PalArch's Journal of Archaeology of Egypt / Egyptology

ANALYSIS OF EVOLUTION OF URBAN FORMS IN THE CONTEXT OF ENVIRONMENTAL SUSTAINABILITY AND RESILLIANCE IN ANTHROPOCENE

Naveed-ul-Haq[1], *Kanwar Muhammad Javed Iqbal*[2], *Muhammad Irfan Khan*[3]

[1,2,3]Department of Environmental Science, International Islamic University, Islamabad, Pakistan;

[2]National Institute of Maritime Affairs, Bahria University, Islamabad

E-mail: [1]naveed.phdes3@iiu.edu.pk

Naveed-Ul-Haq, Kanwar Muhammad Javed Iqbal, Muhammad Irfan Khan Analysis of Evolution of Urban Forms in The Context of Environmental Sustainability and Resilliance In Anthropocene-- Palarch's Journal of Archaeology of Egypt/Egyptology 17(12), 1793-1809. ISSN 1567-214x

Keywords: Urban Forms, Eco-City, Sustainable Metropolitan, Urban Planning, Composite & Opus Plans

ABSTRACT

Classical walled cities were built for security and grandeur; modern with orthogonal urban form, emphasizing transportation corridors, height zoning; and innovative urban planning, strategic spatial planning without predetermined urban form, compact city approach and eco-city approach are premeditated. This study identifies indicators of sustainability and resilience in evolution of urban forms from ancient to modern times and proposes a functional model for urban form in technology-driven Anthropocene. Urban forms of six cities of Pakistan developed in different times in the history were analyzed against three urban design parameters; namely substantiation of location, space allocation and land-use planning standards. Six cities included ancient city of Multan, medieval city of Lahore, Gujranwala developed during 17th to 18th century, Faisalabad (Lyallpur) and Sargodha developed by British colonial empire in 18th and 19th century respectively and the modern city of Islamabad developed in 1960s. Qualitative data collected and analyzed using multi criteria analysis technique. Faisalabad was found the most planned city with highest score of 2141, which substantiates that well-planned cities have better capacity to deal with environmental and urban issues. Based on analysis, a novel "composite city planning approach" is proposed, which may provide an ultimate answer to human quest for a functional, convenient, technologically assimilated and sustainable urban form. It would have quad-tier transportation infrastructure i.e., low flying zones, spiral public avenues, link roads, pedestrian streets; intermittent zoning, amenity area and facility center having multi-use high-

rise buildings with parking plaza for adopting approaches essential to attain goal of sustainable development and social cohesion of metropolitans**.**

INTRODUCTION

Historiography have found the basis of modern urban planning in the middle of the 19th century developed to respond new conditions as a result of the industrial revolution. "Le origini dell'urbanistica moderna" by Leonardo Beneolo narrates that modern urbanism was an attempt to correct the flaws of industrial cities: with the Utopian proposals on the one hand, a d the new urban planning legislation on the other. Thus, cities around the globe are in different stages of development and consume majority of natural resources providing livelihood and shelter to largest number of population (Monclús and Díez Medina 2018).

Thus, cities should be able to survive, adapt and grow from all kinds of acute and chronic stresses they experience – a concept known as resilience. In urban planning domain, resilience allows the built environment to accommodate new or retrofitted forms (and/or functions) through incremental transformation (Dhar and Khirfan 2017). Climate change is presenting a significant challenge to the urban systems worldwide. Most likely impacts including rainfall intensity, storm surges, urban flooding and urban heat island effects are likely to intensify in coming decades. Adaptation to climate change impacts can be introduced in urban areas while planning a city. Whereas, the way the cities are developed, influences the level of emissions produced from human settlements by changing energy and fuel consumption patterns (Shalaby and Aboelnaga 2017).

UN-HABITAT narrated the characteristics of a resilient city as resistant, adaptable and inclusive while resilient process must be integrated, reflective and transformative. Also, UNDP has major focus on; i) eradicating poverty, ii) structural transformation for sustainable development and iii) building resilience to crisis and shock. All of these points are directly or indirectly linked to the sustainable/resilient urban form.

