

Improving Greenery in the Ghanaian Built Environment Through Policy and Legislature

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ABSTRACT

The world is craving for sustainability and thus implementing various measures to achieve this laudable task. For sustainable development to be achieved there is the need for a balance between environmental, economic and social development. Therefore, the Millennium Development Goals (MDGs) and the new Sustainable Development Goals (SDGs) encompass all three. In Ghana, most infrastructural projects such as roads and buildings are done with economic and social focused leaving out the environmental concerns. Even though there is Environmental Management Systems (EMS) in place such as the Environmental Protection Act (EPA), the country's environment with regards to greenery has setbacks. This research examines how the soft landscaping component of infrastructural development can be enhanced to improve the environment. Questionnaires in the form of Google forms were used to collect data. Stakeholders of infrastructural developments such as financiers of projects, institutions that give approvals and professionals involved in the design and execution of projects were the scope for data collection. The research reveals that there are no clear indications of requirements of soft landscaping in legislature and thus making it difficult for their inclusion in infrastructural development. A well-structured legislative instrument combining the Green Building Code and National Building Regulation should be adopted. Institutional capacities should also be enhanced for enforcement of this new legislature.

Keywords: Greenery, built environment, infrastructure, legislature, policies, environmental protection, environmental management.

doi: <https://doi.org/10.21467/ajgr.2.1.1-11>

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Article History

Received: 12 January 2017

Revised: 1 February 2017

Accepted: 27 February 2017

Published: 28 February 2017

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Academic Year: 2016-17, Second Semester

Course Level: Master Degree

Course Name: M. Phil (Architecture)

Course year: 2nd year / IInd Semester

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1. Introduction

The built environment is explained by the McMillan dictionary as all structures built by people and excludes the natural environment. These include structures such as buildings, roads, bridges, tunnels, water supply, sewers, electrical grids and telecommunications. It can further be explained as the physical parts of interrelated frameworks giving products and administrations key to empower, manage, or improve societal living conditions [1]. Developing the built environment is essential to man's survival and this also involves the clearing of the needed vegetative land. Though physical developments improve upon the lives of people both socially and economically, the deterioration of the natural environment should be of concern too. For instance, development in terms of social amenities, roads, schools and hospitals helps with social development as well as makes provision for economic activities to thrive, but not much is seen of its environmental improvement. For sustainability to be achieved, there must be a balance; projects must have positive impact on the society, economy and the natural environment. There is a growing need for positive environmental impact of infrastructure across the world and therefore the promotion of "Green Infrastructure". This idea involves the integration of the natural ecosystems into infrastructure development such as trees, water, green roofs and green walls. This is easily achieved by inclusion of green in construction especially in building and road projects [2, 3, 4].

The concern of the inclusion of greenery in the development of the built environment has existed from the 1st century AD. The Roman Architect Vitruvius is amongst the first proponents of this inclusion. He was of the idea that the seasonal patterns of the sun and wind should influence the planning and orientation of buildings. Hippocrates of the 5th century and a Greek physician explained the need of "airs, waters and place" for the human being's or society's health. [5]. During the 15th century, architect Leon Battista Alberti elaborated on Vitruvius concerns. He advocated for the environment to be the defining premise for the positioning of cities, design of streets, squares and buildings for cities to be healthy, dignifying, safe and pleasurable. He believed in nature centred development and recommended that "We ought never to undertake any thing that is not exactly agreeable to Nature" [6]. Marshan environmentalist also proposed that man should work with nature to reconstruct the damage for all to benefit [7]. Olmsted and Vaux realised some of these concerns in their works for a healthy, safe and welfare of urban dwellers [8]. The Twentieth century brought a lot of arguments about nature and physical development but central to it all is green inclusion in the built environment [9, 10-12].

The inclusion of greenery in the built environment this 21st century has enormous importance. When greens are enhanced in the built environment, the environment is enhanced through the reduction of temperature. This abatement is accomplished as greenery retains some sun based radiation and counteracts re-radiation of heat. The inclusion of greens in the built environment has a bearing air quality. Greeneries also serve as filters for air pollutants such as dust and smoke in urban centres. Air quality is also improved through soft landscaping with the absorption of CO₂ and emission of oxygen needed by man for respiration. CO₂ is one of the Green House Gases causing global warming and thus its absorption helps to mitigate global warming. The inclusion of greens such as trees, waters, lawns and grass in the built environment helps to reduce the volume of rain water runoffs, a major cause of erosion. Existence of soft landscaping makes soil very porous and thus there is the assimilation of rain water to prevent flooding [13]. The world at large has seen the need for greenery with the increase in awareness through professional bodies, associations, standards and legislative instruments. Legislative instruments are mostly generated from standards or policies. Standards are categorised as international standards, regional and national standards [14]. International standards are imperative for the mitigation of monopoly and thus available to everyone across the globe [15]. However, the most acceptable environmental standard across the world is the International Standard Organisation (ISO) 14001. ISO 14001 is the key administration framework standard which determines the necessities for the definition and upkeep of an Environmental Management Standard (EMS). EMS controls ecological angles, decrease affects and guarantee legitimate consistence [16]. Various countries and regions have developed their own standards to achieve the ISO.

