Land Use and Land Cover Change Analysis along the Coastal Regions of Cape Coast and Sekondi

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Abstract

The study sought to investigate and analyse land use and land cover change for the Cape Coast and Sekondi coastal regions in Ghana between 2005 and 2013. The methodology adopted for the study involved data acquisition and preprocessing, extraction and validation of land use/cover information. It also involved assessment and examination of the patterns of land use/cover changes in the two study areas. Aerial photographs and topographic maps were obtained from the Survey Department of Ghana. The delineation of the different categories of land cover and land use in the study area was done manually through on-screen digitization in ESRI ArcGIS 10.1. The major land use/cover types identified in the study sites were built up area, vegetation and farms. It was found that since the two study sites are both fast growing urban communities, most of the land was used for human habitation, hence, large parts were covered by built-up area. It was recommended that, relevant agencies such as the metropolitan, municipal and district development planning committees, including town and country planning department should monitor, regulate and plan the pattern of development in both communities. This recommendation will help the city authorities to keep abreast of changes that will occur in the cover and use of land and also factor such changes in the planning of such communities.

Key words: land use, land cover change, aerial photographs, Cape Coast, Sekondi

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Ghana Journal of Geography Vol. 8(2), 2016 Pages 108-126

Introduction

Land use and land cover are two related concepts though they are not the same. The activities that are carried out on the land usually effect changes in its cover. According to Yang (2001), human activities are increasingly altering the surface of the earth, yet there are few landscapes remaining on the earth's surface which have not been significantly altered or are not being altered by humans in some manner. This means that, though, human activities are fast changing the cover of the earth, there are few areas which may not have been affected.

According to Ringrose, Vanderpat & Maheson (1997), Land Use Land Cover (LULC) change in Africa is currently accelerating and causing widespread environmental problems and thus needs to be mapped. In Ghana, sand mining, forest degradation and other human activities are fast changing the cover and use of land. For example, around the Oweri River in the Ashanti region, studies by Frimpong (2007) reveals a serious logging and clearing of the bushes in the catchment areas of the river to pave way for sand mining. Thus, with time, the cover of the land may be altered, mainly through human activities, in this case, forest degradation and sand mining. Another study on the catchment area of the Owabi River indicates how fast the forest cover has given way to built-up are due to human encroachment (Frimpong, 2011).

Land cover refers to the physical material found at the surface of the earth. It includes both natural and human made materials such as trees, buildings, grass, water, asphalt and any other objects that cover the surface of the earth. The Food and Agriculture Organization (FAO) defined land cover as "observed (bio) physical cover on the earth's surface" (FAO, 2000). The question that arises is should everything that is found on the surface of the land be classified as a cover of that land? The FAO document on land cover classification systems, (2000) partly answers this question. *When considering land cover in a very pure and strict sense, it should be confined to describe vegetation and man-made features. Consequently, areas where the surface consists of bare rock or bare soil are describing land itself rather than land cover. Also, it is disputable whether water surfaces are real land cover. However, in practise, the scientific community usually describes those aspects under the term land cover* (FAO, 2000:1). From the above, it can be deduced that, what actually constitutes land cover could be subjective. It could sometimes be defined by the observer's subjective thinking. This notwithstanding, it should be noted that the term land cover is all embracing. It is used to include whatever is found on the surface of the land, including both natural and human-made materials. Thus, this writer agrees with the definition of Ellis (2013), when he puts it as follows: *Land cover refers to the physical and biological cover over the surface land, including water, vegetation, bare soils and or artificial structures.* Land cover should however not be used synonymously or be confused with land use since the latter concerns the utilization of land rather than what is found on the land. Land use is thus characterised by the arrangements, activities and inputs people make or undertake in a certain land cover type to produce, change or maintain it.

Thus, as the land is utilized, the cover is also modified, hence land cover change. Land cover change, according to Ellis (2013), is a generic term for the human modification of the earth's

terrestrial surface. Accordingly, though humans have been modifying land to obtain food and other essentials for thousands of years, current rates, extents and intensities are far greater than ever in history, driving unprecedented changes in ecosystems and environmental processes on local, regional and global scales. The changes encompass the greatest environmental concerns of human populations today, including climate change, biodiversity loss and the pollution of water, soils and air. It is therefore, important to monitor and mediate the negative consequences of land cover change while sustaining the production of essential resources. These have therefore become a major priority of researchers and policy makers around the world (Ellis, 2013). Thus, from the above, it can be said that land cover changes have always been part of human societies, since wherever humans are, they make their activities impact the environment. From the argument made by Ellis (2013), he is alluding to the fact that though, land cover change is as old as humanity, the extent and degree of changes far outweigh those of thousands of years back. Thus, this writer also believes that if the rates of changes and consequences are not checked, they could be more devastating in the future than they currently are.

Thus, as the physical surface of the earth is in constant change, abundant water resources give rise to new growth, cities expand, and what was once forest is converted into farmland. Humans cause some of these transformations; others are merely the result of the changing of the seasons (NASA, 1999). It thus means that land cover changes are basically caused by the direct and indirect actions of humans and nature (anthropogenic and natural factors).

