

## Creating healthy spaces indicators

Arch. Esraa Ebrahiem Ebrahiem  
Demonstrator, Department of Architecture  
Obour engineering institutes  
[rokasalim92@gmail.com](mailto:rokasalim92@gmail.com)

Prof. M Alaa Mandour  
Prof. of Arch.& Building Technology  
at Arch. Department  
Helwan University  
Cairo, Egypt  
[alaa\\_mandour2004@yahoo.com](mailto:alaa_mandour2004@yahoo.com)

Associate Prof. Tarek Mostafa Sobhy  
Assistant Prof. at Arch. Department  
Helwan University  
Cairo, Egypt  
line 4: e-mail address

**Abstract-** Maintaining human health is one of the most important challenges facing our society, and there are many reviews of empirical studies on the relationship between nature and human health. It found a consistent negative association between exposure to urban green spaces, mortality, heart rate, violence, and a positive association with attention, mood, and physical activity, with more than half of the world's population now living in urban areas, and this proportion is expected to increase.

The urban-type has an impact on the traveling actions, which affects air quality on open spaces, and the global environment.

The World Health Organization tends to study the social need to provide a healthy environment around the world for all age groups by improving regular physical activity and greening in urban spaces. Therefore, it is imperative to rethink the methods of managing and designing urban spaces in Egypt to preserve public health and reduce the total dependence on medical care providers by redesign our urban spaces.

**Keywords:** climate change; urban form; built form; human health.

### 1- Introduction

Global climate change is a part of the larger Anthropocene syndrome of human-induced global environmental changes. These include land degradation, ocean acidification, and disruptions and depletion of the stratospheric ozone concentration, soil fertility, fresh-water resources, biodiversity stocks and ecosystem functioning, and global nitrogen and phosphorus cycles.

today, the world population is encountering unfamiliar human-induced changes in the lower and middle atmospheres and world-wide depletion of various other natural systems (e.g. soil fertility, aquifers, ocean fisheries, and biodiversity in general). Beyond the early recognition that such changes would affect economic activities, infrastructure, and managed ecosystems, there is now recognition that global climate change poses risks to human population health. globalization has brought new, large-scale influences to bear on patterns of human health. Various global-scale changes economic, social, demographic, and environmental (particularly climatic) are linked, for example, to the increased prevalence of obesity, changes in regional food yields, the emergence of infectious diseases, the spread of cigarette smoking,

and the persistence of health disparities. Undertaking primary prevention at the source to reduce health risks resulting from these global influences is a formidable challenge.

Conceptual perspectives are needed beyond the traditional understanding of causation and prevention, and political will, faith, and money. The difficulty of climate change mitigation strategies is evident. In the meantime, new tools and policies will be required to reduce the risks for health that have or cannot be prevented as a result of global change. The health sector should collaborate with other sectors to redefine how human society plans, develops, transfers, creates, uses, exchanges, and generates resources to help populations live sustainably and with long-term health

➤ **Research Problems**

1- Alcohol, smoking, drugs, environmental pollution, motor vehicles and weapons such as firearms and knives are today the major causes for death and harm to the urban world. Many of them have very little impact on the formal health system.

2- the rise of the amount of CO<sub>2</sub> which is the main part of the emissions ratio affecting the health of urban areas.

3- Several infectious diseases, including several newly circulatory diseases attributable to air pollution, are evidently growing and several studies have suggested the correlation of skin cancer with sun radiation.

4- Urban planning policies, particularly rigid zoning criteria and urban design, are incompatible with health.

➤ **Research questions**

Does space affect people's health?

How we can create healthy places?

➤ **Research Objectives**

- ✓ Determine the human needs that achieve the quality of life
- ✓ Environmental and health space indicators
- ✓ Demand for create new policy in the new urbanization

➤ **Research methodology**

the research discusses the quality of urban spaces in terms of achieving human needs and environmentally friendly spaces to improve human health and develop indicators for the design of healthy spaces such as the proportion of green areas, public spaces, activities within spaces, feeling safe, social interactions and reduce the spread of pollutants in streets and the transportation. through discusses the previous studies of the urban spaces to reach some requirements for the healthy spaces and human health in Australia and New Zealand

## **2- Case studies**

### **2.1- Australia Experiment, Selandra Rise**

Selandra Rise is a new residential community in Melbourne, Australia. A key focus of Selandra Rise was to implement best practices for health and wellbeing and to follow its impact to inform the design and development of future residential communities.