Urbanization brings drastic changes in a landscape surface. A city's climate, geology, physiography and bio-climatic zones are known as deep structures. These deep structures linger on as decisive participant from history to the future. Decision makers and planners should essentially know the answers of the questions like initial settlement location, economic and population distribution, transportation routes, street structure, building characteristics, health and well-being of messes. A city design that is in agreement with the deep structure of the region is more likely to have resilient urban form. Also, it is expected to be more economical and functional. Deep structures play fundamental role in deciding quality, type and capacity of the city infrastructure such as power, water supply, sewer, transportation, neighborhood and building scale. All these are supportive structures and should have an aesthetic outlook along with life sustaining capacity (Axelsson et al. 2013).Almost all the cities are susceptible to natural hazards. Exact time of these calamities is never known. History is full of success and failure lessons (Vale and Campanella 2005). The structure and overall look of the city

depends upon the chosen approach. Selection of appropriate development approach can make a city heaven on earth whereas choosing an odd approach can prove vice versa. Deciding an appropriate urban form is a complex and uphill task being debated for centuries. To the author's point of view, suitability of urban morphology can be assessed by understanding architect Jen Grehl's concept of urban planning, which is **"**Urban Planning is all about human dimension. Neither cars, nor industries and businesses. If people find a city worth living in, everything else will follow" (Wheeler and Beatley 2014). Materializing the Grel's philosophy into a comprehensive and innovative city development approach is an uphill task due to complexity and multidimensionality of the issue. Because such an urban form should have all the elements, which makes a city not just livable but also it should deliver a solution to the human pursuit of developing a convenient, sustainable and technically assimilated urban form. This projected ideology may be called as "Composite City Approach".

Pakistan's rank among the countries most vulnerable to climate change has jumped from 8^{th} to 5^{th} during years 2018-2020. To adopt the impacts due to changing climate and inculcate resilience, there is need to make innovation in city planning and building systems. Therefore, it seems inevitable to update the urban planning principles to incorporate resilience in urban form.

Due to global south bearing burnt of the climate change, Pakistan is facing elevated temperatures and increased frequency of urban flooding. These calamities along with unchecked urbanization has raised serious concerns about urban planning practices in Pakistan. This study is attempting to introduce an environmentally resilient urban infrastructure that is supposed to cater the natural as well man-made catastrophes and provide an effective solution for planning of urban areas.

LITERATURE REVIEWED

Authors like Paul Knox have suggested that urban planning has emerged as a profession due to number of crisis. People responded to this crisis and attempted to confront this crisis aroused from epidemics (health crisis), riots and strikes (social crisis) and natural ones such as flood and fire incidents. Despite of, minimizing the adverse impacts of capitalism, planning response has also made it viable for longer term. These were philosophical, intellectual and moral stances opposed to the trend in social relations, values, and environmental conditions of the 18^{th} and 19^{th} century, with loose ties to Marxism. Romantics were utopian visionaries generally attempted to balance city/country opposition but seldom saw their plans actualized and had a major influence on planning profession. Progressives were activists motivated by the desire to reduce poverty or the harmful effects of poverty.

For establishment of early human settlements, natural resources were subjugated, and subsequent over extraction resulted into distortion of vistas. This visible scale deformation of nature was realized and responded in city planning practice in the form of "Patrick Geddes's Regional Planning and Design with Nature", Daniel Burnham's "The City Beautiful Movement" and The Parks Movement by Frederick Law Olmstead. Patrick Geddes (1904,

1915) called for urban planning to take into account the ecosystem and history of a region, called for social surveys. (Batty and Marshall 2009; Geddes 1915). Geddes drew on Le Play's circular theory of geographical locations presenting environmental limitations and opportunities that in turn determine the nature of work. His central argument was that physical geography, marker economics and anthropology were related, yielding a "single chord of social life of all three combined" (Munshi 2000). Patrick Geddes is of the view that rural development, urban planning and city design are not the same and adopting a common planning process is disastrous. He proposed the sequence of planning is to be: regional survey, rural development, town planning and city design. These have to be kept constantly up to-date.

Because of urbanization and prompt population growth, risk-prone and hazardous areas are getting more and more populated (Roy 2020). The trend is same either it is a large city or a small or average sized urban area. However, each type of urban sprawl has its own disaster risks. An urban center with greater than 10 million individuals are called mega cities and according to UN reports there will be more than 41 mega cities by the year 2030 (Vinke 2020). Due to their size, function and design, all mega metropolises are vulnerable for natural disasters and hazards. These hazards include geological (mass movements, ground shaking earthquake), climatic events (cold and extreme events) and wildfires. Thus, it creates necessity to plan such strategies that minimizes the risks in megacities (Anees et al. 2020). Without exception of the coastal areas, climate change is supposed to adversely affect all mega cities with the rises in sea levels, accompanying costal floods, increases in the intensity and frequency of climatic events such as intense cold and hot events or intense rain and flash floods (Grimm et al. 2008; Hunt and Watkiss 2011). Disaster risk reduction strategies and plans have been widely discussed in developmental studies. However, along with these strategies and plans, there is sheer need of such initiatives that may reduce the frequency and intensity of these extreme events. Basic factors causing such events should be addressed particularly in urban environment. Initiatives must be taken to increase threshold levels of natural resources or to decrease the burden of raw materials extractions. Increase the threshold capacity of nature to hold waste materials or to take such steps which may lessen the burden of waste dumping. Reduce the emission of GHGs or make such arrangements which may utilize or recycle these emissions. To achieve all these goals, basics theories of the ecology should be revised (Heynen 2006; Jenks 2000; Stone et al. 2010).