1.1 Policies on Greenery in the Built Environment of Ghana

Not much greenery has been included in infrastructure development in Ghana. However, some aspects of the National Building Regulation (NBR), Environmental Protection Act (EPA) 1994 and Green Building Code (GBC) of the Building and Road Research Institute (BRRI) have it. The National Building Regulation (NBR) a legislative instrument LI 1630 of Act 1996 has soft landscaping component in part 3 [17]. The NBR has its roots from the Town and Country Planning Ordinance (CAP 84) of 1945 [18]. In 1988, the Building and Road Research Institute (BRRI) developed the Green Building code. This code outlined standards for administration, use and occupancy, structural loads and procedures, foundations and housing and small buildings. The enactment of the Environmental Protection Act 1994 [19] with Environmental Impact Assessment under LI 1652 section 41-1 adds up to Ghana's commitment to soft landscaping [20]. The Environmental Impact Assessment Regulation 1999 under LI 1652 outlines guidelines for Environmental Permits. Section 14 – 1 states that an environmental impact statement shall also address possible direct and indirect impact of the undertaking on the environment at the pre-construction, construction, operation, decommissioning and post-decommissioning phases. These include ecological consequences of direct destruction of existing habitats from activities such as dumping of waste and vegetation clearance and fillings [20]. The issue is the absence of clear definitions on the percentage of soft landscaping or the natural habitat that should accompany projects. Decision is left to the discretion of the assessors. Individual residential units are not captured in the guidelines as it concentrates only on large housing schemes. This gap needs to be addressed for a better environment development.

Part 3 of the National Building Regulation (L.I. 1630) under the local government act also deals with site preparation and landscape. This however does not detail out the soft landscaping component. United Nations Development Program (UNDP) proposes the merging of National Building Regulation (NBR) and the Green Building Code (GBC) which was developed by the BRRI in 1988. It further proposes additions to the GBC such as materials and standards, building services, energy efficiency, sustainability, health, safety and environment. The soft landscaping components of the proposal are captured under the health, safety and environment. Under health, safety and environment there are sub categories of open space planning, topography, soil conditions, building envelope, orientation, landscaping, permeable surface regulation and green infrastructure. This proves how weak the current NBR is towards soft landscaping thus making it necessary for GBC integration [21]. The environment should have been better with the existence of Environmental Management Systems (EMS) such as ISO 14001, Environmental Protection Act 1994 Ghana, Ghana Green Building Code and Part 3 of the National Building Regulation. EPA of Ghana is about 60% in conformity with ISO 14001 which is a world standard and therefore a positive indication [22]. In addition to these, Section 52 sub-section 1 of the Local Government Act 462 mandates municipal assemblies to enforce physical developmental plans by the municipal and thus greenery inclusion should be easier if welcomed by the municipal assemblies.

Nevertheless, the United Nations Framework Convention on Climate Change (UNFCCC), affirms that Green House Gas (GHG) emissions of Ghana have increased from 9000 Gg CO₂ equivalent in 1990 to 18,000 Gg CO₂ equivalent in 2006. This is however made up of both CO₂ and Non-CO₂ gasses. The Non-CO₂ gasses are Water vapour (H₂O), Methane (CH₄), Nitrous oxide (N₂O), Ozone (O₃) and Chlorofluorocarbons (CFCs) [23]. All gases contribute greatly to global warming and thus their mitigation makes the world better. There are different ways of mitigating each gas and the provision of greenery helps to curb CO₂ gases. Thus, without greenery, the rate of CO₂ gases in the country will continue to increase as seen in Figure 1.

