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Historical Paradigms of Architects Le Corbusier and Anthony Almeida on Modern Architecture and City Planning with an Overview of Dar es Salaam – Tanzania

Livin Henry Mosha[1]
[1]Architect and Associate Professor of Architecture, Department of Architecture, School of Architecture, Construction Economics and Management (SACEM), Ardhi University, P.O. Box 35176, Dar es Salaam, Tanzania

***Abstract*—** *This paper presents wide range of knowledge from Architects Le Corbusier and Anthony Almeida on modern architecture and city planning from historical paradigms to modern history of our time. It traces disconnections and dis-functions of cities and highlight various concepts of city architecture and planning. Literature review was a major research method deployed in this study plus field case studies. It analyses the extent at which transport systems have destroyed cities and how they have been used as planning tool to modern cities such Paris. The research further analyze Le Corbusier's five building design principles, namely open building plans; buildings elevated from the ground by the use of concrete columns (pilotis) to allow integration of nature with building structure; free façades; horizontal windows with the use of shading devices (brise-soleil) and roof terrace (gardens). Found out that these five design principles were used by Architect Almeida to design most of building projects commissioned to him in Dar es Salaam – Tanzania. Further observed, that building users do not necessarily appreciate functional spaces designed by Architect. The paper concludes that functional modern cities must be a product from both architecture and spatial planning knowledge.*

***Keywords*—** *Anthony Almeida, City planning, Le Corbusier, Modern architecture.*

I. INTRODUCTION

1.1 Architect Le Corbusier in Architecture and City Planning

Architect Le Corbusier

Charles-Edouard Jeanneret commonly known as Le Corbusier (pictured above) was born in 1887 in Switzerland, lived in France, and died in 1965 in France. He worked very close with his cousin Pierre Jeanneret to design and supervise various buildings. His first design project was a simple residential house for his parents in 1912 followed by number of projects including several residential houses and villas before World-War II (WWII) in France and Switzerland (1912 – 1929); army buildings, hotels, government public buildings in Europe, Brazil and Russia (1930 – 1944). After WWII he designed and supervised United Nations Organization (UNO) buildings (1946); Unite de'habitation in Marseille and Ronchamp Chapel in Belfort France (1946 – 1957); Chandigarh capitol in India (1951 – 1965); Museum at Sarabhi (1954); the Philips pavilion for international exhibitions in Brussels (1958); the centre for visual arts at Havard University in the United State of America (1961) and Weber Pavilion in Zurich (1965). Le Corbusier was not only an Architect but also furniture designer (he was once quoted saying, "*chairs are architecture"*), a painter, a sculptor, a founding member of the International Congress on Modern Architecture (CIAM) which was launched in 1928, and a book writer. The list of his books include: The Radiant City (1933), When the Cathedrals were White (1937), The House of Men (1942), The Athens Charter (1933) and The Modulor (1950). He designed several buildings in Europe, Japan, India, South America and North America. Le Corbusier's design philosophy mainly based on mathematical derivatives from Leonard daVinci such as golden section and the Fibonacci series which he used to develop his architectural and city planning proportions [1].

1.2 Le Corbusier's Contributions on City Architecture

Unlike other famous architects of modern movement in architecture concentrating only on architecture of buildings, Le Corbusier was anxious to develop legacy in both urban planning and architecture. He observed that cities are haphazardly planned, designed, inhabited without a coherent model of urbanity to be followed. Le Corbusier was ahead of time since 1922. Le Corbusier's design features of modern architecture at the city level are largely demonstrated by his three urban planning schemes, namely Contemporary City, Radiant City and Voisin City plans [1]. In 1929, he noted city problems and forecasted more planning problems for future cities. His book titled *The City of Tomorrow and its Planning"* which was first published in 1929, with its second edition in 1947 and third edition in 1971 indicate that his urban planning ideas and concepts were initially not accepted or even understood by French Government officials because the capacity to scrutinize, digest and understand architecture and urban planning plans was too low. After the World War II, Le Corbusier said the following: "*the solution I put forward is a*

