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TOPOGRAPHY AS A RISK FACTOR IN ACHIEVING PROJECT OBJECTIVES IN NDDC 500-UNIT HOSTEL COMPLEX IN UNICROSS, NIGERIA

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Abstract

It is common place to see public building projects delayed in completion for one reason or the other. This study was undertaken to investigate if the topographic risk factors inherent in the site contributed significantly to the delay in the completion of the 500-unit Hostel complex located in CRUTECH (now UNICROSS), Calabar, Cross River State for the past nineteen years. Survey method was adopted on the physical structure of the complex, field method on the site, using differential GPS-RTK Hi- target (V60 Model), AutoCAD Software, Civil Cad and other equipment to capture site topography survey data in 2021 and studio method to produce the topographical map. The details of the 2021 map were used to compare with those of the 2002 original topographical map when the University campus was established. The research hypothesis was to determine whether the topography of the site as at 2021 was not significantly different from that of 2002. Sixty (60) points were identified spread over the project area on both maps, 3 readings taken at each point for comparison. Multivariate ANOVA was conducted using F, Pillar's trace, Wilks lambda, Hotelling's trace and Roy's largest root tests statistics to test for significance at .05 level of significance. The Study concluded that the topography of the site as at 2021 was significantly different from that of 2002 which accounted for the delay of the completion of the complex due to earth filling to stabilize the subsoil, drain surface and ground water, fill up low-lying areas, rebuild cracked portions during construction et cetera. This impacted negatively also on the technical/structural performance of the complex as deep structural cracks were seen all over the complex, making it unfit for human habitation. The study proffers that topographical surveys/investigations should be carried out first to note the three dimensional attributes of the topography of a site before constructing on it.

Keywords: *NDDC* 500-unit Hostel complex, topographic surveys, topographical maps, *topographic risk factors, project site, timely completion, and UNICROSS.*

1.0 Introduction

Harison (1992), defines project management "as the achievement of project objectives through people and involves the organizing, planning and controlling of the resources assigned to the project together with the staff involved, both in-company and with other companies involved." Moder (1988), defines it as "involving co-ordination of group of activities in which the manager plans, organizes, staffs, directs and controls in order to achieve an objective with constraints on time, cost, and performance of the product. "Project Management has five (5) distinct phases and is "concerned with planning, organizing, directing and controlling of resources (human and non-human) for a specific time period to meet a specific set of one-time objectives, time and budget (PI, 2017). Project management therefore has the responsibility of the overall planning, controlling and co-coordinating a project from inception to completion so that the project is completed on scheduled time, cost minimized, and the required performance standard attained.

Experience and observations show that there is hardly the happy ending of a project processes, whether public or private, whereby project objectives are achieved as envisaged within the budget, time and technical performance standard. The reason is that the sponsors, managers and stake holders never think their projects stand the chance of being invaded by different kinds of risks from inception to completion which could be identified, planned to be managed/utilized and properly checkmated and enhanced for the achievement of project objectives. Some of the risks are capable of crippling the achievement of project objectives if not properly managed on time.

The 500-unit Cross River University of Technology (CRUTECH) Hostel Complex, is a direct intervention in the accommodation need of tertiary institutions by the federal government of Nigeria through the Niger Delta Development Commission (NDDC) in the nine states making up the Niger Delta region of Nigeria. By the modality of the Commission, two, each of this complexes are sited in every State in the region, distributed as to one to a State university and the other to a Federal University.

The construction of CRUTECH's (now UNICROSS) complex started in 2004 and had initial execution duration of one and half years but it has been in construction for the past sixteen years without completion. Even though the benefiting institution has taken possession without the contractor handing over the project to the client (NDDC), nor the client handing over officially to the benefiting institution, the project is yet to be completed. There seems to be some inherent risks in the project conceptualization, location and execution which were not identified, planned for, apportioned and managed to achieve the project's objectives within the time allotted, which has caused the enormous delay in completion. Need therefore arose to investigate the possible project risk factors which have kept the project uncompleted for so long. Topography was hypothesized as one of the possible risk factors which led to this investigation. The risk factors being considered here may not have been placed as a priority when siting the 500-unit male hostel near the Akpa Yafe estuary at the Calabar campus of Cross River University of Technology (CRUTECH).

This study is carried out to ascertain the risk profile (or otherwise) of the site's topography or terrain, where the 500-unit Hostel complex is sited and how it affects the timely completion of the project.