A study carried out by Yang, (2001) revealed that anthropogenic activities are the most important factors that affect environmental changes in the land use and cover. *Changes in the LULC are thus pervasive, increasingly rapid, and can have adverse impacts and implications at local, regional and global scales* (Yang, 2001). Ellis (2013) also argued that the causes and consequences of changes in land use and land cover have been pervasive through pre-history to the present, mainly as a result of agricultural activities, modern industrialization and the concentration of human populations within urban areas. What one deduces from the submission above is that changes in land cover have existed alongside the quest of humans to earn a livelihood. Such changes have occurred through agricultural activities from the time when societies were not as complex and modernised as today. With industrialization in modern society, there is a shift of population and human activities from the rural to the urban areas. With urbanisation and industrialization, more productive lands are still being utilized while marginal lands are being abandoned. Thus, the causes and consequences occur around the world at the same time. It can also be argued that though land cover change is facilitated by the needs of the people, the rate and extent will depend on several factors such as the technology of the people and their overall level of social and economic development. Consequences of land cover change are thus manifested in biodiversity, changes or variations in climate, pollution and other environmental consequences.

Biodiversity is usually affected and often reduced by land use and land cover change. The changes occur through several human activities such as lumbering, farming, mining, construction and other activities that disturb the ecosystem. For example, land can be transformed from primary forest to farmland. This leads to loss of forest species. Generally, biodiversity loss and the disturbance of

the ecosystem occur whenever undisturbed lands are transformed into more intensive uses such as livestock grazing, intensive agriculture, industrial activities and human habitation. These activities can cause disturbances to plant and animal species, destruction of habitats and even general extinction. Research demonstrates that, species invasions by non-native plants, animals and diseases may occur more readily in areas exposed by Land Use and Land Cover Change (LULCC), especially in proximity to human settlements (Ellis, 2013:6).

Land Use and Land Cover Change contribute a lot to variations or changes in climate at all levels. LULCC is responsible for the release of Greenhouse Gases (GHG) into the atmosphere. Ellis (2013) argued that LULCC can increase the release of carbon dioxide into the atmosphere by disturbance of terrestrial soils and vegetation. The major driver of this change, according to Ellis, is deforestation, especially when followed by agriculture, which causes the further release of soil carbon in response to disturbance by tillage. Changes in climate may occur in response to changes in vegetation cover and built structures.

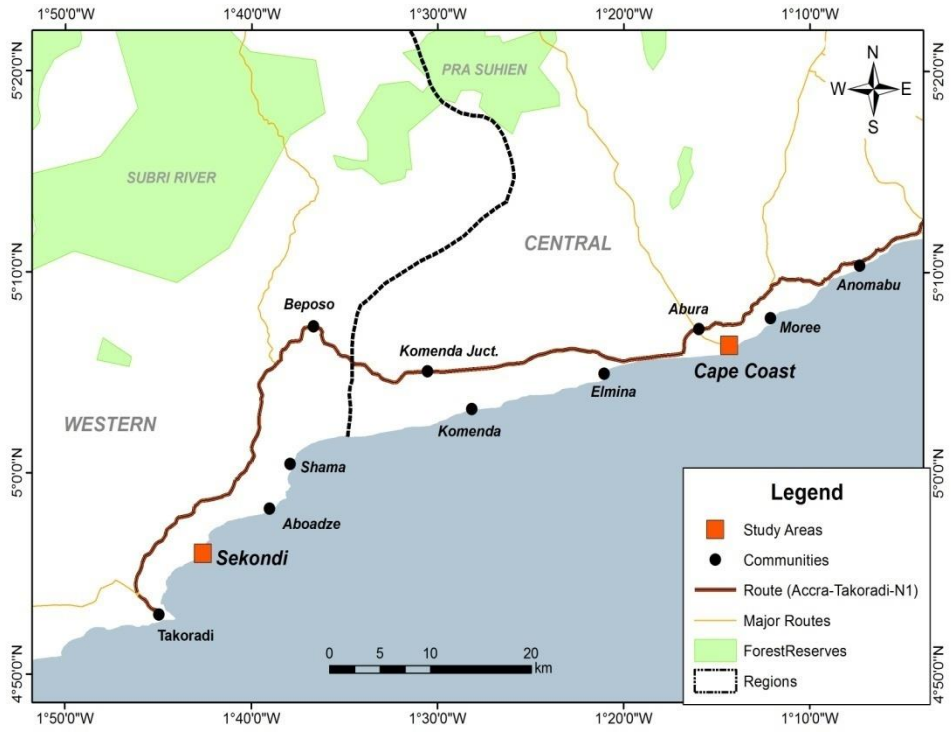
It can thus be argued that the impact of LULCC on climate stems from human activities that impact negatively on climate through the release of GHG into the atmosphere. These activities usually border on the amount of carbon dioxide and oxygen that are in the atmosphere. Thus activities such as farming, land clearing, human settlements and industrial activities among others reflect the amount of carbon dioxide and oxygen in the atmosphere. Through observation by this author in his visits to the study area, it was observed that the activities mentioned above differ from one location to the other since their extent is also different. Thus the cover of the land in the two urban coastal zones under study is undergoing some significant changes. This is due to the fact that economic activities are very vibrant and as a result the rate of growth of these coastal communities is on the increase. As population increases, hitherto unused land becomes utilized for settlements and other activities. Farms, vegetation, bare lands and water bodies may be altered. Land change studies, according to Loveland & Acevedo (2015), usually attempt to explain where change is occurring, what land cover types are changing, the rates or amounts of land change and the driving forces and proximate causes of such changes. Thus, the questions that this study posed were: what are the classes of land cover and what land use is effected in the study area? What is the extent of change, and what major reasons account for such changes in the land cover and land use in the study area?