**A- The key features of Selandra Rise that integrated health into planning include:**

- early delivery of services, including public transport (a bus service), a community Centre (Selandra Community Place), diverse parks, a secondary school, and a town Centre.
- all households having walking access to parks and green space (300m).
- support for physical activity, including paths for walking and cycling and exercise stations.
- A long-term partnership between key stakeholders Stockland, the City of Casey, the Metropolitan Planning Authority, and the Planning Institute of Australia enabled the early delivery of public transport, Selandra Community Place, and diverse parks, which were the key features of Selandra Rise.
- Early provision of diverse parks and interim measures for creating community, such as Selandra Community Place, encourages social interaction and engagement amongst residents.
- Access to public transport and commute times to work are two of the most important dimensions impacting the health of residents. For example, long commutes to work reduced residents' capacity for physical activity, time spent with family and community engagement, while exacerbating weight gain.
- Provision of continuous walking and cycling paths that connect new communities with public transport, local destinations, and community facilities and services, both within and beyond a residential development, are needed to reduce car dependency and support physical activity, active transport, social inclusion, and community engagement.

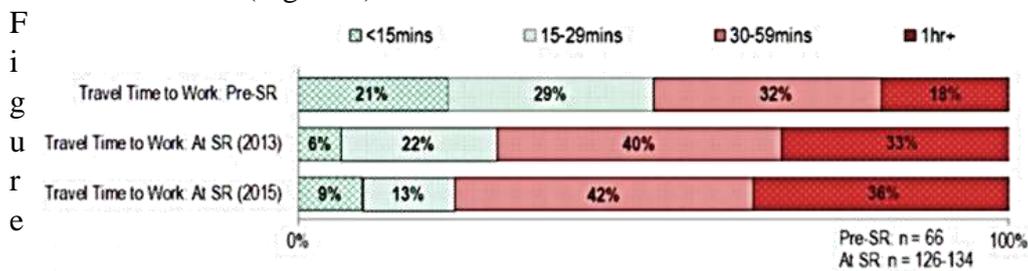


Figure (1) shows selandra rise planning. (source: google map, authors edit)

**b- Key findings for work travel:**

- Work was one of two main regular travel destinations for over 90% of Selandra Rise residents and most made this journey four or more days per week.
- In 2015, 86% of residents mainly used a car to travel to work, with 20% of households owning one car only, while 79% had two or more cars.
- Around one-third of residents working in the Melbourne CBD, inner or north-eastern suburbs, with many residents working outside the local government area (Figure 1).

- Only 13% of Selandra Rise residents worked in the Clyde North or Cranbourne postcodes (Figure 1). These postcodes represent work locations accessible by a bus ride of 20 minutes or less or walking up to one hour (walking would be difficult due to the lack of connecting footpaths).
- Commute times increased throughout the study as roads became more congested. Overall, commute times were unpredictable.
- Few residents found work closer to Selandra Rise during their participation in the study, while some found jobs in more distant locations.
- In 2015, 42% of Selandra Rise Residents traveled between 30 and 59 minutes each way to work, while 22% traveled each way to work in less than 29 minutes.
- Before moving into Selandra Rise, 18% of residents had a commute to work more than one hour each way; in 2015, this rose to one in three (36%) Selandra Rise residents (Figure 2).



(2) Comparing one-way work travel times at Selandra Rise in 2013 and 2015 (source: VicHealth 2016).

**C- KEY FINDINGS FOR COMMUTING AND HEALTH OUTCOMES:**

- Long commutes were a major concern for many residents and reduced the time they could spend with their families, participate in community engagement, and dedicate to physical activity.
- Residents with short commutes were most likely to report an increase in physical activity since moving to Selandra Rise (47%), while residents with long commutes were most likely to report that they exercised less (36%).

