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A Review of Walkable Neighbourhoods and its Multifaceted Benefits

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Abstract:- The concept of walkability and walkable neighbourhood is investigated using sequential mixed-method studies. A synergistic research project using mixed methods as one method enabled another to be more effective by providing a fuller understanding of the walkability, walkable neighbourhoods which ultimately lead to form the walkable cities.

Data collected in study is firstly the exploration of the term 'walkability' & its definition, 'walkable neighbourhood' and 'walkable cities'. The multidisciplinary dimensions and benefits of walkability and walkable neighbourhoods are studied. Findings are named as 3E's of walkability which is Essential, Encouraged & Extra.

Keywords:- *Walkability, Walkable neighbourhood, Walkable Cities, 3 E's findings.*

I. INTRODUCTION

Walking is fundamental and basic form of mobility and physical activity. It provides independence to navigate from one place to another which not only keeps us active and mobile but exploring new feet in all walks of life. Conventionally we human beings are considered as outdoor species but after such long time since human evolution on earth, we have turned into indoor species. The repercussions are obvious which is affecting the overall development genetically the mind, body and soul with less physical activity and inactive lifestyle.

In urban planning context, holistic approach required to understanding the walkability, factors affecting walkability, transport impact on environment, global footprint & public health. Walkability provides multifaceted Social, Economical, Environmental & Political benefits to mankind. This paper is an attempt to review the walkability and its impact and start a discussion on walkable neighbourhood and walkable cities.

➢ *Origin of term*

What exactly is term 'Walkability' meant? The term walkable has been in use since at least the 18th century (Oxford English Dictionary 2013).The literal meaning of 'Walkable' as per Oxford dictionary is "suitable or safe for walking" or the area(destination) being close enough to reach by walking. As far as 'Walkability' which in contrast with parent word is very recent term and is concerned with the measure of how friendly is an area for walking. According to advocate Dan Burden[1] the walkability movement started circa 1983 but believes the term came later circa 1992 or1993 (Burden, 2010).

The earliest found references of term 'Walkability' identified by researchers in the early 21st century (Southworth 1997; Southworth and Ben-Joseph 1995; Southworth and Owens, 1993). No definition was providing to the term walkability but elements of the built environment and factors which contributed to it were identified (Southworth et al., 2005, 1995, 1993). The terms walkable and walkability frequently appear in texts advocating new urbanism principles usually in relation to a positive association between new urbanism theories and the walkable neighbourhood (Henson, 2000; Kelbaugh, 2000; Southworth and Owens, 1993). Next segment in the report analyses the earliest identified definitions and descriptions of walkability or references of pedestrian friendly environments in the literature. The terms walkable and walkability frequently appear in texts advocating new urbanism principles.

➢ *Definition*

In literature and research the word Walkability defined and used by many researches. In 1995 Dan Burden & Florida Department of transport states walkable area as which provides continuously linked walkways, pedestrianized intersections, special accommodations for people with disabilities, signal placement, illumination, simplify median crossings, safe access to schools, eliminate backing out of parking spaces, commercial development access to have options other than vehicles, auto restricted zones, combine walking and transit, walkable scale land use planning of traditional neighborhood design, planned mixed unit development, transit orientated design.

[1] Dan Burden 1995 Transport

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S.N	First author (year)	Research Field	Description of main findings
1	Dan Burden 1992	Walkability Inc.	A walkable area provides: continuity & adequacy of walkways, placement of school and transit, ,street quality & speed with illumination signal placement, simplify median crossings, combine walking and transit, land use planning as per walkable scale, Density, Affordability of housing, (conventional neighbourhood design, planned mixed use development, transit orientated design with distance criteria)
2	Florida Department of Transportation 1995	Transport	A walkable area provides: linked pathways, Pedestrianised intersections, placement of school and transit, disable friendly accommodations (Americans with Disabilities Act ADA) ,path quality with illumination signal placement, simplify median crossings, Automobile backing up remove backing out of parking spaces, access to commercial development to other modes than vehicles, auto restricted zones, calming of traffic
3	City of Portland (1998)	Transport	"Think globally, walk locally "Walking is oldest and most basic form of transport. Pedestrian are catalyst in forming community. Variables: Zoning, Land use mix, destinations, connectivity, scale, topography. Pedestrian Potential Index on factors: Policy (2040 RMP), Proximity, transportation, other factors to destinations, environmental variables factor (mixed uses and density, proximity to destinations, interception density/connectivity, block size scale, slope). Deficiency Index: missing sidewalks, improper & unsafe cross walks , crash points between pedestrian & vehicle , traffic speed, traffic volume counts, carriageway width, block length and size
4	Henson (2000)	Transport Planning	LOS: Level of service, comfort, ease and safety , security and economy in transport planning
5	Congress of new Urbanism (2001)	Urban Design & Planning	Walkability alongside: connectivity, mixed use and diversity, mixed housing, state of art architecture and urban design, conventional structure, increased density, green transportation, sustainability and quality of life
6	King (2002)	Transport Planning	New Urbanism philosophy : Mixed use, Accessibility, Compact Development and public transport, environment stressors and curative environments, imageability and legibility
7	Stonor (2003)	Transport	Hierarchy of order for walkability; First order: Footway accessibility, ground level activity, pedestrian intersection design, traffic signal phasing & time of day. Second order: Illumination level, 'Type' of pedestrian (visitor ,tourist or resident) Walkway width, walkway gradient, Movement generators – proximity to transport facilities, signage, weather, day of the week, presence or absence of other moving people and/or other stationary people. Third order : Walkway quality, proximity to transport
8	Brian E. Saelens (2003)	Mixed (Public Health)	Levels of walkability; High walkable area are concentration of non residential land-use, grid like street patterns , main corridors with walkways, short block length, few cul de sacs and great street connectivity
9	Shriver (2004)	Planning	Transportation: No & type of block and intersections: street network with 4 way intersection, availability of transit. Land use with economic interaction & commercial services. Urban design to encourage walking, seating and parking per dwelling unit and commercial use.
10	Mayor of London (2004)	Transport	A walking friendly city is a city where people opt walking as preferred choice of travel for health, relax and leisure. As far as walking is readily available as a safe, accessible, connected and pleasant activity termed as walkability. 5C's concept: Connected, Convivial, Conspicuous, Comfortable and Convenient
11	M. Southworth (2005)	Planning	Walkability is extend to which built environments promote walking through comfort are: Connectivity, Path quality and context, safety, Fine grained land uses, linkage to other transport modes
12	Burden (2010)	Advocate	Walking is phenomenon to which the built environment is friendly for walking, shopping, visiting and leisure in an area for mass and presence of people.