Metropolitan ecosystems are relatively less stable, have more non-native species, have different species structure (always changing but simplified), different underlying structure highly flexible in spatial and temporal scale), and exceptional energetics (extreme anti-entropic). Metropolitans are less stable, have unique energetics (extreme entropy), simplified but always changing species composition, more foreign species and variable dynamic (both in spatial and temporal context). Thus, temporal and spatial heterogeneity is greater, which gives rise to complicated assortment of living things and physical patches within an infrastructure, social institutions and human organizations. Land covers are directly affected by anthropogenic activities. Which are return affects primary productivity, biodiversity, surface

runoff, pollution and soil quality. Altered air quality and land surfaces formulates microclimates and create heat islands. Increased impervious surfaces due to urbanization also affects nutrient cycles, sedimentation, fluxes of water and hydro geochemical cycle (Leopold 1968). Jean-Marie Pelt in his book "The Re-naturalized Human" introduced a new aspect to ecology clearly different from traditional one (Pelt 1977). Forman and Godron's in 1986 wrote book "Landscape Ecology" in which first distinguished urban settings and landscapes forms were introduced (Forman and Godron 1986). These theories and concepts kept on molding with the pace of industrialization, population explosion and rate of economic development. Today, the greatest challenge for the town planners and ecologists is to integrate the human activities into the urban ecology in order to minimize their impact on surrounding environment without sacrificing the standards of life. Incorporating humans into ecosystems provide vital prospects for all kind of bionetworks (Alberti et al. 2003). Emerging requirements introduced the different cities such as smart cities (Neirotti et al. 2014), sustainable cities, compact cities, eco-cities, city resilience and many others(de Jong et al. 2015). Thus, a new debate has been started to integrate modern technology-based elucidation in to approaches of urban layouts, designs and planning. It can be a way to guarantee future viability and opulence of urban areas (Alawadhi et al. 2012; Dirks et al. 2009). Different authors have considered different set of parameters such as green spaces, reduction is GHGs, mobility, water quality and availability, air quality, waste management (3Rs), urban climate, territorial development, marine and in land ecosystem development, environmental management and reporting to be focused. World "resilience" has its etymological roots in Latin word "resilio".

Peter Newman (co-authored with Heather Boyer and Timothy Beatley) wrote a book "Resilient City" which was published on 9th January, 2009. Taking into account the climate change and oil peak resilience refers to "equipping cities to face future shocks and stresses from climate change and depleted oil and fuel sources". According to researchers, the concept of resilience city is a concept that has a relationship with the perception of sustainability. Also, it is based upon three dimensions i.e., adaptation, mitigation, and innovation. The three dimensions will be explained as follows:

Mitigation is the reduction of risk relative to the object capacity, the object itself in accordance with its capacity. Adaptation is the self-adjustment to risk, which is adapted to the hazards and vulnerabilities that exist at the object. Innovation is the time frame to consider the implementation of new activities in the treatment of actual risk which falls outside the existing capacity on the object, such as creating new technologies to reduce disaster risk (Da Silva and Morera 2014; Index 2014; Renald et al. 2016).

Resilient cities fulfill the requirements of users, uses, public spaces and building types. It accommodates the diversity and density. Pedestrian's mode remains prime mode of transportation to ensure healthy life. Necessities of life are provided within walking distance (500 radius). Develop in a way that is transit supportive. Focus energy and resources on conserving, enhancing, and creating strong, vibrant places, which are a significant component of the

neighborhood's structure and of the community's identity. Conservation of natural systems as well as climate is ensured by impact management. Enhanced efficiency, safety and effectiveness of industrial and technical process and system is ensured. Manufacturing, communication, transportation and construction phases are guaranteed with minimum footprint and maximum energy efficiency. Promises self-sufficient communities. Good (growth and production) and services are available in 200-kilometer radius. Community membranes has to participate actively in development plans at all scales.

Plan and design for redundancy and durability of their life safety and critical infrastructure systems. Planning and design of these systems will aim for levels of redundancy and durability that are commensurate with the increasing environmental, social, and economic stresses associated with the impacts of climate change and peak oil. Reduced service cost and minimum environmental footprint is ensured during constructing urban form and building types. Develop building types and urban forms with reduced servicing costs, and reduced environmental footprints (Wang et al. 2018).