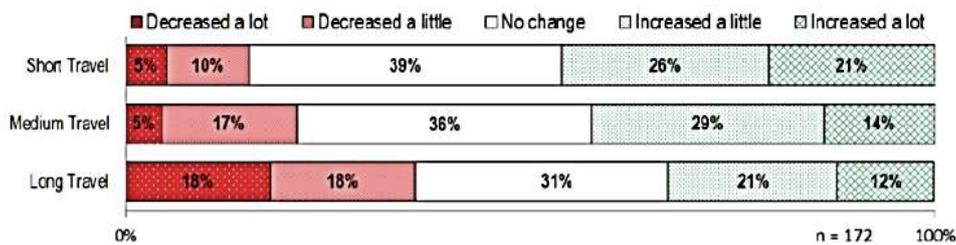


Figure (3) shows Change in Selandra Rise residents' self-reported physical activity levels about time spent traveling to and from work (source: VicHealth 2016).

Residents with short commutes were most likely to report having lost weight throughout their participation in the study (46%), while those with long commutes

were more likely to report gaining weight (52%) (Figure 4). Overall, most residents gained weight throughout the study.

**D-PHYSICAL ACTIVITY**

Most Australians do not participate in enough daily physical activity to benefit their health. Research has shown that access to attractive, large public open spaces can increase walking.

**D.1- PLANNED FEATURES TO SUPPORT OUTDOOR PHYSICAL ACTIVITY**

- All dwellings are located within 300 meters of open space/parks.
- Footpaths 1.5 meters wide, 2km of bike paths.
- A layout to encourage walking or riding to parks, local shops, kindergarten, primary and secondary schools (including wayfinding signage).
- Hilltop Park with a half-basketball court, children’s play equipment, outdoor gym stations, walking circuit, and open space.
- Heritage Park with a half-basketball court, children’s play equipment, an off-leash dog area, allocation for an orchard, and open space.

**D.2- WALKING AND PARK SATISFACTION**

- Being able to walk locally appealed strongly to residents. Walking was the most common type of physical activity, with 72% of residents who exercised including walking as the main type of physical activity, and 21% reporting walking as their only type of exercise.
- Resident satisfaction with ‘ease and pleasance’ (97%) of walking and the quality of parks (87%) were higher at Selandra Rise compared to residents living in their previous neighborhoods (85% and 75% respectively) (Figure5).
- Parks were the most common walking destination, but most full-time working residents that did not have young children used the parks infrequently

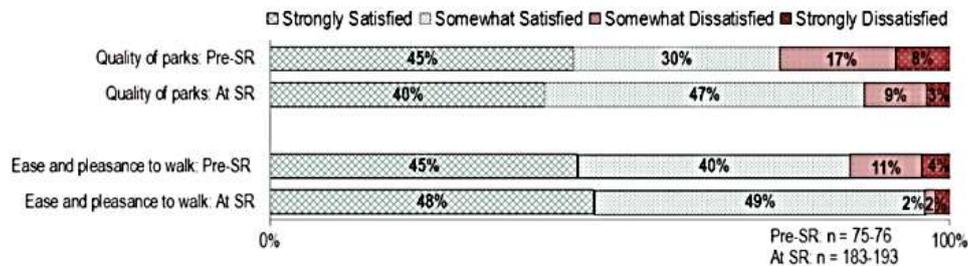


Figure (5) Comparing resident satisfaction with quality of parks and walkability at Selandra Rise to previous neighborhoods. (source: VicHealth 2016).

**D.3- The Key findings changes in physical activity levels**

- 86% of residents reported doing at least some physical activity’ when living at Selandra Rise, compared to 78% living in their previous neighborhoods.
- 42% of residents reported that their physical activity increased on moving to Selandra Rise while most reported no change or that their physical activity decreased (Figure 6) (includes activities on and offsite).