13	Forsyth, Ann.2015	Urban Design	Walkability referred to promote liveliness, sustainable transport options or exercise. Walkability theme; Environment, Traversibility, Compact planning, Safety, Enticing and interesting. Outcomes; Social, Live community, Sustainable transport options, Physical activity like exercise. Proxies; Multidimensional, Holistic solution
14	Linda et al. 2019	Planning	Walkability referred to attractiveness to walking; Path quality, attractiveness. Assessing the walkability is more important than universal definition. Studies are more empirical & quantitative so need to be more on qualitative

Table 1:- Origin/Definition of term Walkability

II. WALKABLE NEIGHBOURHOOD

A walkable neighbourhood is such which promote positive experience through its safe and well serviced neighbourhood. It not only encourages pedestrian activity but also have least environmental degradation. Walkable neighbourhood associated with economy, social and land use diversity. The best parts of such neighbourhoods are that of its quality public realm which foster social interaction & exchange.

In terms of Equity it serves the best as it provide equitable access to goods & services, facilities and amenities which facilitates to protect global & local environment & public health.

S.N	First author (year)	Research Field	Description
1	Clarence Perry (1929)	Urban Design	Neighbourhood Unit : A unit which is walkable safely from home to elementary school and community center described in neighbourhood unit and community planning in three monographs
2	G. D. Suttles (1972)	Social Science	The Social construction of Communities: The area of familiarity forms the neighbourhood feeling. Neighbourhood exist first as social reconstruction unit
3	Southworth (1997)	Planning	Grain & pattern of neighbourhood and its density, land use patterns, open public space, street design and circulation pattern, access to public transport, pedestrian access and infrastructure good for pedestrian activity. Special character to children, teens and senior citizens and market success.
4	Henson (2000)	Transport	Qualitative study : LOS Level of service, comfort, convenience, safety, security and economy
5	G C Galster (2001)	Social Science	On the nature of neighbourhood: spatially based attributers like cluster of residences linked with other land uses. 'Compost Commodity' are challenges in planning to spatially delineated neighbourhood
6	Congress of the New Urbanism (2001)	Planning	Emphasis on Sustainability with quality of life, green transportation. Walkability alongside: connectivity, mixed use and diversity, mixed housing, state of art architecture and urban design, traditional structure, increased density.
7	A.C. King (2002)	Public Health	New Urbanism: mixed use, compact and accessible to all with public transport. stressors & restorative environments, imageability and legibility
8	A.Do (2002)	Predominately Transport	Aesthetically pleasing, well-maintained and well lit pathways
9	A V Moudon (2003)	Urban Design & Urban Planning	Objective & subjective measures of neighbourhood. fundamentals from the following groupings: Spatiophysical (roadway characteristics, environment along roadway, network area),Spatiobehavioural (non-motorised traffic, vehicular traffic, safety),Spatiopsychosocial (perception) and area policy that affects walking
10	Mc Cormack (2004)	Public Health	Land use patterns, Urban design characteristics (as street design) and transportation system links.

11	Alfonzo (2005)	Planning	Hierarchy of walking requires : feasibility, accessibility, safety, comfort, pleasureability
12	Urban Design Compendium (2007)	Urban Design	5C's by Mayor of London: Connected, Convivial, Conspicuous, Comfortable and Convenient
13	Sallis (2012)	Public Health	Neighbourhood Quality of Life Study (NQLS): Walkable characteristics & median household income compared for neighbourhoods for multiple health outcomes. Public policies have direct impact on neighbourhood attributes which directly influence physical activity & obesity in America
14	Emily Talen and Koschinsky (2013)	Geography & Planning	Tangible, definable, culturally significant phenomenon : Walkable neighbourhood is such which promote positive experience through its safe and well serviced neighbourhood

Table 2:- Walkable neighbourhood description in Identified Literature

- *Physical activity & health impacts of Walkable neighbourhoods*

Doyel et al. 2007[2] has emphasised the importance of walkable neighbourhood for active community which eventually results in lower BMIs for people living in more walkable are and have relatively safe environment than higher crime rate and less walkable areas.

Elizabeth Shay, Steven C.Spoon & A. Khattak[3] 2007 in their article on *Walking Environments and Walkable Activity have* analysed the travel behaviour choosing walking over automobiles and Physical activity. They found that however increase in walking was modest but aggregate benefits were numerous .Physical activities increased in study area and helpful in coping up with public health problems like asthma & obesity.

Duncon, Sharifi & Melly [4]2014 have studied the characteristics of built environment and BMI z scores in children and adolescent. They have found in their studies that overall built environment that are conducive to walkability were associated with lower BMI z scores. Large electronic data of geocoded residential areas of 14 pediatric Harward Vanguard Medical practices examined for age group 4 to 19 for a year period in 2012.