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rough one and completely uncompromising" [2]. Nevertheless, those who reacted against him, they acknowledged his creative thinking towards addressing issues of chaotic contemporary cities of his time. Others like Jane Jacob named him as a Utopian of urban planning theories. His talent of sketching ideas instead of writing was admired by other architects and city planners [3]; [4]. For instance in 1928 he sketched a female figure portraying the essence of female beauty and translated it into erotic plan of Obus building in Algiers showing the beauty of Kabylie hills and the natural character between a man, architecture and the landform. Le Corbusier went further and proposed principles to be followed in planning a Contemporary City *(Ville Contemporaine)* as shown on (Figure 1). He used these principles to plan the contemporary city of three million inhabitants on ideal site, the garden city of Paris. These principles included de-congestion of the urban center, densification, efficient traffic, increase of recreational parks and open spaces. The proposal included series of sixty story skyscrapers whereby rooftops could allow commercial airplanes to fly between skyscrapers. Cities must be built in the open and the layouts must be purely of a geometrical order [2].

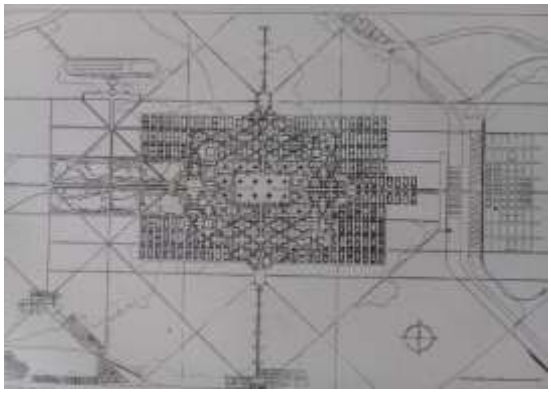

Fig. 1. Contemporary City (*Ville Contempraine*) Planning Concept
Source: [2]

However, the contemporary city principles were rejected by state authorities. Le Corbusier showed professional maturity in the way he accepted critics, new ideas and suggestions from one concept to another. For instance, he condemned his own idea of concentricity of the Contemporary City as static and proposed for Radiant City (*Ville Radieuse*) as shown in Figure 2 of linear organization which would permit organic growth and the biological development of the city. According to [3], Le Corbusier conceived Radiant City planning as a machine with the following urban planning to consist of the following: satellite cities dedicated to education; business zone; transport zone of roads, railways and airports; hotels and embassy zone; residential zones; green zones; light industrial zone; ware houses zone and heavy industry zone. The Radiant City benefited on the open plan concept from the contemporary city principles of which all city structure were to be elevated from the ground to allow a continuous recreational parks, pedestrian circulation, garages and access roads to be beneath.

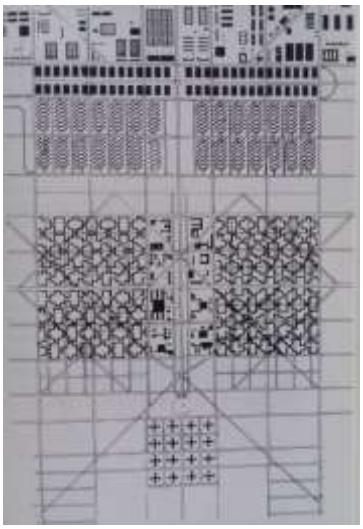

Fig. 2. Radiant City (*Ville Radieuse*) Planning Concept
Source: [3]