The study was thus intended to assess the classes of land cover and types of land use in the coastal areas of Cape Coast and Sekondi between 2005 and 2013, to analyse the extent of change in land use and land cover of the study area within the stipulated time and to investigate the factors/reasons for changes in land use type and cover for the two areas during the period covered in this study.

Method

Land cover change analysis was done for Cape Coast and Sekondi (Figure 1). That is, the study assessed the changes in various land use/cover types between 2005 and 2013 in Cape Coast and Sekondi.

Figure 1: Map of study area derived from ArcGIS 10.1, (2014).



The choice of 2005 to 2013 was based on availability of aerial photographs. Moreover, the study was commenced in 2014, thus, 2013 automatically became the most current year. The methodology adopted for the study consisted of three major phases. The first phase was for acquisition and preprocessing of data. The second phase was for extracting and validating land use/cover information for the respective areas while the third phase assessed and examined the patterns of land use/cover changes in the two areas.

Aerial photographs were mainly requested for periodic updates from several national base maps. Thus, in using aerial photographs as a source for generating land use/cover information, especially in the coastal areas, it is important to note that the availability of these photographs, their accessibility to several time periods, and their high resolution and geometric fidelity make them relevant in such studies. Al-Tahir & Ali (2004) posit that the high resolution of aerial photographs increases the ability to identify features in the scene, which in turn improve the process of epoch-to-epoch image registration and minimizes the error of registration. Aerial photographs have also proved to be very effective and competitive in terms of low cost, wide coverage and archival

recording, among others (Al-Tahir & Ali 2004 cited in, Al-Tahir, Rajack and Oatham 2005). Aerial photographs and topographic maps were thus obtained from the Survey Department of Ghana. Each photograph has to be registered to a map (geo-referenced) to be brought into the same scale and frame of reference as other data sets. Then images were projected from the Accra Ghana Grid to the Ghana Meter Grid.

This was followed by the delineation of different categories of land cover and land use in the study area. This study resorted to human skills in photo interpretation to identify and delineate land use and cover classes. This was done manually through on-screen digitizing in ESRI ArcGIS 10.1. Since the digital photographs were at high resolution, the analyst could safely distinguish several categories of land-cover types with high a degree of certainty by well-established photo interpretation principles. After careful inspection of the two sets of photographs and the 1:50,000 topographic maps of both areas, a classification scheme was formulated to identify eight specific major land use/cover categories as shown in Table 1.

Table 1: Major land use categories adopted for the study

Category	Description
Vegetation	Areas covered with plants/grass/shrubs, etc.
Built-up area	An area densely covered by houses or other buildings.
Quarry	Areas used for mining of sand or gravel.
Bare Area	Area of land covered with gravel and bare soil.
Farm	Areas where crops are cultivated.
Water	Water bodies in the study area.
Beach	Coastal margins covered by sand, shingles, etc.
Wetland	Marginal lands surrounding lagoons.

Source: Field survey, (2014)

The digitized vector maps were converted to raster models and the areas of all land use/cover categories in both years were extracted. The change in land use/cover was calculated by subtracting the areas of land use in 2005 from those of 2013. The analysis and results are presented in the form of maps, tables, percentages and matrix tables, among others.

Discussion of results

Land cover change analysis was done for Cape Coast and Sekondi between 2005 and 2013.

Land use/cover change analyses for Cape Coast

Classes of land use/cover types identified in Cape Coast between 2005 and 2013 were bare area, built-up area, beach, farm, vegetation and water. Table 2 shows the sizes of land-use/cover for Cape Coast between 2005 and 2013.

Table 2: Land use/cover sizes for Cape Coast 2005 and 2013

Cover Type	Area (2005)	Area (2005) Percent	Area (2013)	Area 2013 Percent
Bare Area	1483480	2.31	2127600	3.31
Built-up area	20290800	31.61	25246200	39.33
Beach	416191	0.65	380843	0.59
Farm	1745320	2.72	460738	0.72
Shrubs & grass	38582600	60.10	33633900	52.39
Water	1380250	2.15	1660220	2.59
Wetland	299279	0.47	688459	1.07
Total	64197920	100.00	64197960	100.00

Source: Field Survey, (2014)

The total land cover/use for Cape Coast in 2005 was 64197920 m² while that of 2013 was 64197960 m². Thus, from Table 2, it is obvious that the total land use/cover for Cape Coast in 2013 was 41m² larger than that of 2005. This represents a percentage increase of 0.6% as shown in Table 3. The increase in land cover and use could be attributed to relative rise and fall in water levels, especially, sea level. This is in line with the findings of a study by Murali and Kumar (2015) in the Indian coastal zone of Cochin which revealed that sea level scenarios have profound effects on the land use and land cover classes as well as on coastal landforms in that area.

From Table 3, it was found that land cover/use for Cape Coast between 2005 and 2013 varied among the various land cover types identified. Land use/cover increased from 2005-2013 for bare area, built-up area and areas covered by water, including wetland. On the other hand, areas covered by beach, farms and vegetation decreased. What these mean is that, there was loss of beach, vegetation and farms to built-up area, water and bare area. Some farm lands and vegetation were cleared for dwelling houses and thus changed to built-up.