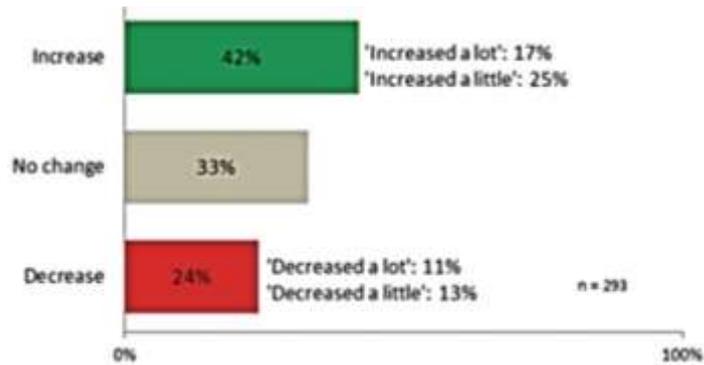


Figure (6) Change in residents' self-reported physical activity levels on moving to Selandra Rise.(source: VicHealth 2016).

- 49% of residents at Selandra Rise reported being pet owners, with 34% of households having one or more dogs, possibly encouraging physical activity for some residents.
- The impact of being able to walk to parks on residents' physical activity levels was mixed. For some residents, the local streets and paths encouraged physical activity, but others reported there were insufficient variety, distance, and/or destinations to encourage regular exercise.

#### **E- PUBLIC TRANSPORT AND CONNECTIVITY**



Figure (7) shows 798 bus routes to Selandra Rise 6.

(Source: Delbosc et al. 2016)

##### **E.1- public transport and the 798-bus service**

- Residents were more satisfied with access to public transport in 2015 (42%) than in 2013 (16%) after the introduction of the bus but were still less satisfied than those residents living in their previous neighborhoods.
- 96% of residents of Selandra Rise knew about the bus, and 92% of residents (including those who had not used the bus) considered it to be important.
- 23% of Selandra Rise residents reported using the bus at least once, with 23% of bus users using it multiple times per week, and 26% of bus users using it a few days per month.
- Overall, 35% of residents reported that someone from their household had traveled on the Selandra Rise bus, including visitors. In households that do use the bus, one-third reported there were multiple bus users.
- More households with children had used the bus (47%) compared to those without children (23%).

## 2.2- Manukau City, New Zealand.

### A- Manukau the Healthy City

Manukau the Healthy City located in the center of Auckland city. In 2008 Manukau the Healthy City commissioned a health impact assessment to explore the potential health impacts arising from the Manukau Built Form and Spatial Structure Plan.

#### A- Manukau concepts in Urban Design

- **The seven essential qualities for urban design featured by the Protocol are:**

**1- context:** ensuring that buildings, places and spaces are part of the whole town or city

**2- character:** reflecting and enhancing the distinctive character, heritage and identity of our urban environment

**3- choice:** ensuring diversity and choice for people

**4-connections:** enhancing how different networks link together for people

**5-creativity:** encouraging innovative and imaginative solutions

**6-custodianship:** ensuring design is environmentally sustainable, safe and healthy

**7- collaboration:** communicating and sharing knowledge across sectors and professions, and with communities.

A foundation of modern urban design is that creating livable cities requires thinking about the needs of people first – not the movement of transport. This means thinking about how we operate, navigate and understand the environment at the different scales and settings of our everyday lives.

#### B- **The Manukau Built Form and Spatial Structure Plan**

- a- **urban structure** – the future shape and ‘bone structure’ of the area, which addresses the proposed street layout, block and lot patterns, the open space network and layout, view corridors, significant elements and special sites
- b- **built form** – the three-dimensional commercial and residential building envelopes (defined by height, depth, length and use) environmental initiatives for buildings, such as water use and energy standards
- c- **the public domain** – the layout of public open spaces and street landscapes design details for the street system (lighting, street furniture paving, signage, and planting).

#### C- **The BF&SSP is intended to support the longer-term development of Manukau in order to:**

- create an appealing and walkable CBD
- unlock regional economic potential and attract investment
- stimulate employment and educational opportunities
- provide public transport choices and accessibility
- embrace features of local ecology (such as the nearby Puhinui stream) into future developments.