The modern city's "*Voisin"* plan resulted from the frustration and destruction brought by the automobile, *the motor-car*. Le Corbusier consulted heads of car companies of Peugeot, Citroen and Voisin and informed them that their motor cars Peugeot, Citroen and Voisin and others have destroyed the city but optimistically, their motor cars must salvage the city. Sounded ridiculous to these three company heads but Le Corbusier persuaded them by asking *"will you please be willing to rescue the city of Paris with the aid of your motor cars?* The two heads of Peugeot and Citroen did not understand what Le Corbusier was talking about and immediately refused to work with him. The head of Voisin Company Mr. Mongermon without any hesitation he accepted Le Corbusier's idea and agreed to finance his research and the proposed urban scheme which was later named *Voisin* Scheme of Paris City. The Voisin urban planning principles include: the transport system to be the major city planning tool; central transport station to be located between the business and residential zones; combine commercial and residential elements by transport networks; integrate neighbourhoods of ancient and modern city to function as one; gridiron urban plan layout; vertical city built of skyscrapers elevated from the ground, cities raised to sky, open to light and air, clear, radiant and sparkling, 80% of land remain untouched nature; increased densification; expansive geometrical layout from the city centre to suburbs; town planning becomes part of architecture and architecture part of town planning. Le Corbusier further challenged his work of the Voisin scheme in Paris for not compromising well with the old Paris and introduced radical variations on how to organize the city to make it more functional. He further advocated the essence of open city which provides "essential joy" of sunlight, green and functional circulation of man and locomotion. He insisted that the city made of speed and functional transport is a city made for success [2]. This was Le Corbusier's dream and the concept of the Voisin urban scheme as shown in figures 3 and 4.

The fourth International Conference on Modern Architecture (CIAM IV) held in 1933 was dominated by Le

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Corbusier and was the most successful out of the ten CIAM congresses. He consciously shifted concentration from housing estate and neighbouhood to town planning which resulted to the articles of the Athens Charter with the theme "functional city" which was very romantic on living, working, relaxing creation and travelling with leisure [6].

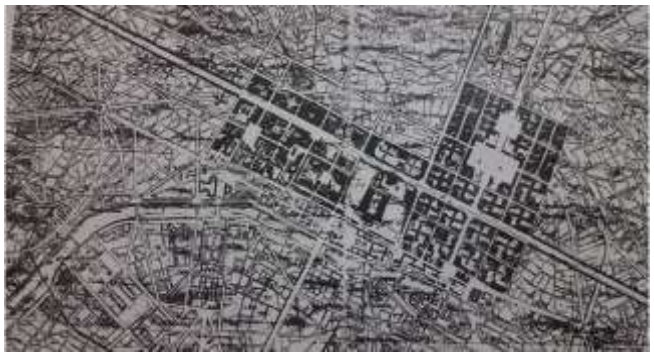

Fig. 3. The Voisin Scheme in Paris
Source: [2]

Fig. 4. The View of Voisin Scheme in Paris
Source:

Despite of all the romantic and functional categories of Athen's charter, it was challenged by a Team Ten (TX) group of young modern architects lead by Architect Allison. Le Corbusier accepted their harsh critiques but he said if a professional person disagrees, then that person must provide better urban planning concepts for our cities apparently in chaos! Unfortunately TX group could not come up with sound alternative to be followed but unaware used Le Corbusier original ideas of open and functional cities without acknowledging him. For instance in 1954 Architect Smithson declared that "*habitat should be integrated into landscape rather than to be an isolated object*" Furthermore, In 1956, one of TX group named Architect Bakema moved away from the rigid principles of housing blocks to uniform height and orientation to a more modulated housing layout, grouped into neighborhood clusters surrounding public facilities such as hospitals, schools, religious buildings, swimming pools, and recreational parks. Also, in 1963 Architect Bakema used Le Corbusier's famous concept of the mega structure of the Obus block (figure 5) as a means of giving order and dispersed form of his Tel Aviv city proposal [1].

1.3 Le Corbusier's Architectural Design Principles in Building Design

Le Corbusier's famaous projects at a building level include Unite d'habitation built in Marseille in France (figure 6), the Obus in Algiers, and Villa Savoye in Paris. This paper details further Villa Savoiye project because he used all of his five major design principles in this project. Firstly, *Open plans* also known as the *dom-ino frame system* (figures 7 and 8) building structures through separation of load bearing columns from sub-dividing walls. This system manifested industrialization and technology in architectural processes. Floors are made out of prefabricated system independent of walls. The system allows user's flexibility to achieve different spaces, furniture, building materials, textures, fittings and colours without disturbing basic structural systems [5].

