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BRINGING DESIGNERS AND CLIATOLOGST TOGETHER: THE NIGERIAN EXPERIENCE

ADE ADEDOKUN
Department of Architecture, Joseph Ayo-Babalola University,
Ikeji-Arakeji Osun-State

ABSTRACT: *This paper examines the problems related to the efficient and effective application of meteorology/climatology planning and design. The paper begins by discussing the lack of mutual understanding between climatologists and designers for examples as regards (a) the lack of agreements on basic definitions and concepts in the application of meteorology/climatology (b) the need to establish practical procedures for the application of meteorological knowledge and data during the successive stages of planning, designs and construction and (c) the need for close co-operation between meteorologists and building professional. The paper then examine the wide range of applications of meteorological knowledge to planning and building design and the very large market for meteorological services which can be tailored to the needs of planning and building industry with illustrations for the tropical urban centers in genera] and West Africa and Nigeria urban centers in particular. The paper also discusses the promotions needed to achieve cooperation and collaboration between meteorologists and designers with illustrations from the activities of the Climatologists in Nigeria in general and the Climatologists Research Group at the University of Lagos in particular. Examples of such activities being carried out by the Climatologists Research Group in University of Lagos include (a) exchange of knowledge through publications especially of the African Climatologists Research Series established by the Group (b) assisting in the provision of Climatological data and in the application of the meteorological/climatological data is design (c) organized seminars on topics which involves application of the meteorological and climatological data (d) promoting the involvement of-' planners and designers in the activities of the Nigerian Meteorological Society (e) serving as a linkage between the Development of the Nigerian Meteorological Services and planners and designers especially in the University of Lagos. The paper finally discusses the key issue in the ability to apply n-meteorological/climatological data to planning and designing such issues discussed include (a) effective co—operation between climatological and designers research and development. (b) Development of appropriate data banks network of observations appropriate data processing methods promotion of education and training and (c) encouraging and assisting planners and designers in attending relevant workshops and conferences related the application of meteorological/climatological data in planning and designs.*

KEYWORDS: Designers, Climatologist, Nigeria

INTRODUCTION

Climate represents a generalization of weather conditions over an area over a period of time at least 30years (Ayoade, 2003). However, It is important to understand the concept of climate change in Nigeria. Climate Change could also be defined as long-term significant change in the average weather that is being experienced by any given region of the world (Efe, 2011).The

average weather condition includes average temperature, precipitation and wind pattern, and it involves changes in the variability in the state of the atmosphere over durations ranging from decades to millions of years (Cooper,2000,Ayoade, 2003 and Efe, 2009a)These changes can be caused by dynamic process on earth, external forces including variation in sunlight intensity, and more recently by human activities (Ojo et al,2001,Ayoade, 2003; Efe,2009a). One of the major problems in Urban Climatology is related to effectiveness of the urban climatological community. to meet the passing challenges of the urban centers., among these challenges are bringing various professional together to ensure that the rapidly cities, especially of the developing countries in expensive principles may help provide a better living and working housing environment for a large segment of the global community. A lot of benefits would therefore result from bringing urban climatologist and designing together as this will result in healthier conditions, greater personal safety, improved efficiency, less wastage of energy and water, reduced property damage, etc. (Oke, 1984). No doubt, bringing climatologists and designers together is a necessary, sensible and profitable thing to do and very deserving for further progress in the climatological profession.

As noted by Landsberg (1974) most modern cities have developed with little or no regard to the climate environment in which they are embedded. Their location, shape, size and spreading is controlled by geographical, historical and demographic elements, but more often than not, city has been governed by mixtures of social, economic, political and other such non-climatic.