Physical features of built environment affect the BMI levels and modifying the existing neighbourhood to walkable one may reduce the children obesity.

Rodriguez[5] et al. 2006 in his studies found that conventional sub urban areas have higher physical activity and spatial data analysis suggest that spatial position have impact on increasing physical activity and reducing the sedentary way of life.

Brian Saelens[6] et al. 2003 had studied neighbourhood based differences of physical activity. In his another study which focuses on relation between physical activity & transit use Saelens in 2014 found that transit users had more physical activity than non transit users. Because of transit walkability and physical activity increased which further need to researched for health improvement of residents. These of course related with the type of neighbourhood & its transit usages.

James Sallis[7] et al. did an epidemiological study of multiple health benefits of particular neighbourhood in walkability & median household income. The study termed as 'The Neighbourhood Quality of Life'. Physical inactivity and obesity are major health related problems in US and were directly attributed to neighbourhood and controlled by policies. Health benefits, low emission of green house gases, reduced automobile use; conservation of open spaces can be promoted through policies which promote walkability & walkable neighbourhoods.

Transportation field studies to discuss neighbourhood forms have been done. Lund 2003 has acknowledged that it actually increases walkability and reduces automobile use.

[2] Scott Doyel : Active Community Environments & Health: The Relationship of Walkable & Safe Communities to Individual Health

[3] Elizabeth Shay, Steven C Spoon & Asad J. Khattak : Carolina Transport Program & Dep't of City & Regional Planning : University of North Carolina

[4] Dustin T. Duncan, Mona Sharifi, Steven J. Melly, Richard Marshall, Thomas D. Sequist, Sheryl L. Rifas-Shiman, and Elsie M. Taveras : Characteristics of Walkable Built Environment & BMI z scores in Children

[5] Rodriguez DA : Out and About : association of Built Environment & physical activity behaviors of adolescent females

[6] Brian E. Saelens et. al : Neighbourhood based differences in Physical Activity : An Environmental scale Evaluation, : Relationship between Higher Physical Activity & Public Transit Use : 2014

[7] James F. Sallis : Neighbourhood Built Environment & Income: Examining Multiple Health outcomes

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➢ *Economic aspects of Walkable neighbourhood*

Walkable neighbourhood brings economic value to the society. These economic benefits are reviewed in terms of property value and personal income and wealth of residents. Another study in this context is affordable housing.

Leinberger[8] 2011 suggested to walk, don't drive to make recovery of real estate. He advocates countering the mortgage & financial crises persistence in the market. Constructive role can be played by real estate and walkable neighbourhoods were key aspect like in ancient times.

Sohn[9] et al. 2012 found in studies that the neighbourhood which promotes walkability & pedestrian infrastructure are high in property values of respective neighbourhoods which are not. It is also found that certain land use mix were reason for increase in rental multifamily property value. Compact high density was found to be driving force and single family in King County, US recorded increase in property value.

Song & Knapp[10] have found that a net premium of 18% was paid for pedestrian infrastructure and amenities in the real estate. They also argue that residents were ready to pay 15.5% more for particular neighbourhoods which are attractive due to activities & walkability.

Personal wealth analysed by institutes like CNT[11]; Center for Neighbourhood Technology and NRDC[12]: Natural Resources Defense Council in United States. Affordability is measure of housing type linked with location. It termed as "location efficiency" which actually allow cheaper & larger loans to the residents of particular location which have leverage to save cost of transportation. Brookings Institute 2006 & NCT 2008 findings are location hinged financing of mortgages.

In the context of economic value for particular aspect of walkable neighbourhood like mixed use and mixed housing type. Kane[13] et al. found that good school increases the housing property value.

On mixed housing type development it was reviewed for negative aspects of subsidized housing in the neighborhood. This assessment heavily depends on neighbourhood context as studied by Tatian[14] et al 2012. As per Ellen & Voicu 2005, Negative impacts can be experienced if subsidized EWS community is more in struggling neighbourhood but if planned with other strategies and location it may provide positive results in housing values.

Mouzon 2006 in studies states that if walkable neighbourhood also able to incorporate the landscape greens which may further turn into savings if planned to grow local food production. Thus brings cheaper food for localities.

➢ *Social goals of Walkable neighbourhood*

Social goals are very important aspect which is researched in many walkability studies. And important one for intelligent life present on the Earth. We human beings are social animal and social capitals like trust among citizens, community feelings and sense of belongings are the important determinants in the context.

Putnam[15] made important study on higher levels of social capital linked with walkable neighbourhoods. Factors i.e. knowing & trusting neighbours & participation in community events are included in the survey.

Social capital is an important determinant of Quality of life, new urbanism theories are aligned with the Quality of life and its constant development. Rogers[16] et al. 2010 found in his studies that certain determinants of social capital have positive impacts having walkable neighbourhoods. Retrofitting of existing neighbourhood & new into walkable neighbourhood is recommended by him. Mixed use developments with interconnecting facilities & activities suggested connected with well lit safe, accessible, calm traffic not only encourages walkability but have positive social gains.

Kim & Kaplan[17] 2004 investigated the neighbourhoods on social domains of sense of community and found that particular community like Kentland had positive impacts. Overall layout, architectural style, physical built forms are vital in achieving sense of community feelings. Landscape green & natural features had its own importance in achieving social gains while help in increasing walkability and social interactions.

Podobnik[18] 2011 compared the neighbourhood on social capital domain and found increased social interaction in new urbanist neighbourhoods. Pedestrian friendly environments are helpful in increasing social capital.