Figure (8) shows the new pedestrian focus outlined in the BF&SSP is intended to coincide with the construction of a new rail link. This is a branch line from the main north–south rail line, which will extend towards the city center. This new rail link is intended to increase connectivity with the other urban centers around Auckland and reduce the transport burden on the roads around Manukau City. To ensure adequate usage, the railway station must be fully integrated into the design of the city center. (source: Adrian Field, 2010)

### 2.3- Waitakere City, East to Auckland City

Waitakere City is located in the East of Auckland City. the sub-regional structure plan for Waitakere City promotes a clear pattern of consolidation around existing, and new, passenger transport and vehicle-based nodes.

#### A- Urbanity solution

##### A.1- Consolidation and dispersal

- ✓ Locate higher-density mixed-use activities closer to the nodal core and busy routes.
- ✓ Exploit the economic benefits offered by busy roads by fronting them with commercial and other uses that will benefit from the exposure.
- ✓ Locate community uses where they are most accessible.

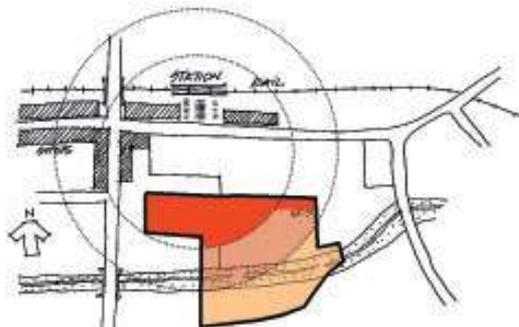


Figure (9) shows planning large sites, locate the higher densities and finer-grain mixed-use elements closer to the center of the node. (source: www.mfe.govt.nz)

##### A.2- Integration and connectivity

Plan sites that are well integrated into their context.

Aim to connect routes across and through the site to increase the public use and safety of the area. Rat running (taking short cuts) and speeding can be avoided through good design and traffic management.

Keep block sizes as small as possible, especially towards the center of a node, as this increases connectivity for all users.

### **A.3- Single-use clusters**

single-use clusters – such as retirement villages and office, industrial, science, leisure, and retail parks – offer few of the synergies possible with mixed-use, and they seldom make strong local connections. Where possible, these uses should be distributed in a manner that provides strength to the local center. However, where large single-use sites are unavoidable they should at least:

1. provide good interfaces with the surrounding streets
2. allow movement connections across the site
3. include facilities that are of use to locals and locate them where the public can easily gain access to them.

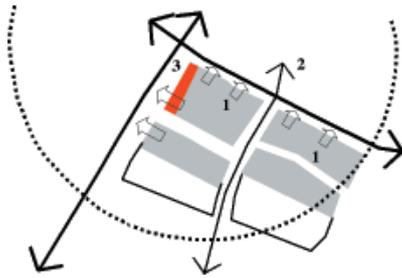


Figure (13) shows Single-use clusters.

(source: Ministry for the Environment,2002)

### **A.4- Diversity and adaptability**

- ✓ Vary the density within the site.
- ✓ Allow for change over time with connected street networks, good street parking, and lot depths that allow parking behind buildings should the uses change from residential to commercial.
- ✓ Plan for a wide range of uses and consider mixed-use areas.
- ✓ Ensure uses are compatible regarding noise, odors, parking, traffic, cultural and visual issues.
- ✓ Where uses differ significantly (eg, industrial vs residential), vary those across the backs of a block – not across the street.
- ✓ Consider buffer uses such as small business units or workshops between noisy elements and residential uses.
- ✓ Consider back-lane options near the center, which allow for the development of workspaces in the back lanes over time.

Figure (14) shows This proposed new town for Flat Bush at Manukau has robust perimeter blocks where buildings front the street and have their private spaces to the rear. (source: [www.mfe.govt.nz](http://www.mfe.govt.nz))





Figure (15) shows This mixed-use development in the Domain Terraces, Auckland, combines housing, offices, and shops, and offers good frontage to the street.