Table 3: Sizes and percentage change in land use/cover for Cape Coast from 2005 to 2013

Use/Cover Type	Area (2005)	Area (2013)	Change (2005_2013)	Percent Change (2005_2013)
Bare Area	1483480	2127600	644120	43.42
Built-up area	20290800	25246200	4955400	24.42
Beach	416191	380843	-35348	-8.49
Farm	1745320	460738	-1284582	-73.60
Shrubs & Grass	38582600	33633900	-4948700	-12.83
Water	1380250	1660220	279970	20.28
Wetland	299279	688459	389180	130.03
Total	64197920	64197960		

Source: Field Survey, (2014)

Parts of the beach either became bare after the retreat of the shoreline, or were utilized for other purposes including buildings. On the other hand, the decrease in the size of the area covered by beach could also be attributed to coastal inundation since there were increases in the area covered by water and wetland from 2.15% and 0.47% in 2005 to 2.59% and 1.07% in 2013 respectively, as in Table 2, with percentage changes of 20.28% and 130.03% for water and wetland between 2005 and 2013, as shown in Table 3.

Table 4 gives detailed results of the extent/size of change for the various land cover types/uses identified and selected for the study in a matrix form for easy identification and description. Table 4 indicates that bare areas mainly changed to built-up area, farms and vegetation. That is, parts of the bare areas were used for buildings, or crop cultivation and sometimes, vegetation naturally grew in hitherto bare areas. Beaches mainly changed to built-up area and water. Shoreline advancement leads to loss of beaches. On the other hand, when shorelines retreated, more land was exposed but in this circumstance, the exposed beach was not left to fallow but was used for dwelling structures. Farms also mainly changed to bare area, built-up area and vegetation. When crops are harvested and the farms are abandoned, the natural vegetation will grow under the natural climatic condition, hence what was farm in 2005 has changed to vegetation (shrubs and grass) occupying an area of 1384200m², as indicated in Table 4.

Farms changed to bare area when they were abandoned and the vegetation was burnt or the surface soil was removed through construction. Farms also changed to built-up area when houses were built on the land. In the field survey, it was observed that when the land was secured, it was sometimes utilized for crop cultivation until the owner was ready to put up a building thus changes from farm to built-up area.

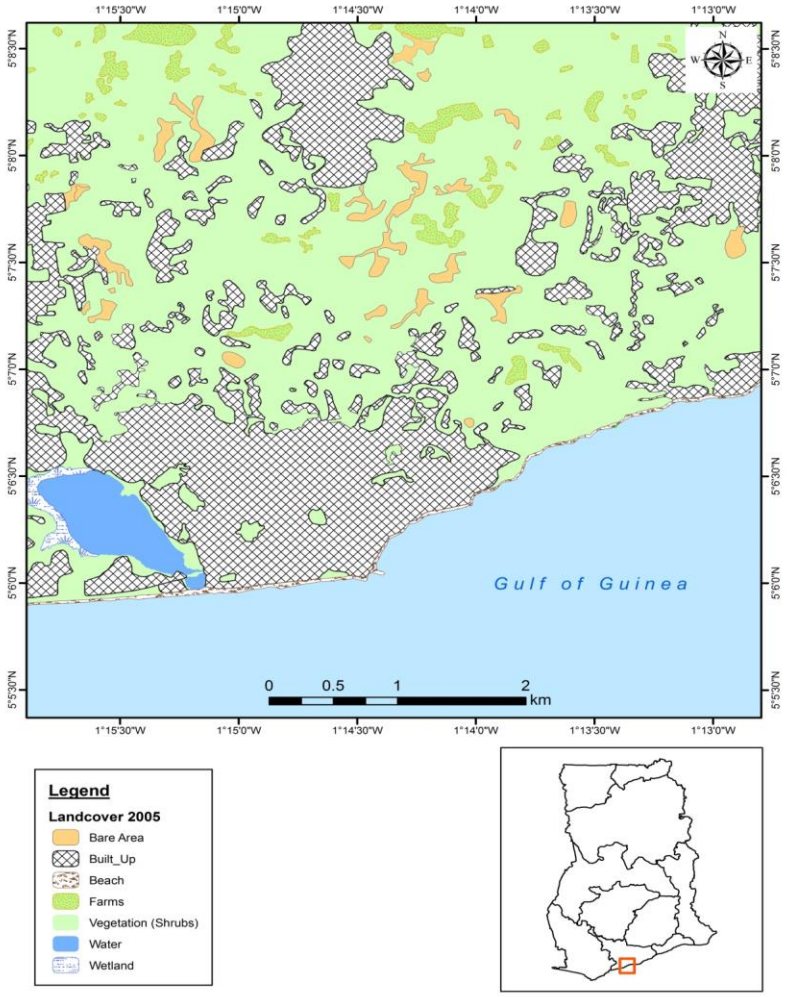
Table 4: Land use/cover change in Cape Coast from 2005 to 2013 matrix

		Land use/cover 2013							
		Bare Area	Built-up	Beach	Farm	Shrubs & Grass	Water	Wetland	Total
Land use/ cover 2005	Bare Area	704344	163163	-	14973.2	601000	-	-	1483480.2
	Built-up	-	20290800	-	-	-	-	-	20290800
	Beach	-	87.6	378180	-	-	7068.8	-	385336.4
	Farm	72112	57001.6	-	231999	1384200	-	-	1745312.6
	Shrubs & Grass	1348930	4746850	609.6	213766	31588700	237850	445855	38582560.6
	Water	-	1283.2	807.6	-	4591.6	1366260	7308.8	1380251.2
	Wetland	-	-	-	-	13896.8	56078.4	229304	299279.2
	Total	2125386	25259185.4	379597.2	460738.2	33592388.4	1667257.2	682467.8	64167020.2

Source: Field survey, (2014)

Vegetation cover (shrubs and grass) experienced more varied changes than any other land cover type for Cape Coast. Some of the areas covered by vegetation became bare through bush burning and construction activities. Parts of the vegetation were also cleared for housing projects, hence changing to built-up area with an area of 4746850m² as in Table 4. Parts of the vegetation very close to the sea and other water bodies such as the Fosu Lagoon were covered by water including wetland. This was due to the advancement of these water bodies due to erosion and inundation. Some vegetation also changed to beach as indicated in Table 4. Water bodies, such as parts of the sea, lagoons and wetlands were converted or changed to built-up area, beach and vegetation, among others. In all, most parts of the land were used for or changed to built-up area. Figures 2 and 3 also further show details of the varied land use/cover types and sizes for Cape Coast in 2005 and 2013 respectively.