Mankind is facing sixth age of extinction i.e.; Anthropocene age and most salient characteristic of this era is that humans are the mediators of change. Among these anthropogenic catastrophes, climate change is the leading one. Since our cities are center of human civilization, thus they are expected to be worst stricken by the repercussions of climate change. Pakistan is located in South Asia and is expected to receive wide range of climate change impacts including; increased frequency and intensity of extreme events, water stressed conditions, threat to coastal areas (increase in sea level and increased cyclone activity, threats to mangrove, fish breeding grounds and costal agriculture, increased health risks and climate driven migration. To cope up with all these problems and to provide a sustainable living to residents, there is a dire need of stringent urban planning, which is altogether lacking in Pakistan. This paper discusses and attempts to provide the solution of all current problems of urban planning being faced in Pakistan, along with effective solutions to climate change related impacts.

METHODOLOGY

Cities were selected on the basis of their historical importance, whether they were political or government centers, type of planning and off course data availability. Following research methodology was used for data acquisition and analysis, schematic presentation is in Figure 1.

Selection of Respondents for Research

Evolution of urban form and environmental changes are phenomenological and naturalistic process. Which requires in depth qualitative investigation from most concerned persons of the planning and environment. A range of dynamics can sway the quantity of data in qualitative research. Sum of interview and cumber of participants decide the load. How many focus group discussions or interview are enough? The actual answer is "there is no rule of thumb"(Baker et al. 2012). In order to be more efficient and save time focus group methodology was used in this research.

Recruitment of Respondents

Contributor's recruitment is important for the success of investigative study. A research project may fails if there is insufficient amount of participants (McDonald et al. 2006). The empathy of optimal enlistment methods is attaining interest and a current systematic evaluation of strategies intended to improve recruitment for "randomized controlled trials (RCTs)" identified 45 significant studies. It has classified six types of intrusion: trial design, approach for participants, obtaining consent, financial incentives, trial coordination and training for recruiters. There can be few strategies that are found to be effective for recruitment. Which includes, reminders on telephone to non-responders, having opt-out procedures where potential participants are required to contact the trial team.

Multiple Criteria Decision Analysis (MCDA)

Howard described decision analysis as balancing process for all the factors that influence a decision (Howard 1966). Among methodological tools for assessing value quantitatively as part of a decision-making process, MCDA could be indicated as an ideal method, ordering a set of alternative options based on the degree to which a number of different objectives are achieved. One of the main aims of MCDA methods is to enable decision-makers to reach a decision by facilitating an understanding of the problem, objectives, and associated values, through organizing and synthesizing information of complex and conflicting nature. MCDA can facilitate decision-making by explicitly integrating objective measurement with value judgment while managing subjectivity in a transparent way, however it cannot act as a substitute for decision-making(Angelis and Kanavos 2017).

Figure 1: A Schematic Diagram of Research Methodology

MCDA Analysis –Ranking Method

In MCD analysis each criterion category was ranked from 1 to n (Total number of criteria. where 1 = Most Important and n = Least. Each sub category was assigned a group weightage by allocating 100 points among the n categories. The more important the interest, the higher its weight and vice versa. Such that sum of the scores for all test questions added up to 100. Sub interest was assigned its own weight, which took a value from zero to max weight of that group. For example, if you assigned a group weight of 15 to an interest, the sub interest in that group can range from 0 to 15. You can assign all sub criteria in that group a 15, or some a 15, some a 10, one an 8, one a zero, and so on. Calculated the sub-interest score for each option by multiplying the sub-interest rating by its weight. Summed up the sub-interest scores within each interest category to derive the interest scores. Summed the interest scores to get the total score. And ratings answer the question, "How well does each alternative satisfy the interest?" Use a 'best to worst' ranking or a numeric scale (5=excellent; 4=very good; 3=fair; 2=below average; 1=poor).

RESULTS AND DISCUSSION

Data was collected by focus group discussion from respondents recruited as per criteria described above. Data obtained from focus group discussion is tabulated as under analysis of the data was carried out by using MCDA. While results of MCDA analysis are given under the heading “Total Score” as shown in Figure 2.