(source:<https://www.scribd.com/document/342862992/Manukau-Framework-Plan-Part-3-of-3>)

### **A.5- Ecological responsiveness**

- ✓ Define natural features and habitats as public spaces fronted by development to ensure they are safe.
- ✓ Provide tree-lined streets.
- ✓ Connect green areas with reserves where the specific movement requires this.
- ✓ Maximize the amenity value of each open space, including stormwater retention areas.
- ✓ Apply low-impact water-quality measures.
- ✓ Avoid extensive landform modifications which would radically disturb the natural character of the area or harm ecologically sensitive habitats.

## **B- Public space**

### **B.1- Integration and connectivity**

- ✓ Design public spaces and streets that effectively connect new developments into the surrounding context.
- ✓ Ensure public spaces are overlooked by adjacent developments and are bounded by streets to ensure a greater degree of personal safety.
- ✓ Design safe streets that combine the movement of public transport, private vehicles, cycles, and pedestrians.
- ✓ Provide generous on-street parking for efficiency, convenience, and to keep the public realm active and safe.
- ✓ Design pedestrian routes with good surface conditions, lighting, signage, and visual outlook. Consider techniques to reduce the space requirements for underground services without affecting their maintenance needs.
- ✓ Avoid grass berms in town/city center areas.
- ✓ Consider techniques that allow trees to be planted near services.



Figure (18) shows Pedestrian-friendly streets, such as this one in Mt Maunganui (left) and Onehunga (right). (Source: <https://www.cnu.org/>)

**B.2--Pedestrian-friendly streets can be achieved by:**

1. having lower traffic speeds
2. providing safe places to cross
3. avoiding the use of roundabouts in high-use areas.

**B.3- Lower speeds can be achieved by:**

1. avoiding one-way streets
2. junctions with tighter radii
3. reduced carriageway widths
4. on-street parking
5. frequent changes in street alignment, and other traffic calming measures.

**B.4- Diversity and adaptability**

- ✓ Promote and design for a wide range of activities, including organized events and markets as well as informal use by individuals and small groups.
- ✓ Consider temporary access and parking needs.
- ✓ Promote well-defined, active edges to all public spaces.
- ✓ Provide coordinated designs for furniture and equipment which can be used in a range of different ways.
- ✓ Promote flexibility of use with simple, uncluttered layouts.
- ✓ Promote winter usage by having some areas with good drainage and hard surfaces for play activities.
- ✓ Provide effective lighting to enable night-time use.
- ✓ Design for shade, as well as solar access, shelter and views.

Figure (19) shows The Square in Christchurch is a robust venue for performers, artworks, outdoor markets and other functions.

(source: <https://www.stuff.co.nz/the-press/business/the-rebuild/88676683/regeneration-strategy-for-christchurchs-cathedral-square-expected-midyear>)

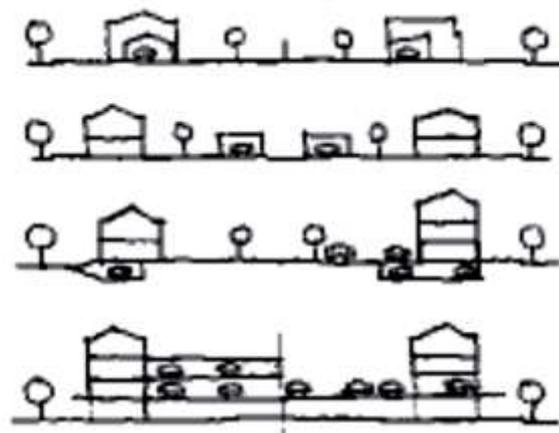


**C- BUILDING DESIGN: Built elements**

**C.1- Integration and connectivity**

- ✓ Design buildings that are well integrated with public transport facilities.
- ✓ Locate active areas opposite bus stops or rail stations.
- ✓ Design buildings to have active rooms fronting onto the public areas in front of them, so users or residents can connect with people in the street.
- ✓ Avoid blank walls on the street edge.
- ✓ Set garages back from the fronts of houses to ensure they do not dominate the street.
- ✓ Step tall buildings down to integrate with lower buildings unless these are likely to be redeveloped at a future date.

Figure (28) shows the degree of liveability on streets by changing parking locations, create lively streets by ensuring parking doesn't dominate.