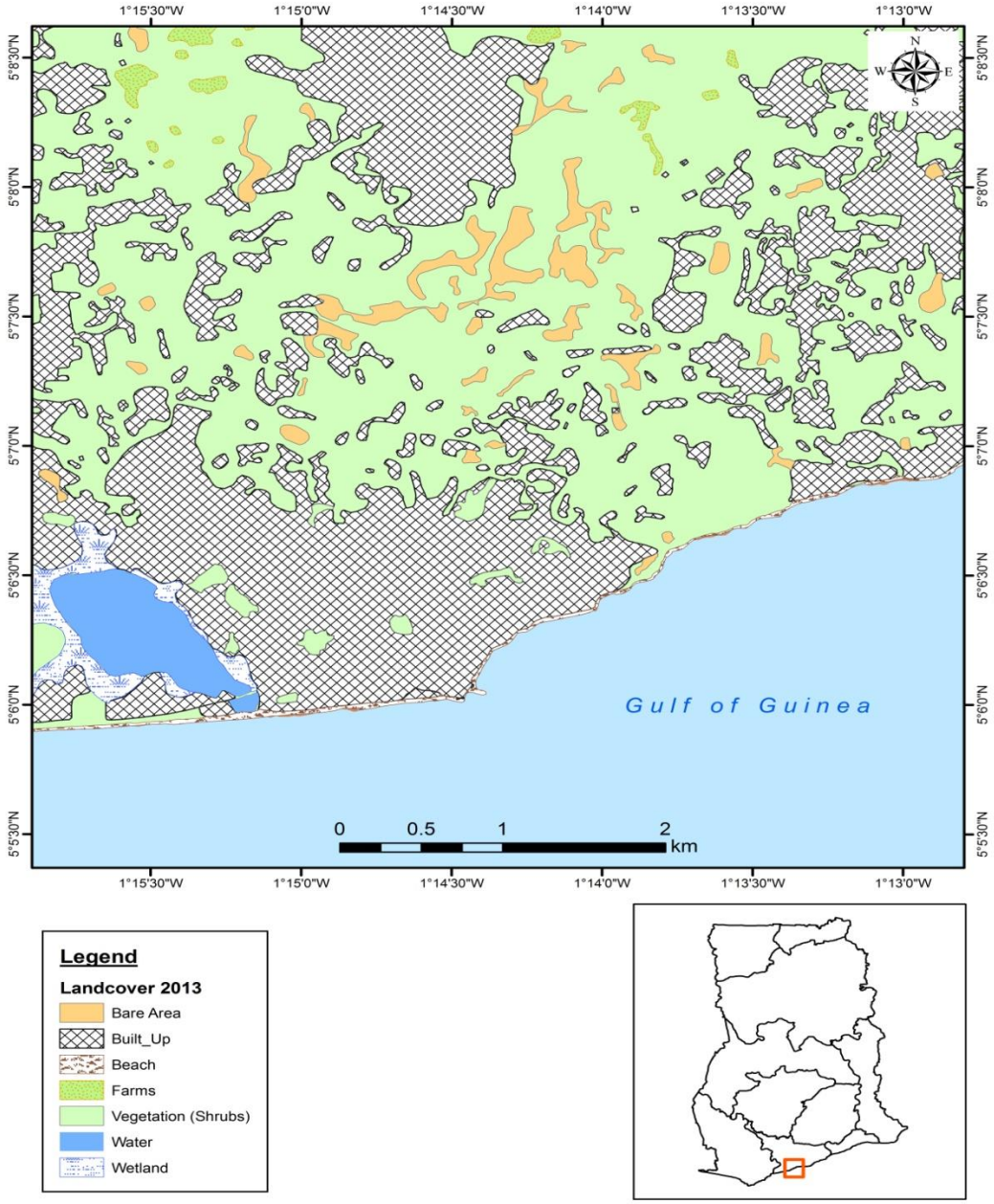
Figure 2: Land use/cover for Cape Coast in 2005 (Survey Department, Ghana, 2014)



From Figure 2, it could be seen that built-up areas occupied most of the land area. Bare areas and farms are scattered all over the area. Vegetation, that is, shrubs and grass occupied a significant proportion of

the land, with the least being water. Compared to that of 2013, that is Figure 3, it is clear that parts of hitherto bare land and vegetation were converted to built-up hence; a significant increase in the areas covered by built-up from 2005 to 2013.

Figure 3: Land use/cover for Cape Coast in 2013 (Survey Department, Ghana, 2014)



From both Figures 2 and 3, it was realized that areas close to the sea, especially the western side, were heavily built up. Also, the north western and north eastern portions of the coastal zone were heavily built up while the central portions were covered by bare area with patches of farms and vegetation. The reasons

were that the land in these areas had been acquired for long term infrastructural projects such as housing but in the interim, they were being used for farms while the unused ones were colonized by vegetation.