[8] Christopher b Leinberger : Walk, don't drive , to recovery real estate

[9] Dong Wook Sohn et. al : The Economic Value of Walkable Neighbourhoods 2012

[10] Yan Song & Gerrit Knaap : Measuring patterns of Urban Development

[11] CNT : Center for Neighbourhood Technology United States

[12] NRDC : Natural Resource Defense Council United States

[13] Michael Kane :Cities, Region and Digital Economy ; New Challenges & Opportunities

[14] Tatian et al.

[15] Robert D. Putnam: Education and Social Capital

[16] Shannon H Rodgers et al: Social Capital and Walkability as Social aspects of Sustainability

[17] Joongsub Kim & Rachel Kaplan : Physical & Psychological Factors in Sense of Community; New Urabanist Kentlands & Nearby Orchard Villages

[18] Bruce Podobnik : Assessing the Social & Environmental Achievements of New Urbanism : Evidence from Portland Oregon

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Roberts 2007 found that in a mix use mixed income development, a well designed open space in walkable community plays an important role in increasing social interaction.

Wood et al. 2008 found that a well designed "safe and social "in nature which promote walkability & connect frequent destination have positive social capitals in terms of social interactions and perception of safety.

- *Environmental impacts of Walkable neighbourhoods*

Walkable neighbourhoods get affected by environmental factors like air pollution, emission from transport and energy required for transportation which not only degrade our environmental quality but also affect the health & wealth. Air quality index is big concern for Indian cities now days. Most of our cities are absolutely not suitable for living and it lies in severe to very bad and bad conditions. Heat island effect is also worry as transportation network share large area in urban areas.

- *Air pollution exposure & health impacts*

The 2010 Global Burden of Disease (IHME, 2013) found that most of the nations have experienced an increase in disease burden because of non-communicable diseases from 1990 to 2010. Exposure to air pollution especially the particulate matter (PM) contributes to those non-communicable diseases. Outdoor air pollution is one of the foremost causes of deaths worldwide and ranks fourth in China. There is an increase of total 33% in burden of diseases in China with 1.2 million estimated premature deaths and 25 million healthy years of life lost. Over the past twenty years. Road accidents are also one of the leading and growing causes of premature death and disability in countries such as India. In Asia air pollution accounts for sixth largest killer and in India it is fifth largest killer of society. Developing nation like us, the rate of growth is faster than other developed countries where construction activities add another burden of air pollution majorly with particulates materials PM.

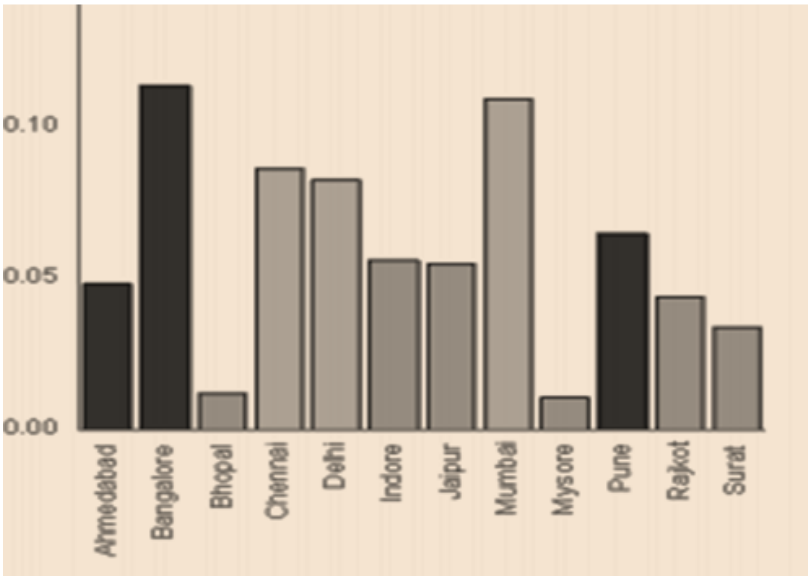

Fig 1:- CO2 emission in tons per capita per year India
Sources; CAI-Asia, Indian Cities Transport indicator CST India, Embarq

Emissions from transport: A recent study by CAI-Asia[19] suggest that CO2 emissions from transportation mainly road due to rapid motorization**,** is projected to increase at 7.75% per year, which is higher than many other Asian countries. Even though the present trip mode share in cities is considered same, CO2 emissions expected to increase 2 to 3 fold between 2008 to 2025. This is happening due to rapid urbanization and increasing number of trips and infrastructural projects.