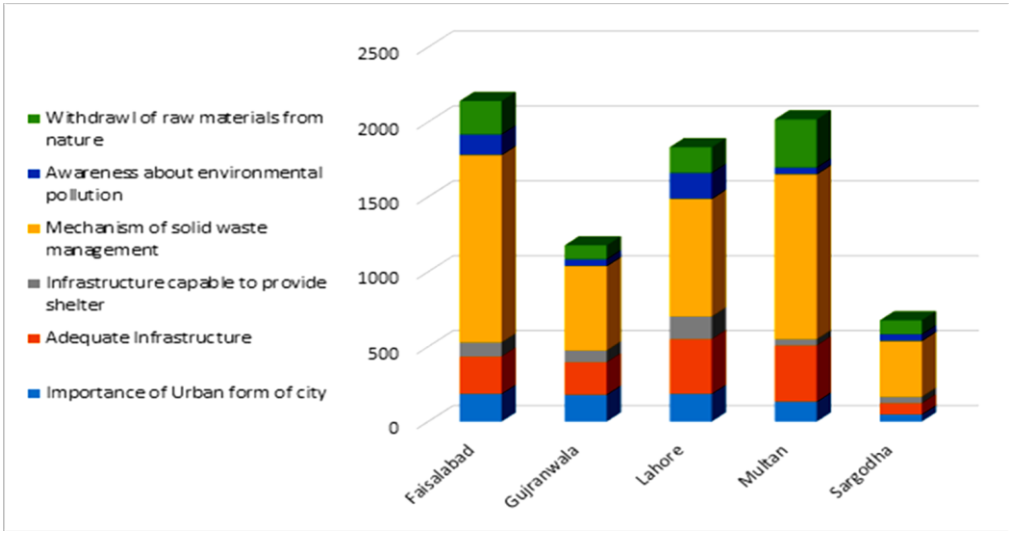

Figure 2: Analysis Of Pre 60's Urban Form By Ranking Method

Faisalabad attained the highest total score followed by the Gujranwala, Lahore, Multan and Sargodha. As per survey data, withdrawal of the raw materials from the nature keeping in view of its threshold and exhaustible capacities were ranked highest. Whereas, infrastructure capable to provide shelter was ranked least; mechanism of solid waste management attained the highest group weight.

A well-planned city is considered that is fully prepared for the future problems, social and economic impacts. Evident from the above analysis and history, Faisalabad is most well-planned city of pre-60's, era providing a better living style to its residents. Study has revealed that a nexus is present between urban forms, economic agricultural, residential and cultural zones even after end of colonial era. It also had centralization of functions and facilities. Our first hypothesis claims that environmental consideration has remained in backdrop of city planning. Rating for different cities varies from 174 for Lahore to 46 for both Gujranwala and Multan. Score for these six cities varies from 321 for Multan to 93 for both Gujranwala and Sargodha. These result manifests that there have remained environmental considerations in back drop of city planning. However, level of considerations has varied keeping in view importance of the city for the state. Highest values are attained by the Lahore and Multan as these were most important cities of their regions. Faisalabad, despite being the most well-planned city could not get the maximum value as it was not most important city of region, losing to Lahore.

Proposed Basic Plan and Concept

The basic concept behind the Composite City Approach is that it warrants for flexibility despite of giving a pre-determined urban form to the city. It goes against the phenomenon of the compactness. The flexibility is ensured by formulating "**Composite Plan**" which will be considered as the Master Plan. Subsequently, to achieve the goals of Composite Plan, action area plans with

nomenclature of "**Opus Plan**" will be prepared. A schematic diagram of the proposed plans in given in Figure 3.