1.2 Statement of problem

Every building project, whether public or private, has set objectives to achieve. But sad to note, majority of these projects remain uncompleted for a long period of time. Huge sums of money invested go down the drain and the executing Agencies remain impoverished alongside the envisaged benefiting stakeholders. At times, it may not be the intention of the executing Agencies to delay the project works unnecessarily but it may be the inability of the project manager to study the project profiles and identify the likely risks the project may confront, which may impede or enhance timely completion and subsequent achievement of project's objectives. Most project managers are not schooled in the art of identifying project risks, planning and managing same to achieve project objectives. The 500-units CRUTECH HOSTEL COMPLEX located at the Calabar campus has been in construction since the year 2004. Its construction duration understandably was to be for one year six months. Twenty years hence, the project is still uncompleted. The execution of this project has been laden with various project risks. This research intends to unearth one of them, hypothesized to be the topography risks, and to establish the impact the identified risks had on the timely completion of the Hostel. In other to achieve the aim, the following objectives were proffered: to carry out a three-dimensional topographical survey and produce map showing the relief, extent and features of the site to determine the topographical risk factors of the site where the building is located to ascertain whether the topography of the site impacted negatively on the structural state and untimely completion of the project.

Fig. 1 The front view of the subject 500-unit NDDC-sponsored hostel complex

1.3 The study area – location of the complex

The 500-unit Hostel complex is located in Calabar, within the main campus of University of Cross River State (UNICROSS), (formerly, Cross River University of Technology (CRUTECH.) with geographical coordinates of 4º 19´ 02"N and 8o 55´ 05"E. Calabar is the capital of Cross River State, and is characterized by two distinct tropical moist climates – the rainy and dry seasons, respectively. The rainy season starts from April and ends in November with a double peak usually in June – July and September – October. The annual rainfall ranges between 2200 mm and 3700 mm. The annual air temperature ranges between 26.0 ºC and 28.0 ºC (NIMET, 2018). The area is a mangrove wetland with typical mangrove vegetation such as Nipa palms (Nypa fruticans wurmb) and other typical mangrove vegetation with propping roots over thick mud, especially mangrove tree (Rhizophora racemosa) locally known as "nunuṋ", other land cover trees found in the swamp include bamboo palm (Raphia vinifera) locally known as "iya", umbrella tree (Musanga cecropioides), (Ceolocaryon preussi) locally known as "u̱no" and 'u̱no-idim' respectively, and Indian bamboo (Bambusa vulgaris). The vegetation extends to the coast along end of Calabar South LGA at Anantigha. Cultivated crops that can survive in this area are some acid tolerant oil palm and coconut palms. Arable crops cultivated around the hostel include

maize, scent leaf, curry leaf, water leaf, pawpaw, plantain, and banana cultivated by some peasant farmers.

2.0 Conceptual framework/ literature review

2.1 A project is defined by the project Management Institution (PMI) Guide of the United States of America as "a temporary endeavor undertaken to create a unique product or service"(www.pmi.org,1996). Cleland (1995); Davis (1951); UNIDO (1986) and Baum and Tolbert (1978) give the definitions of Project to be a one-time endeavor which has a definite starting date with unique characteristics.

Public developmental projects are usually undertaken for social or political reasons. Ogbuefi (2011) advises that in appraising public-sector projects before execution social related matters should be taken into serious consideration. These include socio-cultural norms, beliefs, customs, and subsistence of the people thereby guaranteeing or otherwise of the acceptability of the intending projects by the host community. This thought is echoed by Belassi and Tukel (1996), Goodman (1988) and Ramlee et. al (2016). On the feasibility and viability sides, the authors advocate that the variables that must be studied are varied and include: physical variables - availability and suitability of appropriate site in good location and possibility for future expansion. The site characteristics should include: soil texture, water contents, water table levels, fauna and flora, climatic conditions, geographical layout (topography), the population of the local dwellers, their occupation, reception of the intending project by the locals, the ease of and cost of procuring the site, and the envisaged acquisition costs are to be examined (Ogbuefi, 2011 and Goodman, 1988).

It should be noted that site availability is the starting point of any project and except this indicator is procured no project can start. The verification of site indicators can be made easier if there is good geographical information of the neighborhood (Castle, 1998)).

2.2 Topography and its importance in building site

Topography is said to be the "landforms and slopes" of a particular area which affect the building foundation type, the building form and its relationship to the ground plane, the site drainage and the site micro-climatic elements such as wind, temperature and solar radiation (Ching,1975). In his book, Building Technology, Ivor Seeley (1974) sees topography in two dimensions – 1) as an aspect of a site and 2) as the elevation of the site.