Also significant is the accelerated rate of urban growth in developing countries, most of which are located in the tropic. Besides puttmg pressure on high priority services such as water supply, education and other facilities, the mainly chaotic urbanization is causing environmental degradation (e.g. air pollution, slum areas, heat stress). Despite the acclimatization to heat by the inhabitants of the tropics, increased mobility and loss of productivity may result from the extra stress contributed by heat island grown in large cities. Also significant is the global warming and the protected climate change, which will result in temperature, increases in tropical countries and which will significantly affect human health. All these call for changes in designs of buildings to ameliorated the impact of heat stress and various aspects of environmental degradation. Already, there has been a general tendency to move away from traditional passive means of cooling, and as cities and their heat islands grow, the demands for power to run air conditioning equipment will spiral. This will imply for many developing countries increasing expenditure on imported energy supplies or air conditioning. Further, this heat island related additional power consumption also contributes to problems of carbon dioxide and pollutant release and probably depletion of a non-renewable resource.

Even though tropical are considered generally less industrialized, many of them are plagued by levels of pollution mainly due to the inadequate sitting of industry with respect to prevailing winds aggravated by local topography. Moreover, only exceptionally, tropical have means to monitor air pollution let alone enforce air quality standards so as to reduce emissions. To the mostly uncontrolled air pollution must be added the fact that many tropical cities experience weak ventilation, their atmospheres being prevailingly hot, such conditions are partly responsible for the observed increase in respiratory cardiovascular and cancerous diseases in large tropical cities.

The above discussions illustrate the need for the incorporation of planning and design and for bringing designers and climatologists together. Unfortunately, the need for this has to been much realized in many tropical countries. In some of these countries, sonic efforts in bringing climatologists and designers are made although there is yet a log way to achieving the desired results. Nigerian is probably a good example of such countries. In the present paper the efforts being made iii Nigeria to bring climatologists and designers together are discussed,' The paper first discusses thec1imatological input into building and urban design as well as the building climatology and urban continuum the paper then discusses the decision—making processes as they affect urban planting and architectural design and they relate to the incorporation of climatic input in Nigeria. The paper also discusses the wide range of application of meteorological/climatological knowledge to planning and building design and the very large market for meteorological services, which can be tailored, to the needs of planning and building industry.

The paper then discussed the problems related to the efficient and effective application of meteorology/climatology to planning and design and the promotion needed to achieve co-operation and collaboration between meteorologists and designers with illustrations from the activities of climatologists in Nigeria in general and the Climatological Research Group at the University of Lagos in particular. The paper finally discusses the key issues needed in the ability to apply meteorological/climatological data, especially as related to climatologists and urban planners and buildings designers.

THE BUILDING CLIMATOLOGY/URBAN CLIMATOLOGY CONTINUUM AND THE CLIMATIC INPUT INTO URBAN PLANNING AND BUILDING DESIGN

Adequate and detailed planning for the future development of the country's natural and human resources therefore requires an improvement in the scientific knowledge of the resources and the building up of the needed technical data for it (Filani, 2012). As in other parts of the world, each city in the topics is made up of a mosaic of individual buildings and other land use units. The form and dispositions of which are highly complex, and in detail, unique. Many constraints control the location and design of' individual buildings and building groups. Some are broadly social, others economic some are physical while some are aesthetic. Each has to be carefully and then balanced against the other in the decision making process.

In the tropical countries, the climatic input among the physical countries, has generally been undervalued or completely overlooked, hi general, the climatological input into urban planning and building must recognize that no two cities, indeed, no two buildings are exactly alike. Each urban unit, each wall, each roof, each pavement, courtyard, street or park creates above it, a climatological sheath, with which it interact, the totality of the urban building environment being part of a meteorological continuum. In reality, however, urban-building meteorological continuum has no clear methodological or sharp scale boundaries between then. The significant of this is that meteorological input in building and urban design has to be made at a number of scales, each demanding a different set of data. in particular, the climate of a site may be regarded as the integration of series of controls, ranging from global to local controls, the climate of a site

may be regarded as example, modify the local environmental factors, creating micro-climate modifications of the building environment. These conditions in turn induce modifications of the building and the building groups.