[19] CAI Asia Indian cities Transport indicator CST, India, Embarq

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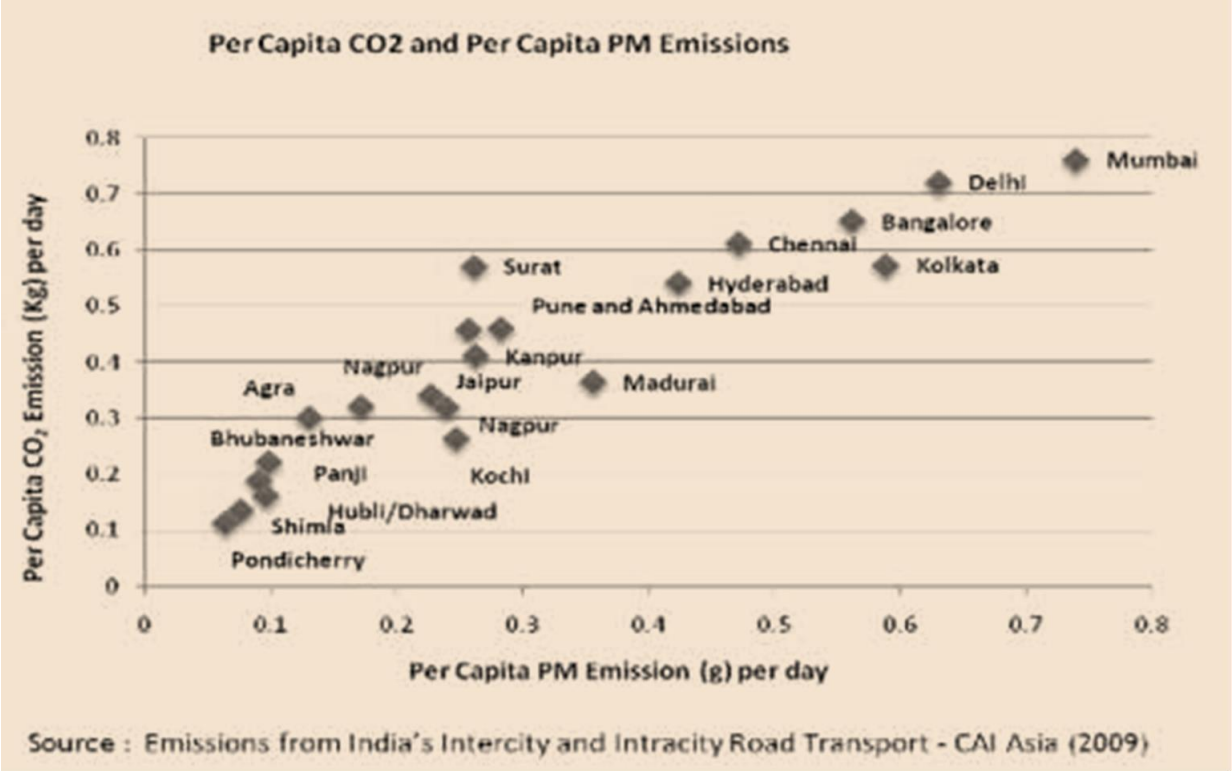

Fig 2:- Per capita Co2 and PM emissions India

Health Effects Institute[20] (HEI, 2010) released a report which assesses the best available evidence of air pollution exposure. It accomplished that the high exposure zone to traffic emissions stretches up to 300 to 500 meters from highways or major roads (the range reflects the variable influence of background pollution concentrations, meteorological conditions, and season). The study also anticipated In North America around 30% to 45% of people are exposed to such zones (HEI, 2010). The report also suggest that two fast developing economies of India and China ; their respective capitals Delhi and Beijing show 55% and 76% of the population within the range of 500 meters of a expressway and 50 meters of a major road expected to get exposed to high pollution level from traffic emissions(HEI, 2010). This proximity also added substantial noise levels in the city. Most of the Asian cities are densely populated, the percentage of people affected are higher to such exposures of air pollution. Pedestrians are exposed to high levels of air pollution while walking in busy roads with high vehicle emissions.

East-West Center (2007) in Hanoi in a study found that pedestrians were found to be exposed to 495 µg/m3 of PM10, motorcyclists to 580µg/m3, and car drivers to 408µg/m3 and bus passengers to 262µg/m3; all of which are way above the WHO guidelines for levels of PM10 of 20 µg/m3 (World Health Organization, 2006).

- *Transport Energy consumption and emissions*

International Energy Agency[21], 2013 estimates that transport is responsible for 62% (2011) of global oil consumption and nearly 26% of world energy use. Dependency on such fuels for transport imposes scarcity of fast emptying crude oil. Despite of new vehicle technology and fuel efficiency the co2 emission is predicted to rise 70% by 2050 compared to 2010 levels as per the latest IEA report and major contributors are developing nations. It has been well-known that transport co2 emissions in some Asian cities are re responsible for up to 70% of air pollution. The rate of such pollution level is higher in rate compared to Gross Domestic Product (GDP) growth in some countries in Asia. Unless we find alternative solution for fuel driven motor transport, scenario will get worse in next decade or so.

➢ *Global footprint on sustainable human developments*

The 2016 Human Development Report (the latest published) found that the U.N. Human Development Index (HDI) improved significantly across all regions from 1990 to 2015. HDI is a composite index based on three components: education, longevity, and income. A score of 0.7 is "high human development which can be considered as bench line. "Clearly, resource security is becoming an ever more significant factor for securing countries' long-term economic vitality and resilience. Unfortunately, till date we don't have mainstream development policy, much to the detriment of low-income populations," says Dr. Mathis Wackernagel, CEO of Global Footprint Network.

[20] Health Effects institutes 2010
[21] International Energy Agency 2013

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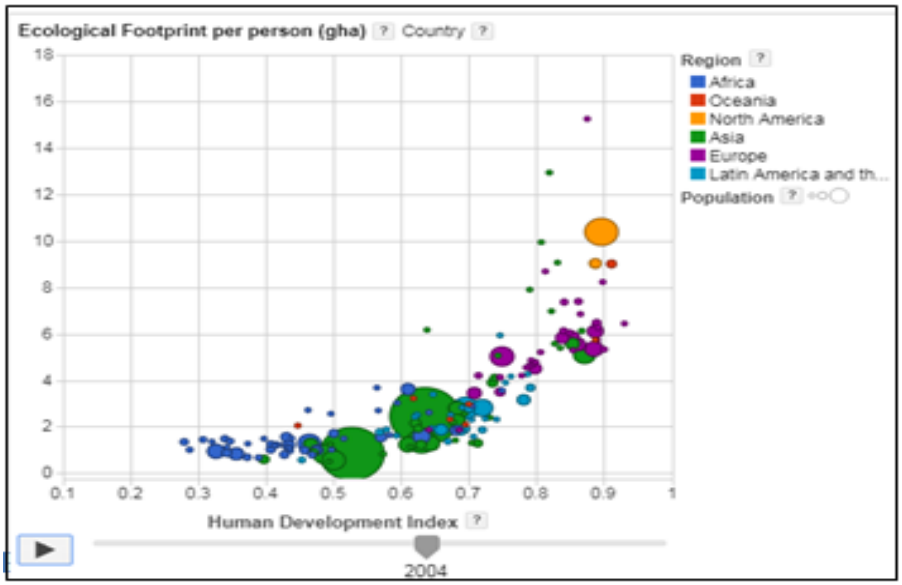