(source: Ministry for the Environment, 2002)

### **C.2- Legibility and identity**

- ✓ Design buildings (or groups of buildings) that provide an active frontage through windows and entrances fronting the street, narrow and varied building frontages, articulated facades, and active internal uses that communicate or spill out on the street.

Figure (32) shows new mixed-use buildings in Wellington exemplify a contemporary, yet contextual, response to a traditional setting.



(Source: <https://www.stuff.co.nz/business/95743868/corner-site-in-wellington-with-consent-for-highrise-development-on-the-market>)

## **3- HOW TO CREATE HEALTHY SPACES IN EGYPT.**

Egyptian zoning practices, requiring greater travel distances between where we live, work, and play, maybe counter to the original health intent because of car culture, city planning and its allied professions have become aware of the health impacts that our land use and transportation decisions have on the ability to walk and bike, the most common forms of physical activity. **we can solve our problem by applying these principles:**

1. Support planning for and delivery of local and regional employment appropriate to the range of work sectors and professions of residents to reduce commute times.
2. Integrate all transport options to promote multi-modal use, active travel, and reduce car dependency; ensure enough road infrastructure to cope with changing traffic volumes.
3. Priorities active transport through the provision of continuous, walking and cycling paths within developments and connected to other communities, local destinations, public transport, and other services; provide shading and amenity via greening.

4. Deliver parks as the first residents move in to encourage walking, creating spaces for children of all ages to play, and so that they can walk to parks and schools safely across the city center area
5. Provide enough lighting and shelter (including trees) when delivering parks, outdoor physical activity infrastructure, and children’s play equipment to support all-weather use.

#### 4- RESULTS

**TABLE 1 : HEALTH SPACE ENVIRONMENTAL INDICATORS(SOURCE:AUTHORS)**

Sustainable urban form	
<b>Healthy Green spaces</b>	<ul style="list-style-type: none"> <li>- Use large park areas, river or stream edges, and waterfronts as opportunities to integrate ecological restoration.</li> <li>- Provide for continuity of green networks where the specific movements of wildlife, or waterways, require this.</li> <li>- Extend tree planting within the street network.</li> <li>- ensures streams, parks, bush areas, and coastlines within urban areas, are integrated with development to make these areas safer.</li> </ul>
<b>Healthy building</b>	<ul style="list-style-type: none"> <li>- Allow for stormwater treatment measures.</li> <li>- Consider how the layout will accommodate changes in use over time.</li> <li>- Discourage single-use clusters. Where they do occur, ensure they front onto existing streets, and make good connections with the movement system.</li> <li>- improves energy efficiency of buildings through sharing walls</li> <li>- helps form active ‘edges’ where buildings address and open out to the public area, creating vitality</li> </ul>
<b>Healthy street</b>	<ul style="list-style-type: none"> <li>- Provide a simple, legible, connected street network that avoids overly complex, contrived layouts.</li> <li>- Locate new street linkages where they will provide safe pedestrian access to the node and public transport.</li> <li>- Provide traffic planning and management that balances traffic efficiency with streetscape quality, pedestrian safety, and comfort.</li> <li>- Develop highly connected street networks that can support a range of activities, which may change over time.</li> <li>- makes more interesting and safer streets, where buildings address and overlook the street and do not have high fences or blank walls</li> <li>- encourages walking, through small connected blocks leading to neighborhood activity centers</li> </ul>
<b>Healthy transport</b>	<ul style="list-style-type: none"> <li>- Locate public transport stops where they are looked over by adjacent development.</li> <li>- supports public transport by increasing density and arranging strings of nodes along public transport corridors</li> <li>- reduces distances that need to be traveled between activities, reducing transport costs</li> </ul>