From designing purposes, the various control exercise by these various environmental conditions have to be matched against other constrains over a wide variety of factors, ranging from social to economic factors that will collectively determines the final form of the development

THE WEATHER DESIGN VALUE

Because of variability in climate change, however, it is important in designing of building, particularly in view of the complexity of the climate, sometimes surrounding the buildings. These socio-economic values are normally weighed against the cost of providing and incorporating meteorological/climatological information. However, the term climate variability is often used to denote deviations of climate statistics over a given period of time (such as a specific month, season or year) from the long-term climate climate statistics relating to the corresponding calendar period (Semeon and Porter, 1995; Porter and Semeon,1999)

In this regards, three forms of designs problems must be noted. These includes (a) designs against climate failures (b) designs to minimize running costs depending on climate factors and (c) designing for economic and safe construction in the face of adverse weather on the constructions site. This is a creative professional process utilizing technical and aesthetic abilities in the imaginative and skillful planning and construction of spaces, structures, which are logically arranged to provide necessary service (Aluko, 2004). They also provide a functional and aesthetically attractive environment that satisfies physical, social and psychological needs of the owners and users while at the same time provide services to protect public health, safety and welfare (Aluko, 2004) .The need for a proper design of a house before its eventual construction cannot be overemphasized. The literary meaning of a housing design is a drawing or outline from which something (e.g housing) may be made (Aluko, 2004).

As in many other places, rational designing in Nigeria always involves balancing the risk of failure against economic costs of avoiding failure. It is possible to reduce the risk of failure by "overdesigning", but there is an economic penalty for doing this which is often substantial. The possibility of failure is always present, due to factors such as unforeseen natural process, human shortcomings in engineering and design knowledge and defects in design construction processes. For example, many building in Nigeria have been subjected to severe damages due to the line squalls or thunderstorms. This has always been case of many houses m the large urban centers where many houses have been destroyed. Examples of such houses are high rises buildings at the University of Lagos, which have been designed and built to face the cast. For these buildings most of the original glass doors have has to be replaced by more solid doors and windows made of wood. But in general and ends of rainy seasons usually cause serious turbulent and catastrophic. periods from these buildings and their occupants when line squalls and disturbance lines accompanied by heavy thunderstones and winds strong in many of the urban centres in the country.

In Nigeria, the various modes of failure to climatological factors likely to produce such failures considerations by predictive, techniques available are poorly understand and they are usually not taken into consideration by designers. Failures also normally result from climatological for which data are not available in useable format. There have been significant reversible and irreversible destructive in the country indicating the need for applications of meteorological/climatological data and information in designs, and consequently the need to bring climatological and urban planners and building designers together.

Apart from design failures in particular and many other parts of the urban centers in general for example are also usually not to take into consideration running cost due to climatological causes in Nigeria, there are many designs, in which energy demand and hence, costs are not taken into consideration. Examples are designs, which do riot consider, or put very little emphasis on heating, ventilation and lighting systems, all involving substantial energy inputs. Examples of such very badly designed building include the University Auditorium and the Arts theatre with no windows, and the Faculty of Business Administration with very poorly ventilated office spaces. Under these conditions, lighting and air conditioning systems have and to be used since they were constructed.

PROMOT1ON OF THE APPLICATIONS METEOROLOGY/CLIMATOLOGY IN URBAN AND BUILDING DESIGNS: THE NIGERIAN EXPERIENCE

Forpromotional, efficient and effective application of meteorological/climatological knowledge to the field of urban arid building designs. It is significant to note that urban and building design decision making processes are a complex systems arid that there are special meteorological! climatological requirements for urban arid building designs and that climatic data and information should be made available for easy interpretation to the architects and designers. Also, communication channels must be opened, for example more frequent short holding frequent discussions, seminars, workshops. This will make architects arid planners become aware of the data arid information available with the meteorologist. In addition, attention must be paid to climaological data and information in relation, to building economics and optimum balance between environmental considerations arid costs of climatic data input and building arid maintenance.