Fig 3:- HDI World in Ecological footprint per person (gha) 2004

Sustainable human development will occur when all can thrive within the means of our one planet. This is the ultimate goal of human development Sustainable development can be assessed with two overarching indicators: United Nations' Human Development Index (HDI) tracks a country's achievements in longevity, access to education, and income. They consider an HDI higher than 0.7 to be "high human development." To measure whether we live within the means of nature, we can use the Ecological Footprint. An Ecological Footprint of less than 1.7 global hectares per person makes the resource demand globally replicable.

➢ *Exhausting Natural Resources*

• Exploring Renewable means of Resources

The capacity of ecosystems to regenerate what people demand from those surfaces within the political boundary, though resources belong to composite form distributed as per geographically. All planet life, including human life, competes for space and resources from early period of civilization. The bio capacity of a particular surface is its ability to regenerate what people demand from it. Bio capacity is therefore the ecosystems' capacity to produce biological materials either used or consumed by people and to absorb waste products generated by humans, under current management schemes and extraction technologies.

Ecological Footprint is a measure of how much area of biologically productive land and water an individual, population or activity requires to produce all the resources it consumes and to absorb the waste it generates, either using prevailing technology and or resource management practices. The Ecological Footprint can be measured in global hectares per person, or in "Number of Earths", which represents how many planet Earths it would take if everybody had their footprint. This is hypothetical parameters in terms of global earth required to regenerate. Ecological Footprint analyses can allocate total Footprint among consumption components, typically Food, Shelter, Mobility, Goods, and Services—often with further resolution into sub-components.

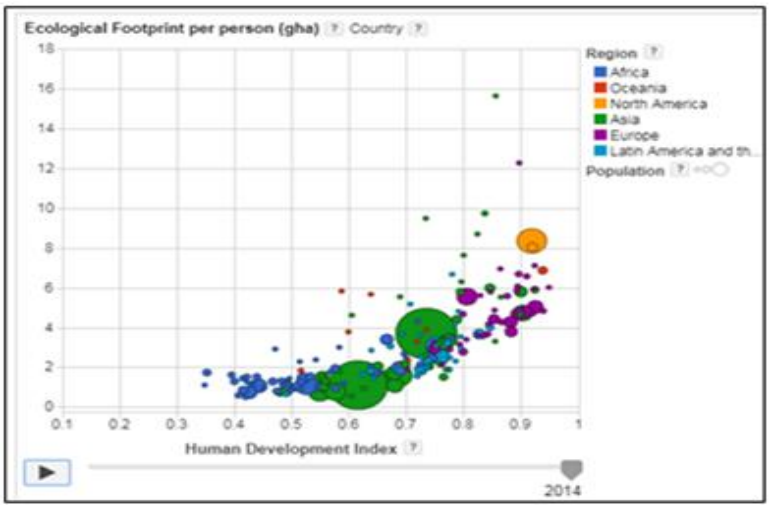

Fig 4:- HDI World in Ecological footprint per person (gha) 1994

Consumption Land Use Matrix
Built-up Land
Carbon Footprint
Cropland
Grazing Land
Forest Land
Fishing Ground
Total

Based on above consumption land use matrix decadal changes of combined parameter for India have been analysed. Ecological footprints is measure in which Bio productivity of land and water of political boundary requires to produce all the resources it consumes and to absorb the waste it generates of given population.

III. WALKABLE CITIES

➢ *Designing the Walkable Cities; Michael Southworth22*

Before the industrial revolution and automobile centric development, walkability was significant aspect of city design. Middle ages were outstanding in walkability having ½ mile distance from the central core in general. High densities with fine grained activities connected with walkable routes are features of such old cities. Urbino in Italy was having just 300 acres of area and yet able to accommodate population of 30000 people. Initially Industrial cities were also walkable but not healthy due to poor air and water quality and sanitary conditions. Later automobile centric development took over and cities expanded due to modernism and high speed transport and efficiency for fast moving vehicle. This resulted in ignoring the pedestrian infrastructure and walkability and in 1920 walkable cities almost started vanishing.

Post Industrial towns have overlooked the pedestrian demands. Large block sizes, cul de sacs and non continuous street patterns due to transport based planning done. Land use pattern segregated the activities with over scale wide lanes; lack of sidewalks discourages walkability in the cities.

Southworth defined the walkability before discussing how to design walkable cities and according to him walkability is extend to which built environments promote walking through comfort & safe environment, connecting places with reasonable travel time and effort and by providing aesthetically pleasing journey . It also connects people socially and higher level of social capital found in such environments.

Walking lays foundation for sustainable developments and its benefits are universally accepted. Walking is increased value for variety of reasons

- NMT/ Walk help reducing congestion
- Low environment impact
- High Social and Recreational value
- Promote Physical & mental health

Many factors affect walkability which is not just limited to distance criteria between places. The quality of path and built environment play important role. Attributes important for walkable networks are as follows.

- Connectivity
- Linking with other transport mode
- Safety
- Quality of path
- Fine grained land use pattern
- Path context

Most of the American cities have developed on automobile dominant pattern which are established. It is very difficult to turn it into walkable cities though lessons can be learnt from European cities which have done remarkably well in walkable cities concept. Few measures suggested by the author are as follows to improve walkability.