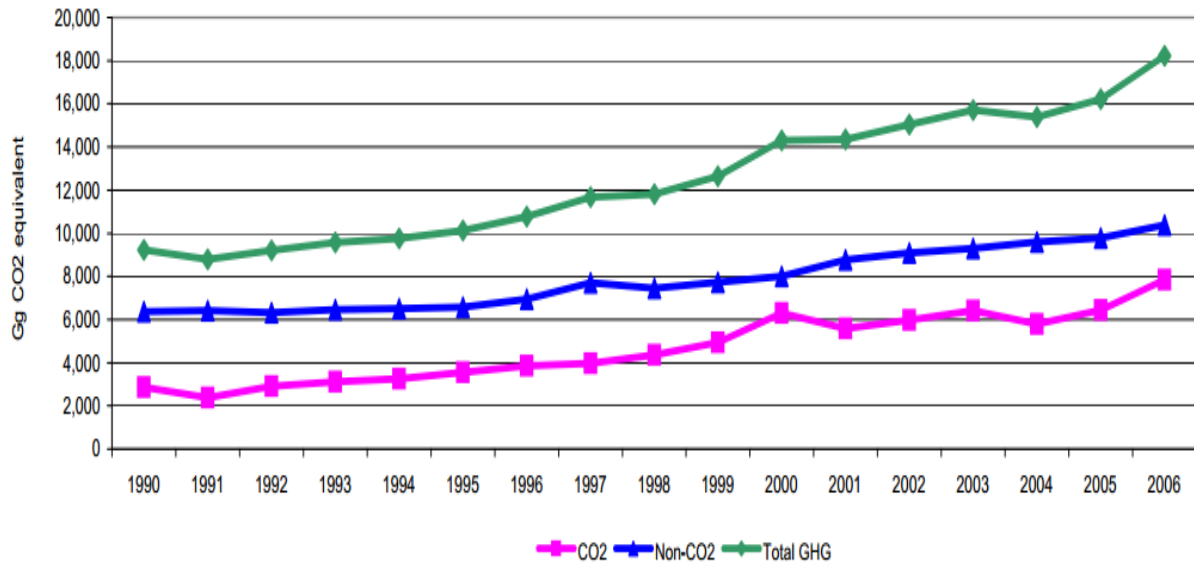


Figure 1: Ghana GHG emissions

Though the emission above does not list Ghana amongst the world's top culprits of GHG emissions, its continuous increase should be of concern. These Green House Gases when increased in the earth's atmosphere, traps or absorbs heat within the atmosphere. There is thus a warming of the earth which has various effects. These effects include the melting of the polar ice-caps which increases sea levels for floods, drying up of land which affects vegetative growth and impedes agriculture and advent of some diseases due to temperature rise. Famiyeh [22] confirms Tamakloe's [24] postulation that "future of Ghana's environment is thus not gloomy". However, Tamakloe outlines some challenges that need attention to improve upon environmental stakes. Challenges that need be addressed include political commitment to the environment, new laws to handle new environmental trends and provision of technical and financial support [24]. These challenges bring out a big question which this research seeks to address; how can soft landscaping be enhanced in infrastructural projects to improve the environment? This aim is however achieved by examining the existing soft landscaping components of infrastructural development for improvement. Directives are then developed to help enhance the soft landscaping component of infrastructural development in Ghana.

2. Materials and Methods

The methods used for this study were both literature review and survey techniques. Literature is reviewed on soft landscaping inclusion in infrastructure and current legislature on the environment. This is to examine the nature of current legislature on infrastructural developments. The literature review focused on existing research and legislative documents to find out the currents environmental trends and laws. Observation on some infrastructural projects was done to ascertain their inclusion in these projects. Content analysis also relied on descriptive approach of each variable in response to the questionnaires.

Google form which is a questionnaire type was used for the survey. Google form allows the recipient to fill forms online through an email and thus make it more difficult for a person to fill many or all of the forms. Google forms also does analysis of responses received electronically and presents results for discussion. The main limitation to Google forms is always the availability of internet to participating respondents. However, with most respondents of this research in the urban areas of Ghana where internet is available, the limitation is substantially reduced. This is achievable though the total internet coverage in the country is 18%, urban areas accounts for 92% [25]. Purposive sampling method is used in this study to identify some key stakeholders in infrastructure development such as clients (financiers), professionals and institutions. Table 1 shows the key areas and their respective categories under them.

Table 1: Key stakeholders and their categories

| Key stakeholders | Category | Reason for category type |
|----------------------|--|--|
| Clients (Financiers) | Transport infrastructure, Industrial infrastructure, Commercial infrastructure and Residential infrastructure. | Major projects mostly executed in the country. |
| Institutions | Town and Country Planning (TCP) & Environmental Protection Agency (EPA) | The main institutions for legally mandated to give permits |
| Professional | Architects, Building Technologists, Civil Engineers and Environmentalists. | Professionals mainly involved in infrastructural projects |

The entire country was chosen as the study area due to the different socio-cultural backgrounds in the country. This is evident as Ghana has many ethnic groups. Climatic differences also play a role, as developments executed under different climatic regions might have different challenges. For instance, grass will do better in the middle belt where there is more rainfall than in the northern belt. The focus is on construction activities in the areas of buildings and roads. Greenery such as trees, grass and plants will be the focus as soft landscaping though it can encompass a lot more. With the geographical area being the whole of Ghana, the 6 Metropolitan Assemblies in the country were used. These assemblies are Accra Metropolitan Assembly, Tema Metropolitan Assembly, Kumasi Metropolitan Assembly, Sekondi / Takoradi Metropolitan Assembly, Cape coast Metropolitan Assembly and Tamale Metropolitan Assembly. These were selected because most building permits are granted at the level of metropolitan assembly. Two people were selected per each category under each key area. Table 2 shows the actual sampling strategy and size. It shows the total sample size is 120 which is made up of 48 for clients, 48 for professionals and 24 for institutions.