Land use/cover change analysis for Sekondi

The land use/cover for Sekondi is discussed in the ensuing paragraphs. Table 5 shows the land cover/use types identified in Sekondi.

Table 5: Land use/cover sizes for Sekondi, between 2005 and 2013

Cover Type	Area (2005)	Area (2005) Percent	Area (2013)	Area 2013 Percent
Bare Area	797213.53	4.46	385728.83	2.16
Built-up area	6397119.33	35.77	8042386.71	44.97
Quarry	171525.4	0.96	171525.41	0.96
Farm	190398.2	1.06	462837.01	2.59
Shrubs & Grass	10272928.67	57.44	8754877.93	48.95
Water	54608.46	0.31	66437.7	0.37
Total	17883793.59	100.00	17883793.59	100.00

Source: Field survey, (2014)

As shown in Table 5, classes and sizes of land use/cover types identified in Sekondi between 2005 and 2013 were bare area, built-up area, quarry, farm, vegetation and water. The largest land cover/use types for Sekondi in 2005 and 2013 were vegetation and built-up area with the least being water and quarry. Table 6 shows the changes in area and the percentages of the various types of land cover/use for Sekondi between 2005 and 2013.

Table 6: Percentage change of land use/cover for Sekondi between 2005 and 2013

Use/cover	Area (2005)	Area (2013)	Change area	Change %
Bare area	792713.53	385728.83	-411484.7	-51.62
Built-up	6397119.33	8042386.71	1645267.38	206.38
Quarry	171525.4	171525.41	0.01	0.00
Farm	190398.2	462837.01	272438.81	34.17
Shrubs & grass	10272928.67	8754877.93	-1518050.74	-190.42
Water	54608.46	66437.7	11829.24	1.48
Total	17883793.59	17883793.59	-	-

Source: Field survey, 2014

From Table 6, it can be seen that most of the bare areas and areas covered by vegetation were lost to other land cover/use types. In other words, built-up areas and farms increased in sizes while bare areas and

vegetation were converted to other uses. In all, there was no gain nor loss in the total land area available due to the fact that the beach was not significantly affected between these two periods. From Table 6, the percentage change between 2005 and 2013 for built-up areas indicates that by bare areas and vegetation were mainly used for the construction of human structures. This shows that there were massive construction activities in the area between these two periods, probably due to the rapidly sprawling nature of such an urban community. Table 7 gives detailed results of the extent/size of change for the various land cover types/uses selected for the study in Sekondi.

The general picture was that bare areas were converted to built-up area, farms and vegetation. This means that parts of the bare areas were used for buildings or residential areas, for crop cultivation and sometimes taken over by vegetation. For example, the change from bare area to built-up areas between 2005 and 2013 was 380837m² but only a small area was converted to farms about 603m², as shown in Table 7. It could also be deduced from Table 7 that farms only changed to vegetation.

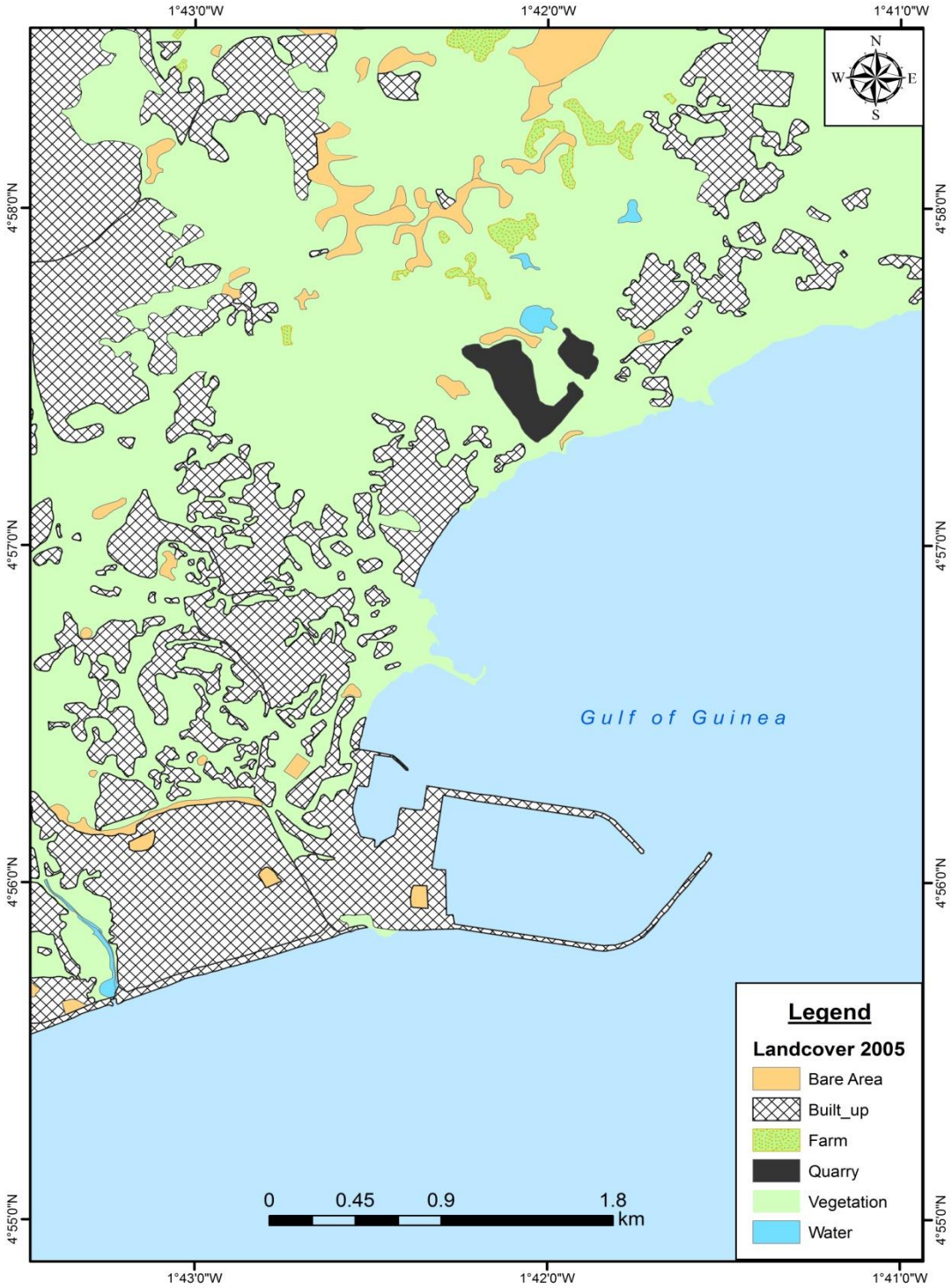
Vegetation cover in Sekondi, like that of Cape Coast, also experienced more varied changes than any other land cover type found in the study area. Some of the areas covered by vegetation became bare, probably, through bush burning and construction activities. Parts of the vegetation were also cleared for housing projects, and hence changed from vegetation to built-up area with the size of 1266149.59m², as seen from Table 7. Parts of the vegetation very close to the sea and other water bodies were covered by water. Part of the vegetation was also used for farming activities. Some areas covered by water also become bare areas mainly due to the retreat of the sea and drying of some water bodies such as the Essei Lagoon or the Sekondi Lagoon. A stone quarry site was found mainly in the north eastern part of Ngyiresia but did not experience much change, though part of it had become bare. In all, it can be deduced that most parts of the land cover types were converted to built-up area or residential areas. Figures 4 and 5 also show details of the varied land use/cover types and sizes for Sekondi in 2005 and 2013 respectively.

