geosciences and mineral endowment. This group of survey results shows correlations with the educational levels of the respondents. At best, most of the artisanal miners are either primary school leavers or have dropped out of secondary schools (Elueze and Okunlola, 2003), while the teachers and medical workers obviously have passed through at least one form of tertiary education. The survey also revealed that the civil servants' awareness level on most of the issues is low, with the highest being 42.5% concerning the geosciences in relation to national economic development. This has adverse implications for policy formulations on issues relating to the geosciences. The civil service in Nigeria primarily formulates and implements policy issues, with some inputs from the academia and private sector (Elueze and Okunlola, 2003).

When the results are examined on the basis of the geopolitical zones, the respondents from South-south and South-west zones show generally higher levels of awareness compared to other zones. Respondents from the northern zones, particularly the North-east zone, are the least aware. This result also reflects the general literacy trend in Nigeria. The northern geopolitical zones have a lower literacy level than those in the southern states (Zhao et al., 1992). To some extent, distribution of awareness level also seems to be correlated with the level of geoscientific activity in each of these zones. For example, on the relationship between the geosciences and mineral endowment and geohazards, the South-south respondents show higher levels compared to other zones, and the same holds true for the South-east zone in relation to geohazards. Both of these zones have prolific oil and gas exploration and production, with the attendant degradation from pollution and oil spills (in the case of South-south zone), and intensive land degradation from gully erosion and landslides have sometimes devastated whole settlements in the South-east zone (Schoneich, 2003). Also, there are indications of higher awareness levels among miners in the North-west and South-west zones, respectively, where there is an appreciably higher level of artisanal mining of gold and rare metals.

Considering the awareness levels for the different survey issues, the awareness level of the contributions of the geosciences to agriculture is the lowest, with the highest percentage of 3.42% recorded among the finance workers. When compared to those levels for mineral endowment issues, there is a very wide gap in awareness level. However, despite the high level of awareness of fertilizer application in relation to higher crop yields worldwide (Bates and Otto, 1998), and by a cross section of Nigerians as shown by earlier studies (Abimbola et al., 2002; Andriess and Schellas, 1987; Gbadegesin, 1996; Oluwatoyinbo, 2006), most respondents are not aware of the role of geosciences in the production of these fertilizers.

Therefore, in all the issues considered, for a sustainable awareness of the role of the geosciences, it is imperative that sustained enlightenment and other appropriate strategies should be adopted, beginning with the students' group, especially in the geopolitical zones of the northern part of the country.

## CONCLUSIONS

The survey sets out to assess the awareness level of respondents from different groups in Nigeria on the relationship and/or contributions of the geosciences to mineral endowment, geohazards, agriculture and food supply, water resources, and overall national development of Nigeria. This survey, which covered all six geopolitical zones, involved 21,252 respondents cutting across the professional groups, students from primary to tertiary level, artisanal miners, and traders. Results have shown wide variations in awareness levels among the different groups and the geopolitical zones.

Factors that have contributed to this variation include differences in literacy level among the geopolitical zones, the different groups surveyed, and the intensity of geoscientific activity—especially mining and geohazards—in the different zones. The survey has also revealed the relatively low awareness level among the civil servants who are the government policy formulators. This low awareness may hamper effective policy formulations as far as the geosciences are concerned. It is therefore obvious from this study that an effective enlightenment program that cuts across the bureaucracy, the formal and informal groups, and the pretertiary educational sectors should be embarked upon to increase the level of awareness of the contribution of geosciences in the overall sustainable development of Nigeria. For now, the curriculum of the primary and secondary schools in Nigeria does not include the study of the geosciences. Therefore, an effective strategy that will involve informal teaching and more practical demonstrations should be devised to introduce the subject at these lower levels.

## ACKNOWLEDGMENTS

This study has benefited from assistance and encouragement from the Secretariat of the Association of Geosci-

entists for International Development (AGID), especially Dr. Tony Reedman. Also, the Director General, Prof. Siyan Malomo and geologists of the Nigerian Geological Survey Agency (NGSA) from the various state offices in the different geopolitical zones of Nigeria have been very helpful. Students and numerous colleagues are appreciated for their positive diverse roles.

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