Table 2: Sample strategy and size

| | Key Stakeholders | | | | | | | | | | | Total |
|---------------|-------------------------------------|------------|------------|-------------|--------------|-----|---------------|--------------------------------|-----------------|-------------------|------------|-------|
| | Infrastructure Financiers (Clients) | | | | Institutions | | Professionals | | | | | |
| Metro | Transport | Industrial | Commercial | Residential | TCP | EPA | Architects | Building Technician / Engineer | Civil Engineers | Environmentalists | | |
| Accra | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 20 | |
| Tema | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 20 | |
| Kumasi | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 20 | |
| Sekondi | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 20 | |
| Cape coast | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 20 | |
| Tamale | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 20 | |
| Totals | 48 | | | | 24 | | 48 | | | | 120 | |

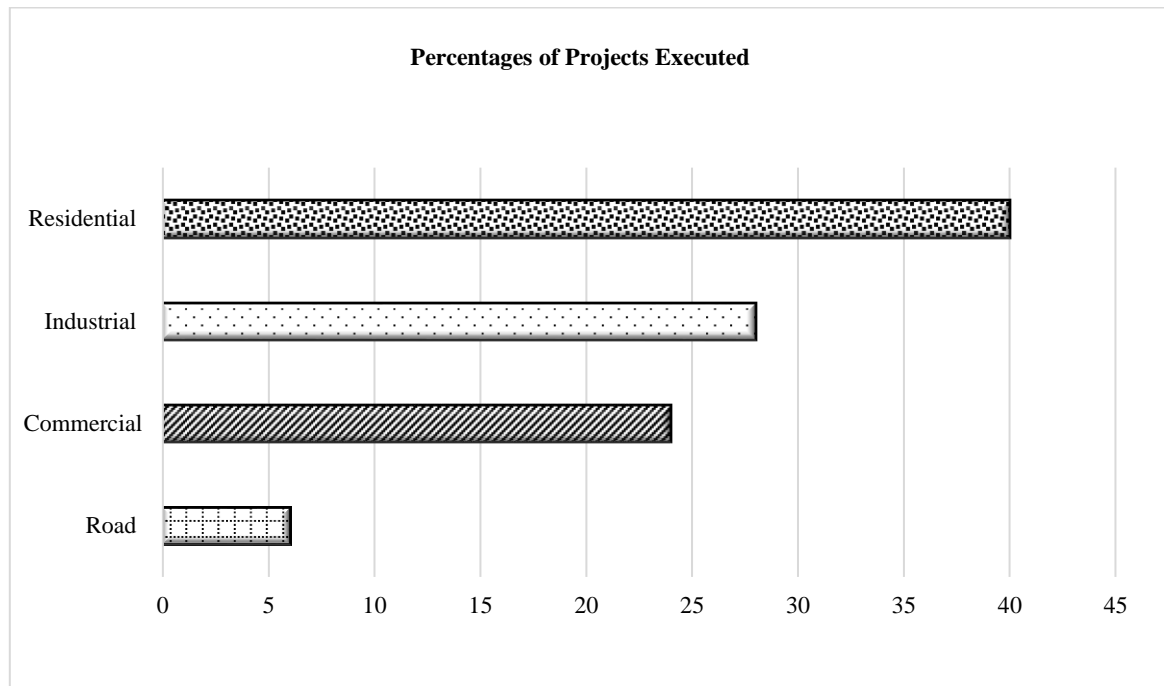
3. Results and Discussion

Data used for discussion came from only 62 respondents instead of the initial sample size of 120. This reduction of data is attributed to respondents not regularly checking their emails and thus phone calls were made severally to remind respondents. Table 3 details out the returned responses.

Table 3: Actual size used for analysis

| Metro | Key Stakeholders | | | | | | | | | | Totals |
|---------------|-------------------------------------|------------|------------|-------------|--------------|-----|---------------|-------------------------------|-----------------|-------------------|-----------|
| | Infrastructure Financiers (Clients) | | | | Institutions | | Professionals | | | | |
| | Transport | Industrial | Commercial | Residential | TCP | EPA | Architects | Building Technician/Engineers | Civil Engineers | Environmentalists | |
| Accra | 1 | 1 | 1 | 2 | 1 | 1 | 2 | 1 | 1 | 0 | 11 |
| Tema | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 0 | 10 |
| Kumasi | 1 | 1 | 1 | 2 | 1 | 1 | 2 | 1 | 1 | 0 | 11 |
| Sekondi | 1 | 1 | 1 | 2 | 1 | 1 | 2 | 1 | 1 | 0 | 11 |
| Cape coast | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 0 | 10 |
| Tamale | 0 | 0 | 1 | 2 | 1 | 1 | 2 | 1 | 1 | 0 | 9 |
| Totals | 26 | | | | 12 | | 24 | | | | 62 |

Though the return rate was reduced to 51.7%, it must be noted that no one responded from the environmentalist section from all six metropolitan assemblies in Ghana. Environmentalist as a professional area is key for soft landscaping and thus if nonexistence is the reason for no respondents, then it is a great setback. On the financiers, residential financiers returned 83.3% response where the industrial, commercial and road financiers each returned 50% each response. The institutions (EPA and TCP) also returned a 50% response rate each. Architects had high representation under the professional category with 100% returned. To determine the extent of greenery usage and viability, data was taken from various categories of projects including residential, commercial, industrial and road. From the respondents, a total of 50 construction projects were executed, of which 20 projects (40%) were residential and only 4 projects (8%) was road as shown below.