As an aspect, it gives different views of the site and for an ideal building site he proposes the one below the summit on a gentle southerly slope, securing maximum sunshine and adequate protection from northerly wind. As an elevation Ivor (1974), views topography as the undulating nature of the sites with various heights attributes of low-lying, hollow, gentle-undulating and steep points. He proffers that elevated sites are preferable to low-lying and hollow areas for the advantageous reasons of ease in drainage and dryer, all seasons inclusive. Steep sites will incur heavy construction costs in cut and fill, so also are low-lying and hollow areas with heavy drainage of ground water and utilization of expensive foundation types of raft and pile to avoid submergence and uneven settlement of foundations thus causing structural failure.

2.2.1. Need for topographic survey

Project construction cannot commence until a topographic survey of the site is carried out and its result analyzed and understood (Korteco/com). This is because topography surveys identify the features of the site and inform stakeholders what will work on a building site and what will not. Absence of topography surveys before construction or mistakes in a survey can result in far reaching consequences compounding problems later when projects are underway. Therefore, it is of utmost importance that topography surveys must be carried out by experienced and credible surveyors.

2.2.2 The contents and value of a topography survey

A topographic survey clearly identifies the legal boundaries of the land upon which the building will soon be constructed. It also contains the contours and levels of the land – flat, low-lying, steep, gentle undulating etcetera. It also answers such questions as: are there bodies of water on or near the prospective land which could affect a planned building? Is the land prone to flooding? Are there other characteristics of the land which might possibly affect negatively or positively what is prospected to be built on the land? What excavation or other pre-construction works/manipulations of the land will be needed before construction? These surveys identify and note other natural and man-made features on site which may impact negatively or positively on the building. These include buildings, sewer pipes, utility lines, trees, water bodies and other natural landforms. The contents of a site survey give the architects, the different rays of Engineers involved in building construction works, alongside the Project Manager, what quality of site they are to work with and helps them develop appropriate plan of actions to mitigate any future eventualities. Project construction cannot be conceptualized, planned, designed and eventually executed until a topographic survey sets the basic parameters to guide the project implementation.

2.2.3 The surveyor and the importance of a survey map

Due to the criticality of a topography survey to successful project implementation, experienced surveyors must be carefully selected to handle the topography survey work prior to design and construction. The topography surveyor will do more than merely mapping the land with approved numbered beacons to produce the survey map. The experienced surveyor will take the future of the project work into consideration and based on his knowledge alert Project Manager of possible potential site issues long before they occur, making room for control and mitigation.

Usually, surveyors inspect the building site first before other construction professionals like architect, Estate surveyors, Town and Country planners, Engineers, etcetera. For that reason, they are the eyes of a potential building site and are expected to investigate same thoroughly in order to guide and direct other professionals, including the principal. The information they provide is critical to the successful implementation or otherwise of any construction project.

Since topography survey forms the basis of any successful project work, they must be thoroughly carried out to avoid throwing the entire construction process into jeopardy. This is so because any slight error in recording site features, example, site aspect, elevation, fauna and flora, ground water levels, elevations, or

other adjourning features can translate into over budgeting of huge funds for unnecessary excavations and long delays causing project time-overrun. Completing projects based on faulty topography survey's information presents enormous risks to the project and eventual users because of possible future structural consequences.

Korte.com further admonishes that in carrying accurate topography surveys prior to project construction works, reference should be made to Country's statutes regarding topography surveys and Federal Emergency Management Agency's flood map of the site. Note also should be taken of the Municipal zoning and utilities that may affect the site.

With the foregoing therefore, topography risk factors seem to be paramount in propelling and/or hindering the progress and thus achievement of building project construction objectives.

Theoretically, projects are adjudged to be completed when all activities have been implemented, clients are satisfied with project outcome, all fees settled, project organizational structures wound down, final evaluation done to highlight the project successes and/or its troubles and how they were adequately mitigated (Project Insight,2017). The project under study has not experienced most of the above deliverables, twenty years after commencement. This is obvious as captured below, hence the research.