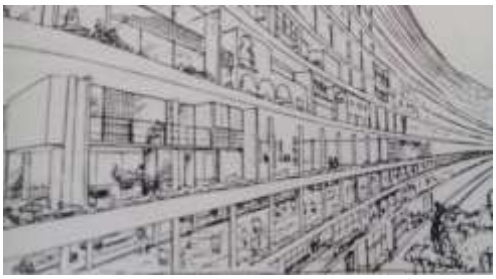

Fig. 5. Obus
Source: [3]

Fig. 6. Unite d'habitation built in Marseille in France
Source: [14]

Fig. 7. Open First Floor of Villa Savoye in Paris
Source: [15]

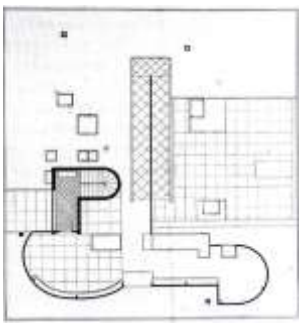

Fig. 8. Roof Terrace Open Plan of Villa Savoye
Source: [15]

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Secondly, *free design of the facades* (figure 9) from the open plan design to achieve different aesthetics for different functions for one building structure. Thirdly, structural *columns (pilotis)* as shown in (figures 6, 9 and 10) to elevate the entire building off the ground to allow the space below to remain in its natural state or at least be used for circulation, leisure and parking cars. Nature becomes part of the design concept. See also Unite d'habitation in figure 6.

Fourthly, *horizontal windows with shading devises* sometimes referred as *brise-soleil* (figure 10) to activate façades. This is facilitated with concrete sun baffle balconies and canopies projecting from the main body of the building structure. See also Anthony Almeida's primary school project in Tanzania in figures 11 and 12.

Fig. 9. Free Facade Design of Villa Savoye
Source: [15]

Fig. 10. The View of Villa Savoye in Paris
Source: [15]

Fifthly, *roof gardens* (8 and 10) to buildings to accommodate communal social and economical facilities such as resting shades and shopping arcades. The roof deck was used also used as running track, paddling pool, a kindergarten and as a gymnasium [7]. Villa Survoye which is built at Poissy on the outskirt of Paris in France has benefited all five building design principles from Le Corbusier. This villa was built between 1928 and 1931 using reinforced concrete. It was however abandoned but was later restored by the French Government from 1963 to 1967 and was listed as a historic monument in 1964 when Le Corbusier was still alive which is seldom to happen for the originator of the monument to witness his object been declared a world historic monument [3].

II. Methodology

The aim of this research was basically to expose and discuss design concepts and ideas of the ancient Architect Le Corbusier on city planning and architecture of the city from Europe before and after World War II (WWII). The research further studied the influence of Le Corbusier's concepts in other cities especially in developing countries. The work of Architect Anthony Almeida was taken as a stepping stone with a case study of his building structures standing in Dar es Salaam – Tanzania. Literature review was a major employed research tool because of the historical nature of the study. Empirical field data and information were collected from Architect Anthony Almeida oral sources, archival records, interviews and photographic registration at his residence and field photographs. Attendance to AQRB (Architects and Quantity Surveyor's Registration Board) Continuous Professional Development seminar in Dodoma further enriched the study. Le Corbusier's five design principles were analyzed and tabulated from Almeida's designs and built structures to understand how design concepts can cross-over from one continent to another to be able to analyze the phenomenon of international style in architecture of the city and city planning across the world.

III. Findings and Discussions on Le Corbusier Architectural and City Planning Influence in Dar es Salaam Tanzania

This research considers Architect Anthony Bosco Almeida, as a Tanzanian Le Corbusian Architect because we can find Le Corbusier's building design principles of the modern architecture applied in all building projects designed and supervised by Architect Almeida.