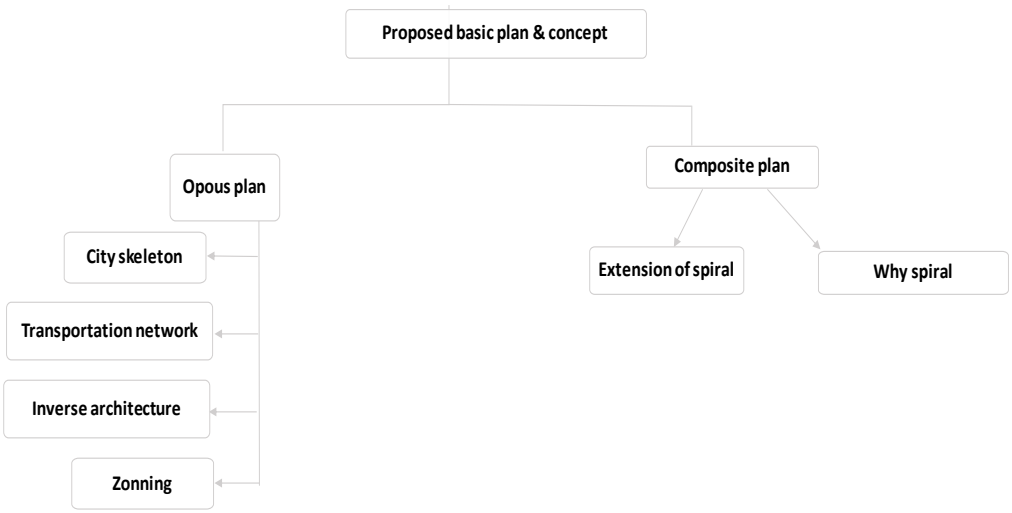

Figure 3: Schematic Diagram of Proposed Plans

COMPOSITE PLAN

The Composite Plan will act like the master plan. This plan will decide the future shape of an urban settlement. This plan will be formulated by following these key steps: i. Definition of goals and objectives, ii. Baseline studies (land uses, socioeconomic, traffic, industrial, utility & services, Community facilities), iii. Re-evaluation of goals and objectives, iv. Composite Plan, v. Opus Plan, vi. Zoning and Sub-Division Plan, vii. Urban Ecology Plan, viii. Community participation Plan, ix. Regulations and building by laws, x. Implementation framework, xi. Stakeholder response, xii. Monitoring and feedback.

The Composite Plan will give a "**Spiral**" shape to main body of city with alternate intermittent zones at nodes. The final form of the composite plan will feature **Quad-tier transportation infrastructure** which will ensure the smooth connectivity between **Intermittent Zones, Amenity Area** and **Facility Centre**.

Why Spiral?

As mentioned earlier that Composite Plan is developed upon a central artery which should be planned in a spiral-shaped city. As a rationale to this choice, we have to look back at the city approaches taken up in past. Major city developing trends adopted in past are; radio Centric City, the grid iron city, the linear city, irregular city. Then, there are some models which also theorize the city development approaches. These models include; concentric zone model, sector model, multiple nuclei model.