**Figure 2: Overall percentage of projects executed.**

A closer look at both clients and professionals involved in the execution of projects shows that professionals executed more projects than clients for residential, industrial and commercial, however with regards to roads, both had equal number of executed projects as shown in Figure 3.

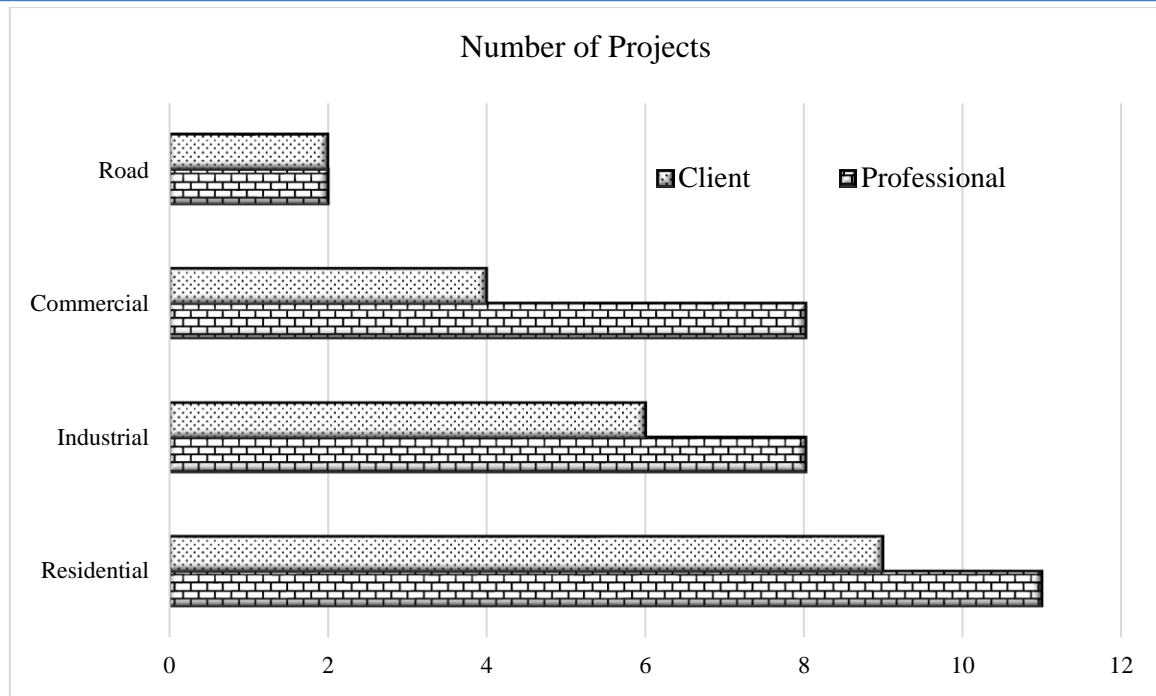


Figure 3: Number of projects executed by stakeholders

Though clients and professionals execute more residential projects, it is industrial projects that have higher numbers of approved permits as in Figure 4. A lot of residential projects are not approved by the recognised institutions.