Firstly assessment of walkability is important at district and sub urban level to know the gaps. Then policies and plans which make pedestrian environment shall be prepared.

Secondly Standards and norms need to be revised to make walkability more acceptable by zoning of mixed use, street design and parking norms.

Thirdly more research in different social groups and built environment is required to ascertain which design factors affect walkability more.

Fourthly urban designers & planners need to focus on walkability with creative and experimental ways which enhance walkability.

Fifthly participatory approach in planning is essential. By educating people and involving in future planning will help increasing walkability.

Finally new generation planners and designers need to accept the fact that walkable neighbourhoods are essential and integral part of development. Barriers between disciplines like transport planning, urban planning and design, need to break down to encourage overall quality of life.

The task is challenging but regulatory environments dedicated to encourage and incorporate pedestrian and cycle friendly infrastructure at all levels is essential. By making cities walkable we can enjoy the fundamental ways of living and benefitting public health, social life and natural environment.

[22] Michael Southworth : Designing the Walkable cities; Journal of Urban Planning and Development Dec 2005 Professor of Urban design & Planning, Dep't of City & Regional planning and Dep't of Landscape and Environmental planning, University of California

➢ *Walkable Cities: Jeff Speck*[23]

Walking is more than just as safe & pretty pedestrian space. Jeff Speck says in his book that pedestrians are very fragile species which thrive and multiple in favourable environment. The general theory of walking must satisfy the four determinants which are meaningful, safe, comfortable and attractive.

Walkable city is notion which is simple and straight forward solutions to our daily life in society. But it is greatly linked with the nation's economic competitiveness, public health and welfare, environmental sustainability.

In present scenario in Urban planning context questions arises like: What kind of city we need to sustain and thrive economically? What kind of city we need which is safe and healthful for citizens? What kind of city we need which is environmentally sustainable? Walkable city is solution to all these issues.

Walking is an urban advantage and many surveys in America found that creative segment of society want communities with street life and pedestrian culture which make cities and neighbourhood vivacious. These neighbourhoods make urban fabric live and choice of many youngsters. America is experiencing major demographic shifts which are predominantly due to pro urban life which will persist for decades. Also walkable neighbourhoods facilitates citizens to save household income which are being spent locally thus brings economic sustainability.

Richard Florida[24] finds that these days generation don't consider car a necessity and source of personal freedom. In contrary not owing car and house is considered greater choice of independence and flexibility. Trends to shift in mixed use urban centers are growing due to naturally occurring retiring community who once live in large houses in sub urban communities.

Repercussions of fast urban life and growth of urban sprawl are obvious in American society which is more obese, stressed and lonely forced to live in auto centric polluting environment with reducing trees and forest covers.

Mercer's quality of life rankings are based in ten categories of Political stability, economy, social capital, health & sanitation, education, public services, recreation, housing, consuming goods & climatic conditions of particular places. On analysis of top global cities necessitates the parameters of Compact city with good green public transit and primarily walkable neighbourhoods. Hardly auto oriented cities make to top fifty lists of such rankings. If we still continue to throw ourselves in highways we will face health, wealth and environmental problems of degrading quality of life.

Author simplified the research and suggested ten (10) steps of walkability.

1. Put Cars in their place:

Automobile which is treated as master of development shall be treated as servant. Automobile centric development already distorted the way design decision is made in post industrial developments. Car first approach has hurt many American cities. It is high time to put human first instead of cars so that rational development can take place.

2. Mixed Use:

Mixed use is an approach by which planning can lead to right direction. Inclusive zoning & accessory dwelling units need to be incorporated in planning. Fine balance of activities within walkable distance to each other will help achieving the walkable neighbourhood in cities. Walk shall serve some purpose and interest.

3. Get the Parking right:

"Discourage parking lot in many". Ample parking actually invites driving. As per Andres Duani "Parking is density". Jeff recommends consolidated parking with higher price at business and commercial areas.

4. Let Transit work:

"While walking benefits from good transit, Good transit relies absolutely on walkability". Good walkability relies on good transit. Transit corridors with 10 minutes headway will help improve transit and ultimately urban fabric. As it is rightly said "Public transport are mobile form of public space".

5. Protect the pedestrian

As Jeff Speck suggest transit lane with more width or one way traffic encourages higher speed. So for shake of safety of pedestrian this needs to discourage. Road way improvements in terms of lane width, turning radius, flow & movement, signals, geometry and other factors need intervention to protect the pedestrian from vehicles.

6. Welcome Bikes:

Walkable cities are bikable cities. Biking and cycling make driving less necessary. Amsterdam with population of 783000 has 400000 people out on bikes on any given day which is fantastic & encouraging.

[23] Jeff Speck : Walkable Cities; How Downtown can save America, One Step at time (2012)
American City planners, Writer, Principal Speck and Associates; Urban Design & Consultancy firm, Co Author of Urban Planning books.
[24] Richard Florida : The Great Car Reset

7. Shape the Space

People will walk irrespective of climatic conditions if we get the design right. People always enjoy open spaces & great outdoors. To make the walk comfortable it is equally important to provide enclosures for pedestrians. Fine balance of green & grey required which is open space and parking.

8. Plant Trees:

Everyone is aware of importance of trees but few are willing to grow. Trees are important feature for encouraging walking which are beneficial in natural cooling, absorbing emissions to an extent reduce storm water pollution, reduce energy demand of air conditioning etc.

9. Make friendly & Unique facades

Create active & interesting façade which invite walking. Pedestrian needs to be entertained too along with safe, accessible and comfortable environment. Jeff further says that parking lots, drug stores and star architects which favour blank facades are enemies of lively streetscapes.