Table 7: Land use/cover change in Sekondi from 2005 to 2013 matrix

		Land use/cover 2013						
	use/cover	Bare Area	Built-up	Farm	Shrubs & Grass	Water	Quarry	Total
	Bare Area	236333	380837	-	603	179574	-	797347
	Built-up	-	6397112	-	-	-	-	6397112
Land use/cover 2005	Farm	-	-	73460	116936	-	-	190396
	Shrubs & Grass	149385	1266149.59	388754	-	17175	-	1821463.59
	Water	5354	-	-	-	49264	-	54618
	Quarry	-	-	-	-	-	171515	171515
	Total	391072	8044098.59	462214	117539	246013	171515	9432451.59

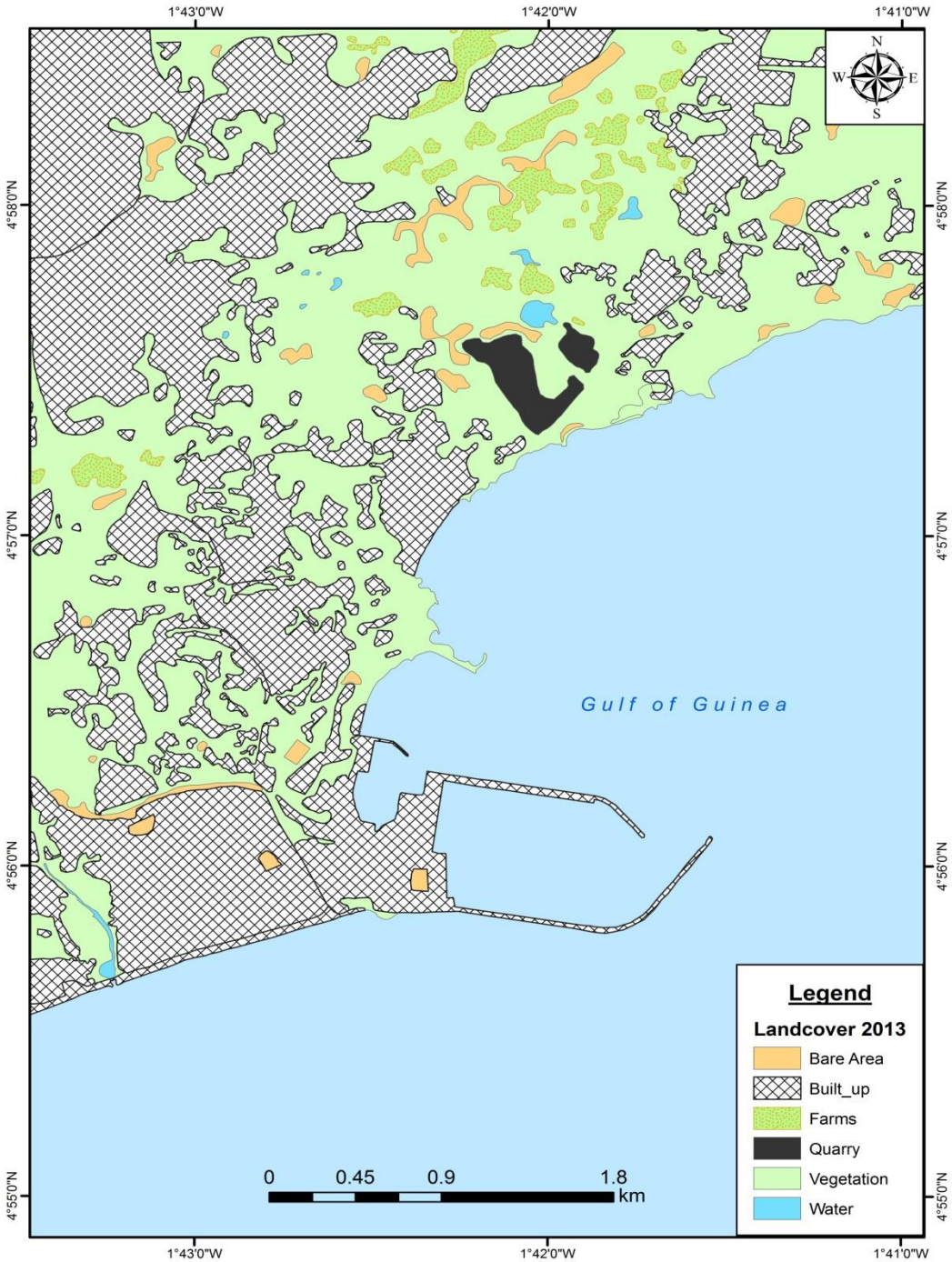
Field survey, (2014)