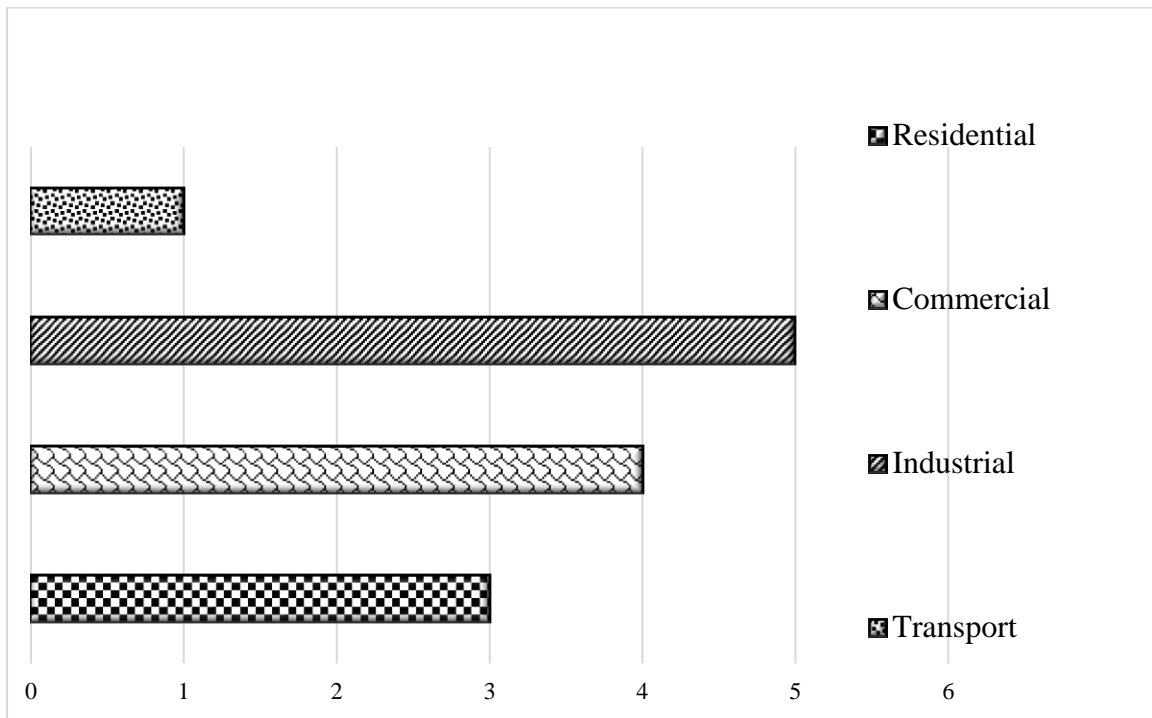


Figure 4: Number of projects approved by institutions only

To extrapolate this, respondents were asked if permits were granted for projects they have been involved. Results show that a reasonable number of permits are granted for both clients and professional but clients had the lowest value of 65% and professionals had 80% as in Figure 5 below.

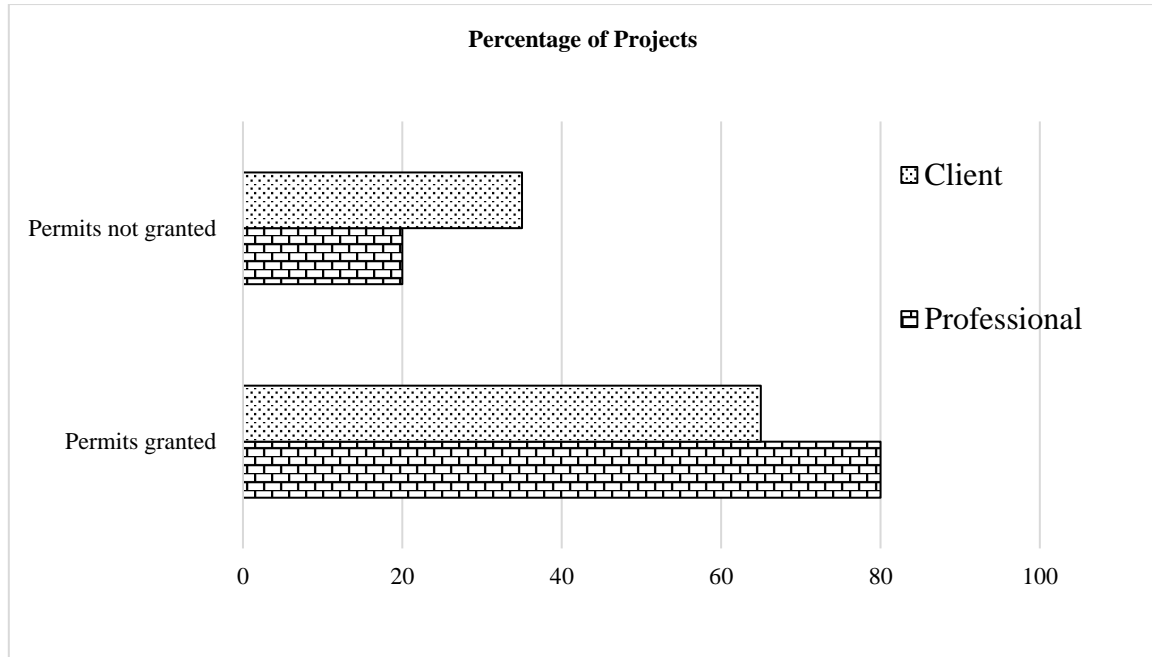


Figure 5: Percentage of projects with or without permits granted

Investigation into the lack of permits reveal that most professionals sought for permits but due to some setbacks, clients were not interested. The reasons for setbacks in permit applications are clients unwillingness, non existence of such permits and financial constraints. Figure 6 below shows that clients unwillingness is the major setback permit applications.