3.0 The Project and its level of completion as at 2021

3.1 Description

The structure is a massive permanent 3-storey hostel complex of cement block walls construction rendered and painted internally but finished with decorated cement brick wall tiles externally. Some of the external walls are rendered and painted, particularly around the entrance lobby. The roof is a combination of shallow pitched and flat roof design, of timber trusses, claded with long span aluminium oven-baked roofing sheets and ceiled underneath with a combination of long PVC ceiling sheets generally and in-situ concrete slabs, where overhead tanks are installed in the roof structure. All internal doors are of hollow Venetia type while the windows are of glass casement on iron frames, but not protected by burglar bars. The floors, which are of cement concrete basement troweled smooth, are finished in a combination of PVC/ceramic tiles and unpolished terrazzo in-situ slabs in the rooms and circulation spaces respectively. There are cloth window nettings on the windows to ward off mosquitoes and other dangerous insects but these nettings were torn at the time of inspection.

3.1.2 Accommodation details

The Hostel Complex has 174 rooms with 3-4bed spaces per room complete with built-in wardrobes serving the three or four occupants (as the case may be), giving a total of 522 bed spaces within the complex. Other accommodation/facilities within each wing of the complex include the following: 8 No. water closets, 1 No. wash tub, open floor area for laundry, 1 No. open-floor Game area, 1 No. large store together with store Manager's office, 1 No. Restaurant/provision shop (on the ground floor) and 1 No. Porter's lodge complete with office.

3.1.3. Services

The grounds of the complex appeared firm at the front and western wings, while the rear and eastern wings are muddy during the rains and water-logged. Generally, the grounds are landscaped around the building with concrete interlocking works using interlocking and kerb stones in the parking area. Human waste is

drained into the septic tanks and soak-away pits located at the rear of the complex. At inspection time, the tanks were broken, emptying their contents onto that flank of the building where the farmers are carrying on their peasant farming. Storm water is drained naturally, as there are no concrete drains provided around the complex, the grounds being waterlogged during rains. Electricity supply to the complex is through solar system but supplemented by supply from the university electricity network. Water supply is through a motorized borehole plus a mini water treatment plant within the complex serving four ground PVC1000-metric ton tanks. The researchers understood that the water could not be pumped to circulate the entire complex through the conduit piping installed in the complex because each time such attempt was made, the entire walls in the building will bleed and walls become continuously damp. Mattresses and wooden double-bunk beds were seen at inspection, though not in all the rooms.

3.1.4. Level of completion/state of the structure

The structure was inspected on the 6th October 2016 by the CRUTECH authority through the Estate and Works department before the Contractor finally left site and in July 2021 by the researchers. The state of completion presented here therefore is on the two reports.

3.1.5 Outstanding works as at 2016

The internal courtyards were not concrete-paved and remained as such until 2021. About 40% of the floors were unfinished either with ceramic or PVC tiles. During 2021 inspections, 60% of the floor PVC tiles in the living areas were removed and non-existent. There were no concrete gutters to carry off storm water from the complex. Even though by 2016 report, the walls were completed with poor work manliness, 40% of the walls, particularly on the 3rd floor were damp to collapsing state as shown by 2021 inspection report. This was as a result of leakages of pipes buried in the walls. The visibility along circulation spaces was very poor occasioned by poor architectural design, inadequate lighting points and undersized electrical bulbs. The fancy block walls, screening off the rooms from the internal corridors, were 60% uncompleted, such that the rooms could be accessed from the walls with ease by miscreants. The internal doors were poorly fitted so that as at 2021 inspection, 80% of them had collapsed and become dysfunctional. 70% of the ceiling space was claded as at 2016 with 60% of the ceiled area vandalized or the PVC sheets, sagging as at 2021. The building appears stable as there are no structural cracks on the walls but some expansion joints reveal wide gaps between walls because of poor work manliness. The concrete foundation base upon which the building rests, showed serious dampness during intense rains. 40% of the metal railings around the sit-outs on the upper floors was not completed. This poses grave danger to prospective students occupying those floors. On the whole, the structure had been poorly executed so that as it stands, double the fund used initially to get the structure to its present state will be required to complete/refurbish it to the standard it was intended. The uncompleted state of the structure together with the poor structural state of the structure after twenty years informed this study, namely to investigate the topography risk factors which may have contributed to this long delay in the project execution.

4.0 Materials and method:

The method which was adopted was in two phases thus:

The ground survey of the project site to produce the current survey map of the site and Using the original survey map of the University as at its inception (2002) to compare with the current map to establish if there any significant disparities in spatial heights distributions across the project site which will indicate topographical risks.

Phase a

The work entailed capturing site data, processing them and presenting the site data in form of topography map. Therefore, the equipment employed included both hardware and software equipment and materials. The hardware equipment included Global Positioning System Equipment (Differential GPS-RT K Hi-target V60 Model, computer system and Radio for communication on site while the software equipment were Auto CAD software, civil Cad, Microsoft Excel and Microsoft Word.