Chartered Architect Anthony Bosco Almeida
Source: Field Survey 2018. Photo taken on 17th April 2018

3.1 Architect Anthony Bosco Almeida in Architecture in Tanzania

Antony Bosco Almeida was born in 1921 in Tanzania (then Tanganyika). He studied architecture at Sir J. J. School of architecture in Bombay in India and he qualified for the membership of the Royal Institute of British Architects (RIBA) in 1948 (Seifert at. el. 2012). He is the first Chartered Architect in the Republic of Tanzania. His father was a talented craftsman with a reputable recognition in building construction sector. After graduation in 1947, Architect Almeida practiced architecture in Bombay with Parti & Dadakar – Architects where he designed the biggest "*pandal*" in Bombay for over 50,000 people. *Pandal* is either a temporary or permanent massive fabricated structure, decorated with many lights and paints mainly used for religious events that gathers several people. To design and construct *pandal* structure requires creativity, inventiveness, artistic expertise and light-system knowledge of the highest level [16]. He returned to Tanzania in 1948. He was initially engaged by an Engineering firm in Dar es Salaam where he

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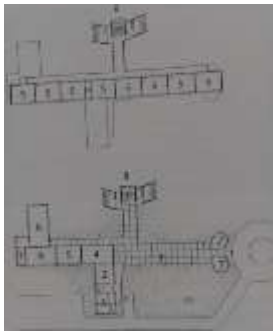
designed several multi-storey residential and commercial buildings.

Fig. 11. St.. Xavier Primary School – Elevation 1
Source: 2018 Field Survey

Fig. 12. St.. Xavier Primary School – Elevation 2
Source: 2018 Field Survey

He managed to establish his own architectural firm before Tanzania's independence in 1961. One out of his outstanding projects before independence was to design Goan's St. Xaviers Primary School (figure 11, 12 and 13) for 500 pupils which was built at Chang'ombe in Dar es Salaam in 1955 [8].



Legend:
1 = Corridor
2 = Office
3 = Office
5 = Class rooms
6 = Staff Room
7 = Store
8 = Wash rooms

Fig. 13. St. Xavier Primary School Floor Ground and First Floor Plans
Source: [9]

Fig. 14. Tanzania national Library
Source: 2018 Field Survey

According to [9] Architect Almeida's building design proposals considered climatic conditions for the tropics with hot and humid climate to achieve proper orientation, adequate protection from direct sun and maximum cross ventilation. However, his modern architecture proposals of St. Xaviers School received several resistances from local authorities (then the Germans) and Central Government (Director of Education and his deputies) by questioning whether the floor plan (figure 13) was an airplane, a building or what?

The local authorities further asked: Why should we spend public money to elevate building from the ground and leave ground un-utilized? Buildings that looks so different from the rest in the country? Architect Almeida narrated this story by saying: *"The St. Xaviers School became the first advertisement for my architectural ability and could be said to have opened the gates for many prestigious and important projects that followed and, amongst the first such projects was that of the Dar es Salaam Technical College offered by non-other than the Education Department of the Government which had earlier disagreed with my proposal for the St. Xaviers School!"* This scenario is similar to the challenges that Architect Le Corbusier faced with the French Government authorities in France when he presented his urban planning proposals on the "*Contemporary City*" of three million people, the *Radiant City* and the *Voisin Urban Scheme.*

Fig. 15. Goan Club
Source: 2018 Field Survey

Fig. 16. St Xavier Catholic Church Chang'ombe
Source: 2018 Field Survey

Architect Almeida managed to design and supervised several completed building projects most of them in Dar es Salaam. He became more popular after Tanzanian independence and was commissioned number of projects including the Goan Club (figure 15) in Dar e s Salaam (1960), St. Joseph's Primary School in Dar es Salaam (1961), St Francis Xavier Church (figure 16) in Chang'ombe Dar es Salaam (1962), East African community Headquarters (figure 17) in Dar es Salaam (1965), Tanzania habours headquarters (figure18) in Dar es Salaam (1965), Tabora Boys Secondary School in Tabora (1965); Tanzania Central Library (figure 14) in Dar es Salaam (1968), National Insurance of Tanzania

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Headquarters Building (figure19) in Dar es Salaam (1970), Joint Christian Chapel (figure 20) of the University of Dar es Salaam (1975), his own residential house (figure 21).