Figure 4: Land-cover for Sekondi in 2005 (Survey Department, Ghana, 2014)



From Figure 4, it is found that built-up and vegetation had the largest land use/cover for the area, with scattered farms and bare areas.

Figure 5: Land cover for Sekondi in 2013 (Survey Department, Ghana, 2014)



From Figure 5, it could be deduced that built-up areas continued to make more gains as compared to those of 2005. Bare areas, vegetation and farms were lost to buildings hitherto uninhabited lands were utilized for human structures. As a result, heavily built-up areas were found in and around the western and north western part of the coastal zone right from the Sekondi Fishing Harbour. There were also patches of farms, bare areas and vegetation, especially in the north eastern part of the coastal zone.

A comparison between Cape Coast and Sekondi revealed that major land cover for both areas was vegetation but major parts of it were converted to built-up due to high demand on urban land for human settlements. At Sekondi, quarry was identified as one of the major types of land cover and use, but was not very significant in Cape Coast. This is because there is a vast deposit of granites on the north eastern part of Ngyiresia which was exploited on a commercial basis. Table 8 gives further details of percentage change in land use and cover between 2005 and 2013 for Cape Coast and Sekondi.

Table 8: Percentage change in land use/cover for Cape Coast and Sekondi from 2005 to 2013

Use/Cover Type	Percentage Change for Cape Coast (2005 – 2013)	Percentage Change for Sekondi (2005_2013)
Bare Area	43.42	-51.62
Built-up area	24.42	206.38
Beach	-8.49	-
Farm	-73.60	34.17
Shrubs & Grass	-12.83	-190.42
Water	20.28	1.48
Wetland	130.03	-

Source: Extracts from Tables 3 and 6

From Table 8, it was revealed that major land use changes in Cape Coast between 2005 and 2013 occurred from beaches, farms and vegetation, while those of Sekondi were limited to bare areas and vegetation. In other words, these land use types experienced deficits and were converted mainly to built-up area. In Cape Coast, major areas that experienced changes through human activities were the fringes of the Fosu Lagoon and patches of vegetated found in 'undeveloped lands' in residential areas. In Sekondi, major areas that experienced land changes were the fringes of Essei Lagoon, the northern part of Ngyiresia and patches of farms and vegetation found in residential areas. Thus, the major cause of land cover change was increasing clearance of land for housing and other projects. This is in line with studies conducted by Loughland, et al.; (2012) in the Gulf state where they identified rapid and hastening coastal development through human activities as the major cause of land change along the gulf coast. Similarly, a research by Frimpong

(2011) in the catchment area of the Owabi River revealed that in 1986, high dense forest covered most parts of the land, but this gave way to built-up from 2002 to 2007 and beyond.

Conclusion and recommendations

Thus, from the analysis, it can be concluded that the major land use type that occurred in the study area between 2005 and 2013 was built-up. This confirms that most changes that were effected on the cover of the land were mainly from human or anthropogenic activities as revealed in the studies by (Yang, (2001); Frimpong, (2007) and Ellis, 2013). This notwithstanding, the impact of climate change cannot be underestimated. Thus in the light of climate change and anthropogenic tendencies, it can be concluded that these coastal regions may continue to remain vulnerable to rapid urbanization, developmental pressures and natural or geomorphic processes.

It therefore presupposes that frequent changes in the land cover and use of an area are an indication of a multiplicity of activities that occur on the landscape. These two communities are rapidly growing urban areas. Most of the land was used for human habitation; hence, large areas were converted to built-up area.

It is therefore recommended that there is a need for their respective metropolitan land and town development planning agencies to monitor, regulate and plan the pattern of development in both communities. There should also be public education by the respective metropolitan assemblies on proper land use in such communities. The above suggestions will go a long way to help the city authorities to keep abreast with the changes that will occur in the cover and use of land. These recommendations will also enable the city authorities to factor the rate, the type and frequency of land use/cover into the planning of such communities.

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