Stages involved in any surveying project were strictly adhered to and automated surveying equipment mentioned above were utilized. The following procedures were adopted: The methodology used was ground survey method; in which direct measurement to each spatial object across the project area was carried out with the use of modern day Surveying Instrument (Global Positioning System Instrument). The stages of operation

4.1.1 Geometric data acquisition.

This is the spatial data capturing. Differential Global Positioning System was used to observe direct coordinates of points. With the use of a dual frequency, 216 channel Hi-Target receivers which is capable of tracking the American Satellites-GPS and the Russian Satellites-ONASSIS, with millimeter accuracy, data was captured in 3-dimension that is, X, Y and Z.

4.1.2 Topographical survey of the project area:

Bench marks were established at strategic points and their reliability ensured. The base receiver (also known as Reference) was set on one on the BM. The Rover GPS receiver was taken to all points of interest, and all necessary data such as the point identification value, coordinates and elevations were captured. A 10-meter grid interval was used to capture terrain data.

Figure 2: Pictures showing GPS Base set-up on an established Bench Mark

4.1.3 Detailing

This is the process of acquiring spatial data necessary to fix the positions of features of the existing 500–Unit Hostel building. The instrument was taken to the edges of the Hostel facilities and its position, shapes and also the topological relationship between the features determined.

4.1.4 Bench Mark establishment

Bench marks (Temporary Benchmark) were established in the strategic positions within the project area. They were positioned in such a way that human activities cannot disturb them.

Figure 3: Pictures showing Geometrical Data Acquisition with RTK DG

4.1. 5 Data processing

This involved downloading, editing and necessary transformation of all data acquired through the use of Hi-target DGPS, plotting of spatial locations and generation of contour across the project area and map production.

Topographical map production

This is the output of all other stages involved in this aspect of this research. Data acquired and data processed earlier are presented in form of a map. Topographical survey of the project site was produced at a scale of 1:1000 with a contour interval of 0.5m. The topographical map below presents graphically representation of the terrain around the project site which is of great importance to the Project Manager, the civil Engineer, the Architect and the

Estate surveyor who will manage the completed building complex.