Fig. 17. East African Community Head Quarters
Source: 2018 Field Survey

Fig. 18. Tanzania Harbours Authority Head Quarters
Source: 2018 Field Survey

Architect Almeida intelligently and successfully applied the five design principles from Le Corbusier as shown in his projects. See also table I.

TABLE I. Integration of Le Corbusier Design Principles in Anthony Almeida's Building Projects in Dar es Salaam - Tanzania

Le Corbusier Design Principle	1	2	3	4	5	6	7	8	9
1. *Open Plan*	Not analysed							√	√
2. *Structural columns (pilotis)*	√	√	×	√	√	×	√	√	√
- *Building partially elevated off the ground*	√	√	×	√	√	×	√	×	√
3. *Horizontal windows*	√	×	×	√	×	√	√	×	×
4. *Free design of the facades*	×	×	×	×	×	×	×	×	×
- *Use of shading devises (brise-soleil)*	√	√	√	√	√	√	√	√	√
5. *Roof Terrace gardens*	√	√	×	√	√	√	√	×	√

Legend:
1 = St. Exavier Primary School Building
2 = Goan Club Building
3 = St. Exavier Catholic Church
4 = East African Community Headquarters Building
5 = Tanzania Habours Headquarters Building
6 = Tanzania Central Library Building
7 = National Insurance of Tanzania Headquarters Building
8 = Joint Christian Chapel of the University of Dar es Salaam
9 = Architect Almeida's Residential Building
√ = The principle is applied
× = The principle is not applied

Fig. 19. National Insurance of Tanzania Head Quarters
Source: 2018 Field Survey

Fig. 20. Joint Christian Chapel of the University of Dar es Salaam
Source: Rimisho et al. (2018)

Fig. 21A. House Plan

Fig. 21B. House View

Fig. 21C. Elevated Bedrooms
Leaving Ground Floor for Car Parking and Laundry
Fig. 21. Anthony Almeida's Residential House
Source: 2018 Field Survey

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3.2 Architects Le Corbusier and Almeida Building Design Principles Observed in Dar es Salaam Tanzania

This research has observed application of "the" five Le Corbusier's design principles in several buildings in Dar es Salaam. For instance, buildings of the College of Engineering and Technology (figure 22) and blocks of residences (figure 23) of University of Dar es Salaam consists of: elevated floors from the ground by the use of concrete columns (*pilotis*), horizontal windows and shading devices *(brise-soleil)*. Roof terraces or *gardens* are also observed on top of the block of apartments at the University of Dar es Salaam as well as on private apartments at the out skirts of Dar es Salaam city (figure 25). These buildings were designed by Architects other than Le Corbusier and Anthony Almeida to integrate nature with buildings to allow leisure, restaurants, business, studies and car parking to take place underneath. Further noticed that space users do not necessarily appreciate the concept of leaving the entire ground floor space as intended by architects but intuitively create enclosure (figure 24) and change designed functional spaces to stalls, groceries and hair dressing salons. Impliedly therefore, not every architectural design concept would be functionally accepted by the entire universal users. This scenario is also observed at St. Xaviers Primary School in Dar es Salaam initially elevated from the ground for functions conceived by Architect Anthony Almeida but the ground floor is now enclosed for other functional uses.

Fig. 22. College of Engineering and Technology – University of Dar es Salaam
Source: 2018 Field Survey

Fig. 23. Residential Quarters Elevated from the Ground for car-parking at University of Dar es Salaam – Tanzania
Source: 2018 Field Survey

Fig. 24. Blocked Space under the Residential Quarters Elevated from the Ground Designed for car-parking at University of Dar es Salaam - Tanzania
Source: 2018 Field Survey

Fig. 25. Roof Terrace used Domestic Purposes in Mbweni Dar es Salaam
Source: 2018 Field Survey