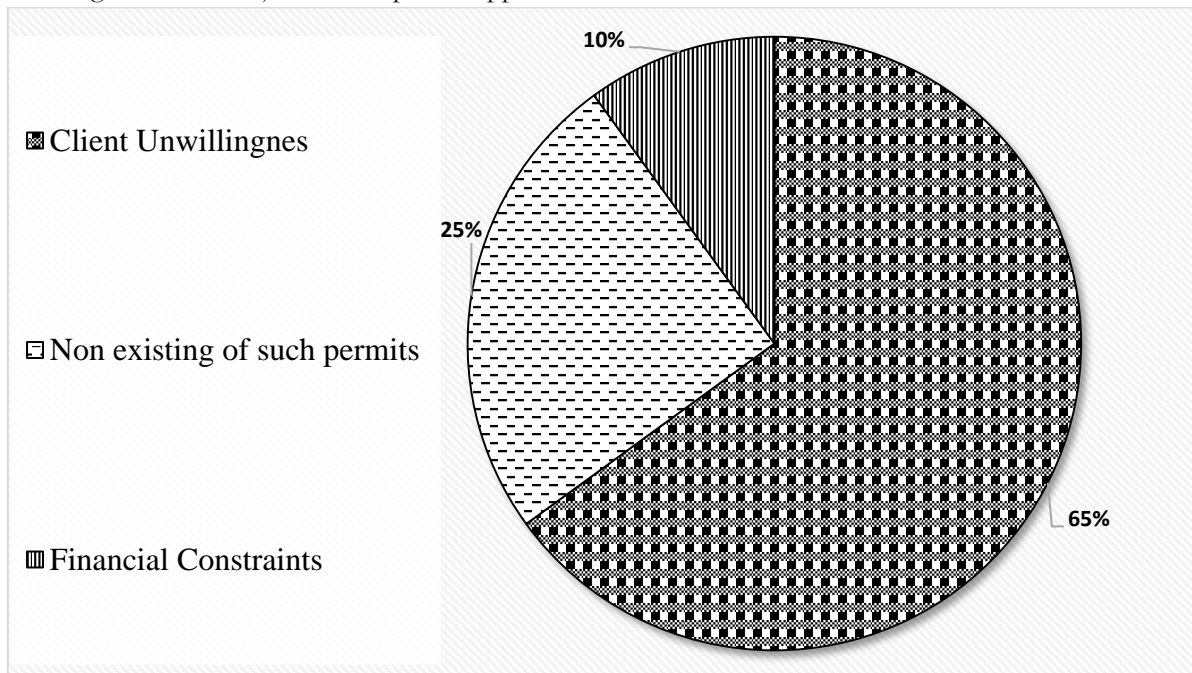


Figure 6: Setback on permit processes

However, a number professionals are also to be blamed as the figure 7 shows about 44% of executed projects are executed by professionals without permit. 44% on the other hand did a good job by educating the client on the need for building permit. This should be the role of every professional. Figure 7 below gives a graphical representation of professionals' reaction towards clients who refuse to apply for permit.

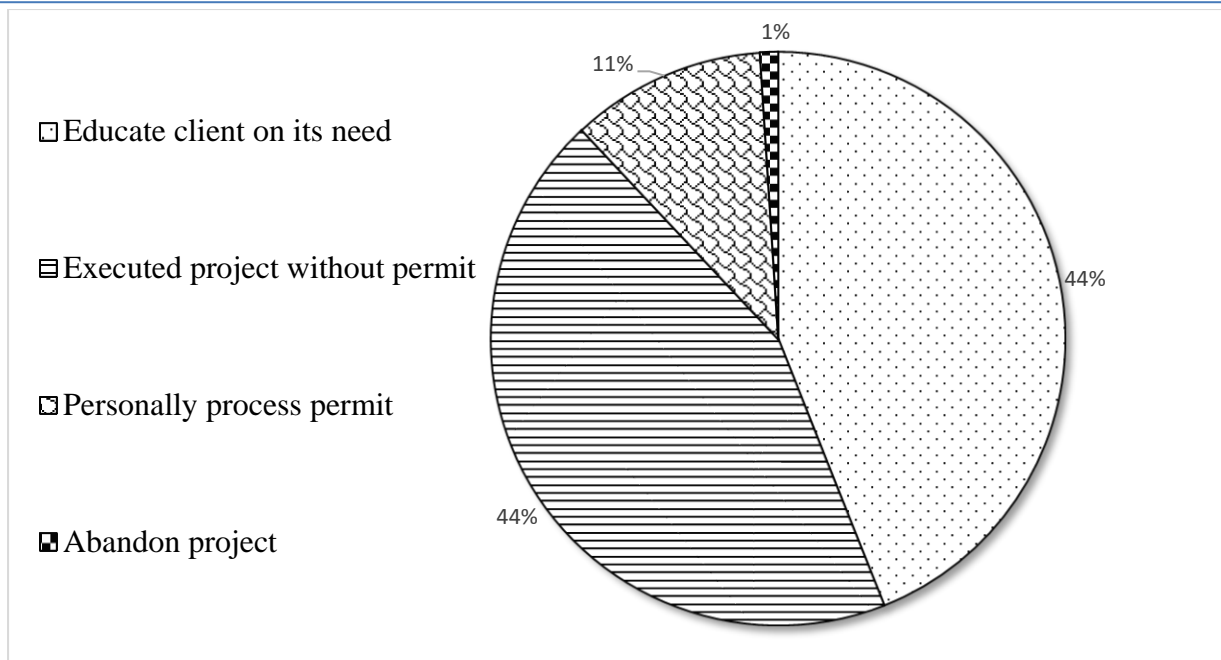


Figure 7: Professional behaviour towards difficult clients

On questioning respondents on the existence of permits, both Institutions and Professionals totally agree to the existence of Building Permit and Environmental Permit. However, when the question of any of the laws having a clear indication of soft landscaping component inclusion, all responded no. This gives a clear indication of these permits not having soft landscaping included. Though it is clear soft landscaping is not included in permits, respondents were asked about their own initiative or commitment to soft landscaping on projects executed. The findings from key stakeholders; clients and professionals realized an average of less than 20% of total land used for soft landscaping. Clients had an average of 16.3% and professionals had 18.6% of projects that included soft landscaping. This can be evident in Figure 8 below.