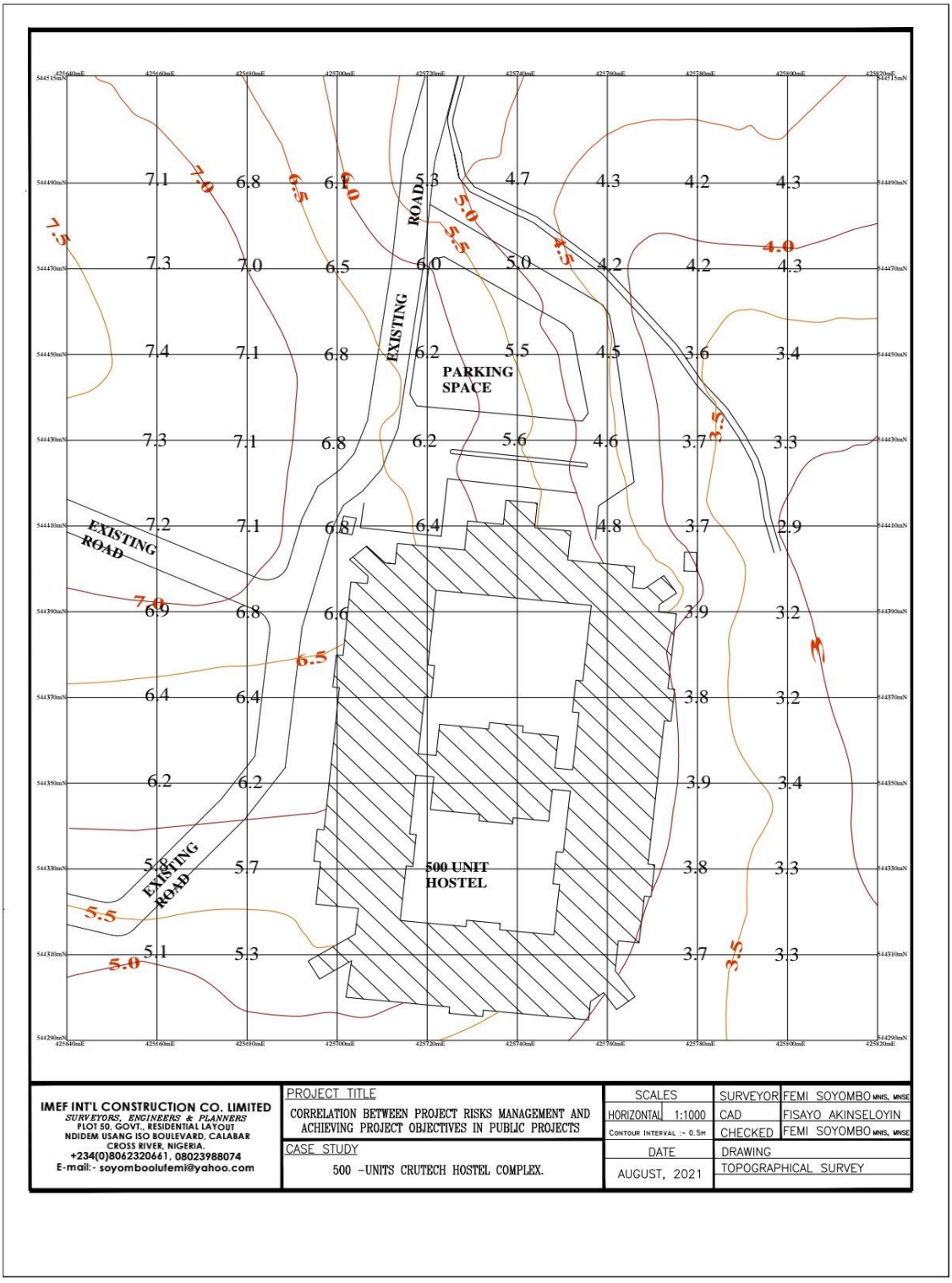

Fig.4

4.2 Phase b

This stage involved the utilization of aerial data sourced from auto photo map of Calabar and a 3D line map (Digital Terrain Map (DTM)) of Calabar at an accurate rate of 5cm of year 2000. The points on the project site for comparison were generated from point cloud. With a 5cm accuracy rate, the topographical risks on the site were ascertained and solutions proffered.

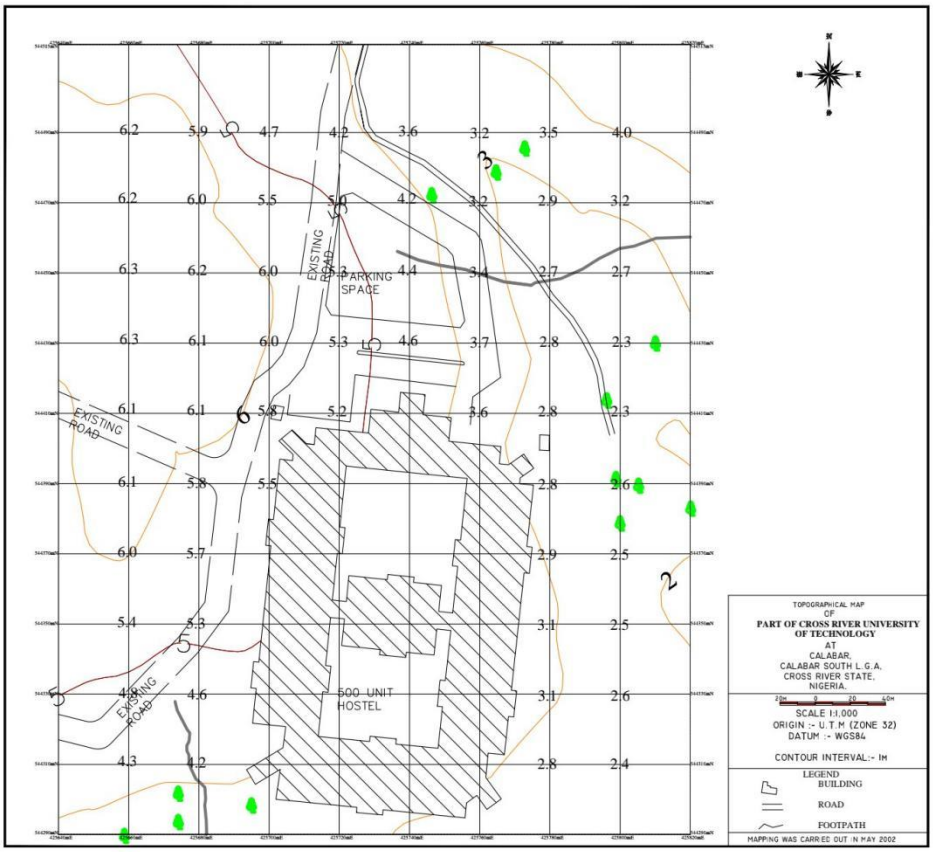

Fig.5

Research Hypothesis

$H0_1$: The site topography of 2021 is not significantly different from the site topography of 2002.