3.3 Borrowing a Leaf from Le Corbusier's City Planning Concepts

Our recent interview held on 20th April 2018 with Architect Almeida revealed his dissatisfaction on how incubator-like skyscrapers are mushrooming in Dar es Salaam city with no regard of climatic design considerations, and with excessive use of glass façades. He posed several questions: Are these incubators (buildings) appropriate in tropical countries without natural air cross ventilations? Where is enough power for artificial air cooling? His last question was: Is it better to be local architect and maintain local design conditions or to be "modern" architect and design Manhattan-like-skyscrapers in tropical countries [11]? He further produced a newspaper cut titled *How Cities force Skyscrapers to Evolve Glass.* This newspaper quotes as follows: *"These behemoths are notoriously inefficient-glass exteriors trap the sun's rays during summer and hemorrhage heat throughout the winter, requiring year-round controls"* A second newspaper cut from him carried a title: *Dar es Salaam Manhattan brand of Skyscraper Investors Unknown to Local Leaders* [12]. Figure 26 shows partial skyscrapers mushrooming in Dar es Salaam competing with historical conserved colonial buildings of the British Overseas Management Administrative (BOMA). Internet surfing provide Dar es Salaam city morphology (figure 27) with a heading *Dar es Salaam – The New York of East Africa*. Unfortunately, this signals that Dar es Salaam city morphology is rapidly changing in the direction of "international style" though with scarce infrastructural services on the ground. Particularly, road and railway network systems. The leaf to be borrowed from Architect Le Corbusier is to understand that motor cars are *destroyer* and the *organizer* of modern cities as applied in the Voisin Scheme in

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Paris city. Dar es Salaam city should not paralyze on rainy days. See figure 28 showing the major city access, namely Morogoro Road turned into a temporary river to the extent of completely cutting off Dar es Salaam city centre from the rest of the city. Compare and contrast figures 28 and 29 showing Morogoro road at the same Jangwani section of Dare s Salaam city. A Kigamboni-like-bridge (figure 30) should be provided to connect the city with other city satellite of Dar es Salaam. Social and economical activities should continue all time round the year. This was reiterated by the Tanzania's Prime Minister, his Excellence, Honourable Kassim Majaliwa Kassim (MP), in his inaugural speech during the 29th Professional Development (CPD) Seminar for Architects and Quantity Surveyors in Dodoma City on 18th May 2018 that: *"We should not repeat mistakes in planning our new cities such as Dodoma (Tanzania's new capital), Mwanza, Arusha, Tanga and Mbeya as we did in the past for the city of Dar es Salaam. Our new cities must be functional and beautiful"* [13].

Fig. 26. Dar es Salaam Skyscrapers Competing with Low-rise Colonial BOMA
Source: 2018 Field Survey

Fig. 27. Cities of New York and Dar es Salaam Juxtaposition
Source: [17]

Fig. 28. Impassable Morogoro Road (Jangwani Section) in Dar es Salaam City on a Rainy Day
Source: 2018 Field Survey

Fig. 29. Morogoro Road (Jangwani Section) in Dar es Salaam City on a Dry Day
Source: 2018 Field Survey

Fig. 30. Kigamboni like – Bridge in Dar es Salaam: A Solution of Morogoro Road (Jangwani Section) all Weather Road
Source: [18]

IV. Conclusion

Modern cities must function in a modern manner like an engine of a motor car. Master plans must allow densification to avoid urban sprawl to overwhelmed demand of expansive social and economical infrastructural services. Road and railway networks must be used as primary planning tool of functional cities of high-rise buildings coupled with hierarchical green open spaces for leisure. International architecture and planning of cities should be avoided to allow local requirements, desires, qualities and culture be integrated in developing modern cities. Planning of new cities such as Dodoma in Tanzania must avoid past mistakes experienced in our present cities. For instance, Dar es Salaam is a bad show case of informalities, huge urban sprawl, disrespect of master-plans, building construction on declared hazard land on master-plans as seen at Jangwani section (compare and contrast figures 28 and 29) and blockage flow of natural water streams. Building designs should consider open plans and free fascade systems to enable accommodation of different functions for different needs at different times in one building. Climatic building design should be fully considered. Building orientation in tropical countries should allow natural cross ventilation to capture passive cooling to avoid massive use of artificial cooling systems which are apparently expensive and often times dis-functional because of unavailability of reliable commercial power supply. City planning must be a cocktail product from professional body of knowledge of architecture and urban spatial planning. Not one in isolation.

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