Generally, climatological data and information needs for building activities in countries like Nigeria include those for (a) planning and site selection (solar radiation, wind, precipitation, flood risk and illumination) (b) structural safety (wind loading, temperature extremes, precipitation extremes, hail loading and lightning) (c) weather tightness (precipitation — penetration, absorption, roof drainage, runoff wind and temperature) (d) energy systems (temperature, wind, solar radiation, humidity and daylight) and (e) operations and maintenance (temperature, wind, solar radiation, illumination (lighting costs) humidity (corrosion, cooling costs) and pollutants (corrosion)). These climatological data and information needs are in addition to socio-economic considerations (e.g. costs associated with environmental factors, beginning with site selection through the whole life of the building). For the promotion of the application of' meteorology/climatology, and for bringing climatologists and designers together, there is need for a reference manual which will contain the necessary climatological data and

information on "how", "when", and "where'' to obtain the climatological information or specific data sets. It is also significant to have information on principles of exrapolation and interpolation of available data and information, and on-site data collection of additional data needed WMO, 1980).

Efficient and effective application of meteorological/climatological knowledge on urban and building design no doubt requires close co-operation and interdisciplinary activities, not only between meteorologists/climatologists, but also other disciplines.

APPLICATION OF CLIMATOLOGICAL/METEOROLOGICAL INFORMATION: THE NIGERIAN EXPERIENCE

In Nigeria, as in many other parts of the world, there is a wide area of applications, and the scale of construction activity in the country implies a very large potential market for meteorological services tailored to the needs of building industry. However, it is only within the last decade that action is being taken to encourage co-operation between meteorologist/climatologists and scientists in related disciplines. At the national level, very little efforts have been made to bring meteorologists/climatologists and designers together. Indeed, it is on very rare occasions that designers request for any climatological information. They only emphasise the general designing principles, based on factors, other than climate. Some efforts were made by the Nigerian meteorological Society, but with very little results achieved, because of the inability of the society to get adequate financial support to effect the amount of co-operation needed at the national level.

At the University of Lagos, an initial efforts were made when the senior author of this paper became the Dean of the Faculty of Environmental Sciences, University of Lagos. This faculty, included the Departments of Architecture, Building. Estate Management, Geography and Planning. At the assumption of office, the traditional problems related to the efficient application of meteorology/climatology to planning and design came into focus. in general, there is lack of disagreement 011 basic definitions and concept in the application of meteorology and climatology. An attempt was then made to offer a course in urban and building climatology, but the attempt failed because of peculiar traditional problem of lack of understanding of the need for it. The architects in Nigeria believe that they are mainly for design, based on the general principles provided by the architectural books, and very few of these are available at the University of Lagos.

The opportunity to bring climatologists rind designers together became manifested when considerations for promotions, based mainly on academic publications and secondarily on design portfolio, were being made. The architects were found to be deficient in publications, although many of them had good portfolios. in addition to the fact that architects in Nigeria in general and at the University of Lagos, in particular do not traditionally believe that scientific publications should for a strong basis for promotion, there were complaints of lack of avenues for scientific publications.

As Dean of Faculty, the senior author of this paper then established a climatological research Group at the University. Some Faculty of Environmental Sciences publications Series were also established. Some members of the faculty, including architects and builders took advantage of these publications series to publish research or technical papers, including those on applications of climatology to urban and building design. Data were made available to those who require them and were necessary. The procurement of these data and information was done for the faculty members free from the Department of the Nigerian Meteorological Services, in addition, personal efforts were made to assist architects in the art of scientific writing and research into the application of climatology/meteorology to design. Seminars were also organised on topics which involve application of meteorology an cliniatological data.

Also significant in bridging the gap is the opening of communication channels, through short—term discussions, especially with individuals in the Departments of Architecture and Building. Faculty Seminars and workshops were also held to bring meteorologists/climatologists on the one hand, and planners/designers on the other, together. This allowed for climatic data and information available to be exchanged and for the needs and use of the same by designers to be understood by the meteorologists.