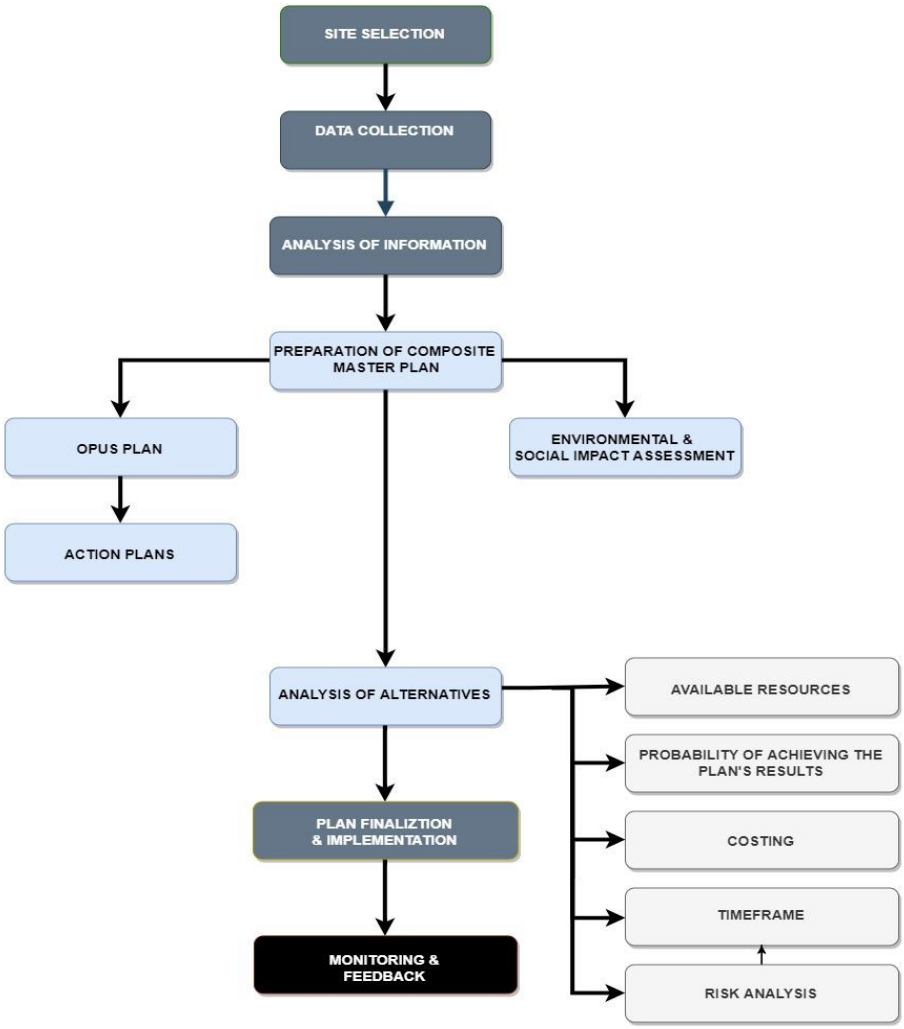

Fig 4: Schematic Diagram of Opus Plan

All these city development approaches have their pros and cons. However, here we are aiming for the ultimate sustainability of city. This can be attained if learn from the mistakes committed in past. Hence, we will be focusing on the loopholes which are present in the above listed city approaches. Radio Centric City are characterized by central traffic congestion causing flow problems in local traffic and difficult building sites. The Grid Iron City requires flow hierarchies, is limited to suitable terrain, has many intersections and quite monotonous, lacking aesthetics e.g., Islamabad is an example of Grid Iron city. Though it is highly livable city but it requires clover fields after every two kilometers to ensure the smooth circulation of traffic. Building clover fields after every two kilometers is very costly and is not economically viable in long-term. The Linear City has exposure to easy blockage and gives fewer options for traffic circulations. Irregular city ensures aesthetics but is not friendly in terms of free movement as person is always exposed to the fear of getting lost.

Concentric zone model may restrict the development of certain models and is defied by commuter villages present in the commuter zone, casuing the

decentralization of the economic hub. The sector model was proposed for early cities of 20th century and does not take in to account cars, which are easier way of commuting. While the Multiple Nuclei model neglects the abrupt divisions between zones and may not be totally applicable to oriental cities with specific background culture, politics and economics. The spiral city has been proposed after learning lessons from these mistakes. The spiral city pattern will not address these loopholes but will also include the pros of these past approaches. The amalgam of benefits forms new spiral pattern and lessons learned from past practices will surely produce such city, which will not only promise highest quality of living but will also be sustainable.

Shape of the City

After discussing the pros and cons of past city approaches, the question is "What will be the shape of the city which will be developed on Composite Approach?" The answer is that the city shape will depend upon the natural topography of the city's location. The spiral main artery will be there and the shape of this spiral artery will depend upon the topography and the natural features present in the location. The spiral can be continuous, semi continuous and may be irregular. For example; in case of plain and mountainous topography, the shape of city spiral will be linear and constant in plain region but the spiral curve will transform accordingly. The result will be an amalgam of regular and irregular spirals. The overall layout of the city may look irregular depending upon the natural topography but this irregular shaped city will be planned. Through this approach, we are trying to give irregular approach a proper name of "**Spiral Approach**".

Extension of Spiral

Another answer to the question "Why spiral?" is that extension of spiral is practically very easy. As the main hierarchy of the city will be spiral therefore in case of future extension of the city, the spiral will take the appropriate form according to the topography of future available land. This extension may change the shape of city in future. For example; if a city was built on plain topography and was exhibiting linear spiral then in case of future extension, the city hierarchy may not remain uniform due to the presence of hilly area, which will deform the uniform spiral crests and troughs.

OPUS PLAN

The Opus Plan will be formulated to achieve the goals described in the Composite Plan and will function as "**Action Area Plan**". The Opus Plans will be prepared and enforced in the subsequent intermittent zones. The sole purpose of the Opus Plan will be to set down the framework for the sustainable, phased and managed development of the intermittent zone.

Fig 5: Components of Opus Plan

City Skeleton

The Composite City Approach purposes a unique and innovative structure of the city unlike other development plans. By implementing the composite city approach, the city will metamorphose into a unique and aesthetic Spiral form. The shape of the spiral will depend upon the natural topography of the city terrain. The city will contain quad-tier transportation infrastructure, which will characterize a main spiral artery, which will be accompanied by alternate intermittent zones on each side.

The nodal point of the zone and the spiral artery will serve as the location of the "**Facility Centre**" having multi-use high-rise buildings with the parking plaza. Each intermittent zone will feature "**Amenity Area**" which will be connected to the main spiral artery via vehicular road. Each zone will feature spiral public walkways to enable circulation for the local dwellers.

Transportation Network

A quad-tier transport system will be maintained in the city. Which will consist of spiral public avenues, low flying zones, pedestrian streets and link roads. There will be one main spiral artery circulating through the center of the city. The connectivity of the zones with the main artery will be ensured via single vehicular road, which will be accompanied by a horizontal escalator. Within the zones, pedestrian movement will be maximized through spiral public walkways.