Results and interpretation

To test the research hypothesis, need arose to produce a topography map of the project site as at 2021 (see fig above 4) when the research was conducted and compare its topography features with that of 2002 (see Fig. 5 above) when the University was established and the construction of the 500-unit complex started. A total of 60 points were identified on the site and their topographical readings taken. The 2002 readings were taken from the old survey map covering the entire CRUTECH land area just before the establishment of CRUTECH and corresponding readings as at 2021, taking three (3) readings by the use of GPS at each identified point. Three readings each were taken and their mean calculated to ensure

accuracy. Multivariate analysis of Variance was then applied, utilizing F, Pillar's trace, Wilk's Lambda, Hotelling's trace and Roy's largest root, statistical tool tests, to test for the significance of spatial differences. Spatial differences simply are the changes in height of the topographical feature of the terrain of the site (see table 1 below).

The descriptive Statistics by Location (reading points) are presented in Table 1 below:

Table 1: Descriptive statistics of spatial distances by year

Location	N	Year 2002		Year 2021	
		Mean	Std. Dev	Mean	Std. Dev.
1	3	6.204	.0055	7.107	.0110
2	3	5.704	.0055	6.808	.0108
.	.	.	.	.	.
.	.	.	.	.	.
.	.	.	.		.
60	180	2.404	.006		.022
Total		4.379	1.372	5.313	1.410

From Table 1 above it was observed that the mean values for each reading station for 2002 and 2021 are different in favor of 2021. That is, the heights of the ground level of the project site at every reading point was higher for 2021 than it was for 2002. The results of the Multivariate tests are presented in Table 2 below:

Table 2: Multivariate tests for significance of model parameters – intercept and location

Model Para	Test statistics	Test value	F- Value	Hypothesis df	Error df	P-Value
Intercept	Pillar's trace	1.000	244617891*	2	119	.000
	Wilks' Lambda	.000	244617891*	2	119	.000
	Hotelling's trace	4111225.061	244617891*	2	119	.000
	Roy's largest-root	4111225.061	244617891*	2	119	.000
Location	Pillar's trace	1.998	2141.634*	118	240	.000
	Wilks' Lambda	.000	32400.2294*	118	238	.000
	Hotelling's trace	489736.093	489736.093*	118	236	.000
	Roy's larg-root	489209.539	995002.453*	59	120	.000

*Significant at .05 level

Table 2 above shows the results of the test of the research hypothesis. Multivariate tests for significance was run using four statistical tools of Pillar's trace, Wilk's Lambda, Hottelling's trace and Roy's largest root. The results show that for the intercept of the effect model, all the tests showed significant contribution in the model – P-values of .000 associated with the computed test statistics were all less than .05, the chosen level of significant for the Study. This means that the null hypothesis is rejected and the alternative upheld; that the topography of the site as at 2021 was significantly different from that of 2002, with the one of 2021 being higher than that of 2002. The results for the contribution of location in the effect model, followed the same pattern. This means that the chosen Multivariate Analysis of Variance (MANOVA) fits the data significantly. The results of the M ANOVA are presented in table 3 below:

Table 3: Multivariate ANOVA of Spatial Area by vertical heights (depts.) and year

Model parameter	Source of variation	Sum of squares	Df	Mean square	F-Value	P-value
Corrected model	G.height 2002	337.061	59	5.713	190783.134*	.000
	G.height 2021	355.916	59	6.032	25013.162*	.000
Intercept	2002	3451.177	1	3451.177	115252680.700*	.000
	2021	5081.534	1	5081.534	21070145.670*	.000
Location	2002	337.061	59	5.713	190783.134*	.000
	2021	355.916	59	6.032	25013.162*	.000
Error	2002	.004	120	2.994E-05		
	2021	.029	120	.000		
Total	2002	3788.242	180			
	2021	5437.479	180			
Corrected total	2002	337.064	179			
	2021	355.945	179			

*Significant at .05 level.

The results in table 3 above show that for 2002 model, the P-values (.000) associated with the computed F-values for the corrected model, intercept and location were all less than .05. The same results were observed for 2021. These results show that there is significant spatial difference both horizontally and vertically, with 2002 as the reference point.