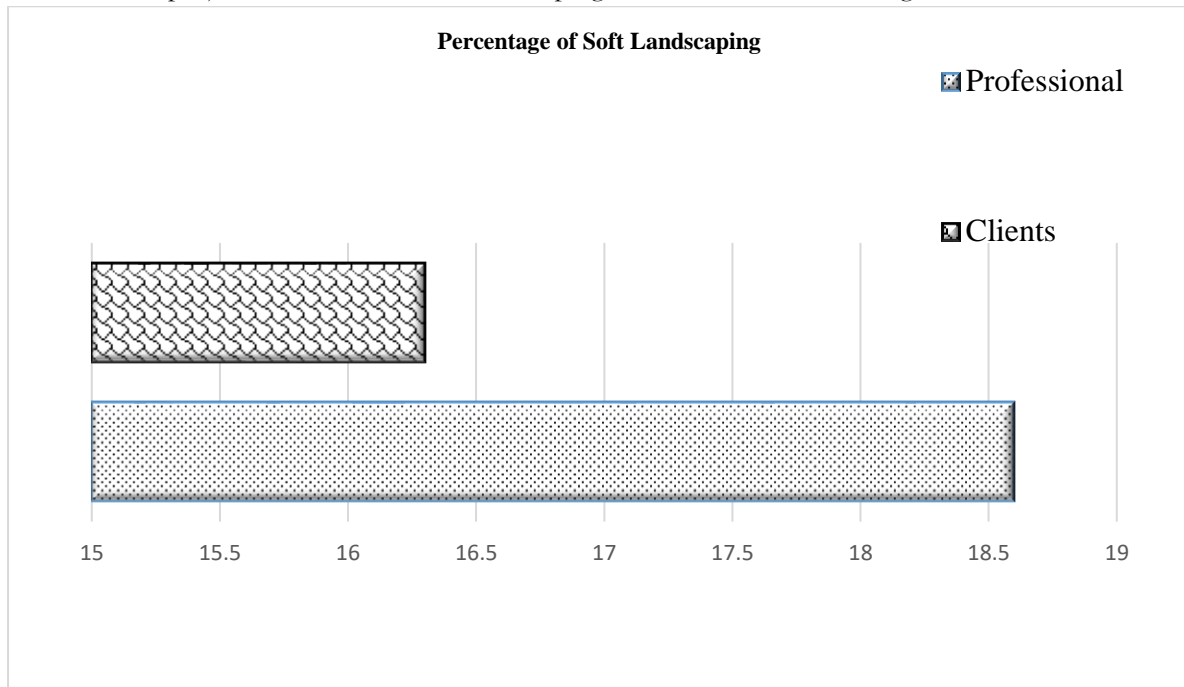


Figure 8: Landscape components of projects studied (%)

Observation assumes that about 50% of the soft landscaping inclusion in figure 8 is unplanned soft landscaping. Though these areas are not hard landscaped, they are left to nature and sometimes become

wild. Some trees and plants also grow where they have not planned for and thus inhibit the beauty of projects as well as cause's damage.

4. Conclusions

This study agrees with UNDP (2012) on merging of the NBR and GBC modified. This is because the GBC has categories such as landscaping, permeable surface regulation and green infrastructure. These categories will help streamline proper inclusion of soft landscaping in projects. It is further recommended that not only will the modification focus on green relating to flooding but inclusion of green walls and roofs for greenhouse gases absorption. This will be an innovative way to increase soft landscaping component with developments without compromising on spatial needs. However, the merging of GBC and NBR will not solve the problem as the GBC does not give specific or details on percentages. Literature from the Hong Kong planning department also proves that fixed percentages cannot be ascribed for all geographical locations as each location has its own challenges and constraints. For Ghana, these percentages can easily be achieved through the Local Government Act 462, 1993. Since Section – 79 of the act empowers all local governments to enact bye laws, each local government can set their own soft landscaping percentages required on projects. The soft landscaping percentages should be done taking into consideration all challenges and constraints. This will effectively give a structured form of ensuring soft landscaping components in infrastructural developments.

How to cite this article:

Gyimah, K., Ampofo, K., & Gyimah, A. (2017). Improving Greenery in the Ghanaian Built Environment Through Policy and Legislature. *Advanced Journal Of Graduate Research*, 2(1), 1-11. doi: <https://doi.org/10.21467/ajgr.2.1.1-11>

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