With so many constraints in planning and design (including social, economic, political, aesthetic and in some cases, physical (soil, topography and water), the hope of bringing climatologists and designers together appears faint p9rticul9rly in the developing countries. The experience in Nigeria shows that on the national scale, the climatelogical input can be successfully carried out, only if integration of climatological data and information is done as part of a larger movement to increase the role of urban planning and building design, as part c a larger movement to improve the contribution of urban planning and building design at the national level in addition, the experience gained on a relatively local scale at the University of Lagos shows that designers can be assisted in research activities and publication of their research and technical papers on Environmental and climatological publications. Also significant is the fact that many meteorologists/climatologist, particularly those trained as geographers are well-equipped to joined professional urban and regional planners. There are a few examples of this group of geographers within the climatological research group at the University of Lagos. Such people have gone a long way to press for, and promote the inclusion of climate—sensitive concerns in physical planning and designs. In addition, there were organised seminars on topics which involved application of meteorological and climatological data, while the involvement of planners and designers in the activities of the Nigerian Meteorological Society is being promoted.

THE STATE OF READINESS

If we assume that success is already being achieved in bringing climatologists and designers together, a big question arises as to what is the state of readiness of the climatological community to meet the challenge, particularly s regards available data and information? To answer this question it is significant to note that there is need to establish practical procedures for the application of meteorological knowledge and data during the successful stages of planning, design and construction in this regard, the need for co-operation between

meteorologists/climatologists and building professionals cannot be over-emphasised. At the national level, the national meteorological services ca be encouraged to promote such co-operation, for example, through establishing the users forum/group in planning and designing, and communicating regularly to architects, designers and urban planners on facilities available for their use. There is also the need for development of appropriate data in readily useable format. Other needs include (i) development of appropriate network of observations (ii) promotion of education and training (iii) ensuring that planners and designers are allowed to take advantage of education and training programmes and facilities available in the World Meteorological Organisation (WMO) as related to planning and designs and (iv) encouraging and assisting in attending relevant workshops and conferences related to the application meteorological/data in planning and designs.

CONCLUSION

The need for the collapse of barriers between climatologists and designers has become more imperative than ever before. In this needed re-alignment of relationship between climatologists and urban and building designers. The major obstacles in bridging the gap include (a) designers attitude and focus (b) lack of data in readily useable form (c) difficulty by architects in understanding climatologists' language and (d) the wide variety of issues to be addressed by designers in a single design.

In addition, courses in architecture and a design in many schools and universities have very limited input of climate, and in many cases, these inputs are out of date and extremely inadequate to develop understanding and incentives among students and to motivate them to develop climate—responsive architecture. Also significant is the fact that architects normally give preference to the clients and users' needs and demands. To successfully bring meteorologists/climatologists and designers together, there s therefore the need for (a) inter-disciplinary team, national specific, but more preferably tailored for relatively smaller regions. Indeed, it is significant to establish or strengthen links with related disciplines/scientists (engineers, architects, planners, economists, demographers, geographers, etc.) united by a common interest in the urban ecology in general and urban and building climatology in particular. There is also the need for creating a data bank with climatolotical information in a form which is user—specific and which is relevant to urban and building design problems.

As already emphasised, there is urgent need for a "reference handbook", which will contain the necessary climatologcal data and information on "how", "when" and "where" to apply for climatological data and infrmation. The preparation of design guide for use by design professionals. It is also significant to ensure that the authorities emphasise the need for change in course content and approach on climatology in school curriculum, or at least for the curriculum to be strengthened so that graduating students can have more fruitful understanding and use of climatological data available with meteorologists/climatologists.

Finally, initiatives from climatologists at the "local" levels in various institutions of higher learning will go a long way to promote interactions between climatologists and designers. These initiatives must come from climatologists in various ways, including formation of climatological

groups, short— term discussions, seminars, workshops and establishment of academic publications at the local levels. A lot of these activities however require financial support, which are usually not available in developing countries. But with persistent efforts, this and other problems can be soled and a lot of progress made in bringing together, meteorologists/climatologists and designers, and ore especially, various professional whose disciplines are related.

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