5.00 Discussion of findings

This research was undertaken primarily to assess whether the topographical risks inherent in the project site of the NDDC

sponsored 500-unit hostel complex located at UNICROSS main campus influenced negatively the timely completion of the complex which construction dates back to 2002, when the University was established. The research hypothesis was to ascertain whether there was any significant difference between the 2002 topographical site and that of 2021 topographical site. This was tested at .05 significant level. In carrying out the investigation many site variables were assessed using the topographical features of the two topographical maps (2002 and 2021, see figs above please). The results as presented in tables I,2 and 3 showed as follows:

1. that the mean heights of the topography of 2021 map were higher than those of 2002 (table 1). Three (3) readings were taken at each point for the two maps and accuracy confirmed.

2. that the difference in the mean heights of topography between the two maps were significantly different in favour of 2021 (site) map. The Multivariate tests conducted utilizing the four statistical test tools (see table 2) showed a P-value of .000 in each one of them, which is less than the significant level set for the study.

3. that the Multivariate Analysis of Variance conducted using intercept and location across the entire project site also showed significant difference between the topography of the two maps both vertically and horizontally.

These results led the study to reject the null hypothesis namely that there is no significant difference between the same site at two different time span, in this case, nineteen years interval (2002 -2021).

Physically, the site is low-lying, prone to seasonal flooding, has high water table level, marshy grounds, fronts unto a swampy mangrove wetland and weak sub soil (Okoro and Okon, 2021). The annual rainfall ranges between 2200 mm and 3700 mm. The annual air temperature ranges between 26.0 ^{o}C and 28.0 ^{o}C (NIMET, 2018). It has a typical mangrove vegetation such as Nipa palms (*Nypa fruticans* wurmb) and other typical mangrove vegetation with propping roots over thick mud, bamboo palm (*Raphia vinifera*) locally known as "iya", umbrella tree (*Musanga cecropioides*), (*Ceolocaryon preussi*) locally known as "u̱no" and 'u̱no-idim' respectively, and Indian bamboo (*Bambusa vulgaris).*

The results above showed clearly that the topographical risk factors inherent in the site affected the building works adversely and delayed its completion. If the height of the site was higher in 2021 than 2002 when the building construction work started, it means the building is sinking. The cracks on the walls/expansion joints of the building are a clear indication of uneven movements of the subsoil which make the building very dangerous for human habitation (Seeley, 1974). Also its location in the water-logged and flood-prone environment negates the ease and speed of execution. Inputs gotten from those who worked on the site bordered on hazards, delays caused by these factors. Foundation trenches had to be dogged several times due to caving in due to weak subsoil and soil water (Okoroo and Okon, 2021). Marshy subsoil caused heavy financial

incursion (Seeley, 1974, & Ogbuefi, 2011) in sand-filling with red earth and hardcore. Ground water had to be drained and flood diverted from site during heavy rains. Capillary movement of water dampen the walls and floors and caused flaking of paints and removal of floor tiles. The site's aspect is quite poor as the location is humid all through the year, sunshine is inadequate, and the site is damp (Ching, 1975). Draining of the subsoil water and surface water is difficult and expensive. The foundation type (stripped) used for the massive Hostel block is not commensurate with the site.(Seeley,1974 & Ching,1975)

The building complex delayed because the topographical risks inherent in the sites were not captured, assigned and planned for mitigation. Information gathered showed that the site risks were grabbled with as they arose during construction. The site topographical risk factors affected not only the timely completion of the building project but the quality standard of the project.

6.0 Conclusion

The study has demonstrated that it is quite unprofessional to undertake a building project work without first and foremost conducting a topographical survey to note the topography attributes of the sites. This has to be done deliberately and professionally to discover possible site topographic risks which will impact on the building projects positively or negatively. This, if done will checkmate on wastage of heavy finances which could alternatively be used in executing the subject building project. As demonstrated by all the authors reviewed, appropriate site is the starting point for a successful building work. Factors to be looked out for topographically are the aspect and elevation of the site, fauna and flora, the vegetation around the site and other built structures, the water table, the soil texture, the wind direction, the quantum of the sunshine, et cetera. The profile of the site topography will inform of the foundation type, the engineering works to be carried out, the techniques and technical personnel that will be required et cetera.

For the project studied, it was discovered that in spite of the huge finances incurred on the project the structure as it stands is inhabitable and for it to be utilized, twice its initial project cost will be required to get it afoot**.**

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Appendices

Areal view of the site