Inverse Architecture

Within the residential zones, the innovative concept of flying zones will be implemented. The housing units will have double storey with car porch on third floor. This proposition of car porch on the third floor will justify the concept of low flying zones. The city exhibiting the Composite Approach will not be having normal vehicles but instead it will have Flying Cars as major

commuter source. Some young and ambitious graduates of MIT first originated the concept of flying cars in 2006. As of now, the concept of flying cars is not just a theory but it has evolved into reality in the form of futuristic flying car goes by the name of "Terrafugia". The Composite Approach will revolutionize the transportation system by creating new dimension of personal freedom for the dwellers. To avoid any unfortunate event by usage of these flying cars, at first this service will not be used in bulk but will only be used as public transport in the form of taxis. These futuristic cars are able to take off vertically hence eradicating the need for the runway. The introduction of Terrafugia in the community will considerably reduce the harmful impacts of vehicular emissions on public health. As mentioned earlier that car porch will be designed on the third floor of the dwelling unit therefore any vehicular emission will be dispersed on a higher altitude without coming directly in contact with the dwellers. The dwelling units will have lifts, which will be used to gain access to car porches. Introduction of lift will ease the mobility of elders and disables.

Supporting Road Infrastructure

The overall commuting system proposed in Composite City Approach will promote pedestrian movement. The nodal points of the intermittent zones serving as the Facility Centers will have multi story parking plazas. The dwellers of the residential zones will park their cars in the parking plazas and will cover the rest of the distance from the parking lot to dwelling unit on foot. The distance between the parking plaza and the residential zone will be maintained at standard of 10 minutes. This 10-minute walk from the parking plaza to housing unit will be encouraged by designing beautiful and aesthetic spiral walkways. Moreover, for enhanced circulation within the zones, cycling lanes will be provided. Dwellers can use their own cycles and to encourage this cyclic maneuvering, a company, which can be used by paying a certain amount of fare, will place cycles equipped with trackers at cycle stands under the contract. The concept of effortless movement will be molded into reality by the provision of the horizontal escalators along the secondary lane connecting the main spiral artery. The street width will be kept enough to allow the movement of two vehicles in a single lane in case of emergencies.

Zoning

Instead of going for typical zoning as proposed by the city approaches mentioned, the Composite City approach preaches the concept of the Intermittent Zoning. As mentioned earlier that the major skeleton of the city will be in spiral form, therefore, each crest and trough of the spiral will accommodate an Intermittent Zone. As the name clarifies, the Composite City featuring intermittent zoning will have zones designed at gradual intervals. The residential and non-residential zones will be placed at respective crests and troughs of the main spiral artery. The reason behind the intermittent residential and non-residential zones is to promote easy accessibility for the city dwellers. Unlike previous zoning, practices, in composite approach, there will be no clear-cut categorization of zones. The concept of heterogeneous zoning will be followed. This means that zones will be intermingled with each

other. A residential zone will be surrounded by the zones of multiple nature. The residential zone will be centered with zones of multiple nature surrounding it. The idea behind this is that the people will not have to move to a completely new zone for daily routine.

CONCLUSION

In order to carve out environment friendly urban forms we need such standards which increases number of trees, safe resources and decrease carbon emission as compared to existing urban forms by introducing new/improved urban ecology. An urban form that facilitates a life style leading to low carbon budget and encourages bicycles and pedestrians instead of hydrocarbons dependent vehicles. It should discourage concrete jungle of buildings and rather have more space for lakes and natural sceneries. The basic concept behind the Composite City Approach is that it warrants for flexibility despite of giving a pre-determined urban form to the city. It goes against the phenomenon of the compactness. The flexibility is ensured by formulating "Composite Plan" which will be considered as the Master Plan. Subsequently, to achieve the goals of Composite Plan, action area plans with nomenclature of "Opus Plan" will be prepared.

RESEARCH IMPLICATIONS

a) Urban planning theories are politically biased in one way or the other and a number of problems arise in choosing a theory to support the decision-making process. Keeping this in view, this theory provides a corridor to planners to interact with all stakeholders i.e., communities and decision makers to reach the best possible solution of the problems.

b) This papers not only provides a comprehensive strategy for policy makers but also provide concrete solution for planning efforts in developing countries like Pakistan. For example, Islamabad is a planned city and proposed plan may help to resolve the six major problems of urban planning i.e. poor house, water and sanitation, transportation, health, education and land management. It will add all the legislative and developmental regulatory bodies to amend its laws for effective planning and implementation.

c) This proposed/hypothesized urban form may help to reduce GHG emission of from transportation and other social activities as proposing alternates of movements and encouraging pedestrian or cyclist pathways.

d) Urban form under discussion ensures the much-needed city resilience and sustainability in the urban infrastructure of the Pakistan by proposing flexible planning and bring together all elements of city planning.

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