10. Pick your Winners:

Identify the fact that "Where can spending the least money make the most difference". This approach is equity based and Jeff argues to focus on downtowns (in American context) first and later short connecting corridors can be provided to walkable neighbourhoods.

Most cities are universally mediocre. Concentration not the dispersion is magic to urbanity.

➢ *Cities for People: Jan Gehl*

"There is so much more to walking than just walking".

Jan Gehl[25] is leading urban quality expert dealing in public domains to improve the quality of lives of City. As per him the compact design with sufficient density is key to environmentally sustainable cities. However walking and cycling to be adopted widely to cater increasing density with quantity and quality public spaces. As he rightly searched life between buildings, the streets, walkways, plazas, squares facilitate the life to cities. City which is inclusive in nature & public spaces human in scale, healthy, safe & vibrant are pleasurable for all the visitors, passerby and the inhabitants. Like right to clean water, everyone shall have right of public space, open greens, play space for children and walk to park within ten minutes.

For last five to six decades the urban planning ideology of modernism misses the human dimension and has low priority of public spaces, pedestrianism and role of urban space as congregation space for meeting, knowledge sharing and fun. Jane Jacobs[26] strongly raised her voice against the way we build our cities in 1960's. Cars invaded the cities in sixties in almost all the geographical locations and humans are deprived of their own space everywhere. Ever increasing vehicles are posing great challenges. For healthy, safe and vibrant sustainable cities, the planners, architects need to reinforce the pedestrianism and sociability of open public spaces to strengthen the idea of democratic society.

Sustainable, live, healthy & safe cities concept can be strengthened by growing concerns for pedestrians, cyclist and city life in general. As per Jan Gehl "First we shape cities then they shapes us".

Like other departments of Traffic & transport, Landscape, Public works, why can't we have pedestrian department in our cities. Hardly we have data & statistics of people and who will look after the people landscape, the human dimensions? The city people tend to be invisible and poorly represented in city planning. Gehl further focused of planning on People scale which is the scale at eye level and at 5km/hour of speed. This is the human thing.

Paradigm shift in planning: We want Lively, Attractive, Safe, Sustainable and Healthy city.

Attraction no1; The People: People scale, less Stress, less pollution and city dominated by people. Live & Safe City: Urban fabric to be live and safe in nature. Sustainable Cities: Good public realm is crucial for good public transport. The concept can be strengthened by growing concerns for pedestrians, cyclist and city life in general.

IV. FINDINGS

Based on the literature review the finds are framed as 3E's of walkability. First one is essential category which deals with walkability variables like mixed use, compact design, accessibility, proximity and connectivity. Second category framed as encouraged deals with density, zoning, street pattern and design and traffic calming measures. It will always be better to incorporate Extra category of street orientation and access to transit to strengthened walkability.

[25] Jan Gehl : Urban Quality Consultant in the field of architecture, Urban design & City Planning
: Making Cities for People

[26] Jane Jacobs : The Death and Life of Great American Cities

ESSENTIALS		
S. No	**Walkability Variables**	**Suggestions / Recommendations**
1.	Mixed Use	a. Neighborhood unit concept b. Mix of Commercial, Retail and public to residential housing types.
2.	Compact design	a. Ensure efficiency of land use. b. Encourage walk and NMT. c. Reduce cost of construction and maintenance.
3.	Accessibility/ Proximity	a. Close proximities of activities to each other and to residential areas. b. ½ mile or 800 meters distance for trip origin and destination.
4.	Connectivity	a. Short block length. (400-600 ft. in length is advisable) b. All destinations to be connected c. Intersection design preferably 4 way d. Avoid cul de sacs

ENCOURAGED		
S. No.	**Walkability Variables**	**Suggestions / Recommendations**
1.	Density	a. Residential density minimum 6-7 du/acre to 10-25 du/acre. b. Increasing employment density in commercial areas.
2.	Zoning	a. Rational zoning practice for walkable neighbourhood b. Excessive separate use to be discouraged c. Zoning increases the distance between activities sometimes inappropriately
3.	Street Pattern and Design	a. Grid like pattern highly connected b. Sidewalks, cross walks, curb ramps, medians, mini circles etc. c. Road improvement design to protect pedestrians d. Intersections preferably 4 ways.

4.	Traffic Calming and Street Speed	a. Shared lanes, avoid one way traffic, discourage ample parking, street narrowing, mini circles. b. Allow 15-20 mph speed and limited to maximum of 35 mph
5.	Open Spaces and Parks , Plazas	a. All levels open spaces and parks at sector , neighborhood , regional level b. Walking paths to connect all open spaces. c. Promotes sports activities
6.	Aesthetics	a. Interesting and pleasing facades b. Landscape part of residential , commercial, and meeting places c. All walkways to be well lit, illuminated, garbage and obstruction free.
EXTRA		
S. No.	**Walkability Variables**	**Suggestions / Recommendations**
1.	Street Orientation	a. Setbacks neither more nor less ideally between 15-25 feet. b. Narrow lot width c. If possible place garage along alleyways d. Porches to be located along sidewalks
2.	Access to transit	a. Transit stop at walkable distance 400-800mts. b. Intermediate stops to be appropriately located to encourage walking

Table 3:- E's of Walkability

V. CONCLUSION

The review is an attempt to put forth the identified literature and researches in the field of walkability and walkable neighbourhood which ultimately lead to form walkable cities. In present global scenario of economic recession, fossil fuel dependency and fuel trade war, climate change, environmental degradation walkability can help address the challenges to certain extent. Walkability has due importance with multi facet benefits like economic, environmental, social and healthy communities and societies.

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