	<ul style="list-style-type: none"> <li>- reduces the need to travel, and therefore the amount of pollution generated from vehicles</li> <li>- supports walking and cycling</li> </ul>
<b>Healthy public space</b>	<ul style="list-style-type: none"> <li>- Walkable nodes people will take around five minutes to walk 400m and 10 minutes for 800m. A five-minute walk to convenience shops, bus stops, and other daily facilities is considered reasonable, as is 10 minutes to a railway station.</li> <li>- Promote higher-density residential activities that achieve high standards of privacy, safety, security, private open space, and visual character.</li> <li>- Link landmarks and nodes with strongly defined paths.</li> <li>- Use contrast and differentiation in design to make each public space memorable.</li> <li>- supports public spaces, creating safe and busy areas at all times of the day and night</li> <li>- supports activity and walking by creating activity during the evening and the weekend, making places that are safer and not 'dead' after hours</li> <li>- creates safety – places that have little movement.</li> </ul>

## 5- CONCLUSION

Egyptian zoning practices, requiring greater travel distances between where we live, work, and play, maybe counter to the original health intent because of car culture, city planning, and its allied professions have become aware of the health impacts that our land use and transportation decisions have on the ability to walk and bike, the most common forms of physical activity.

improving Regular physical activity in Egyptian spaces maintains muscle strength, peak bone mass, joint structure, and function, and perceived physical and mental health status. Moreover, the benefits of regular physical activity may accrue more to persons in the last decades of life, as it may delay the onset of partial or total disability, chronic diseases, and total dependence on medical care providers.

green space in urban areas is good for health and wellbeing. It has been associated with reducing feelings of stress, increased levels of physical activity, more opportunities for social interaction and assisting in child development, releasing oxygen provide clean air, water, and soil, and balances in the Egyptian natural urban environment.

## 6- RECOMMENDATION

our urbanity is in the hand of researchers, professionals, the public, everyone is responsible for the future of Egyptian spaces by applying the health indicators in our spaces

- The road space for pedestrians must be restored in residential areas, and movement and vehicle parking must be stopped. To improve the environment.

- Establishing standards used as a framework and a useful tool for all local authorities to determine their local standards. Trusted fields the quantitative component of requirements relates to provision of outside activities

- City congestion should be minimized on pedestrian routes. In a simple and consistent "furniture area" that is to be added at a minimum needed for the foot bread, signs, trees, lampposts and all other street furnishings should be placed.

- The opportunity to reduce the anxiety of crimes is possible in well-built areas with protective measures such as walls, locks or secure entrances.

## 7- REFERENCES

1. Anthony J. McMichael, "Globalization, Climate Change, and Human Health" The new England journal of medicine global health, Massachusetts Medical Society, 2013.
2. Alberti, Marina, Derek Booth, Kristina Hill, Bekkah Coburn, Christina Avolio, Stefan Coe, and Daniele Spirandelli "The impacts of urban patterns on aquatic ecosystems: An empirical analysis in Puget Lowland Sub-Basins. Seattle", Department of Urban Design and Planning, University of Washington, 2003
3. Adrian Field "Integrating Health Impact Assessment in Urban Design and Planning: The Manukau Experience" for the Ministry of Health
4. Nancy F. Huddleston, Laurie Geller, Sally Tyldesley and Tracey Elliott "Climate Change Evidence & Causes", An overview from the Royal Society and the US National Academy of Sciences, 2013
5. Lawrence D. Frank, Peter O. Engelke "The Built Environment and Human Activity Patterns: Exploring the Impacts of Urban Form on Public Health", Journal of Planning Literature, Vol. 16, No.2(November 2001).
6. Metcalfe S, Woodward A, Macmillan A" Why New Zealand must rapidly halve its greenhouse gas emissions" New Zealand Medical Journal, 2009
7. S, McCreanor T, Witten K.. "Reducing CO2 emissions from domestic travel: exploring the social and health impacts" Greenaway, Eco health, 2008
8. Public Health Advisory Committee "healthy places, healthy lives: urban environments and wellbeing" A report to the Minister of Health, Wellington, New Zealand, April 2010, <http://www.phac.health.govt.nz>
9. Witten K, Exeter D, Field A. "The quality of urban environments: mapping variation in access to community resources" Urban Studies, 2003.
10. Ewing R, Schmid T, Killingsworth R, et al." Relationship between urban sprawl and physical activity, obesity and morbidity" American Journal of Health Promotion. Suburban sprawl and physical and mental health, 2003
11. Adrian Field "Integrating Health Impact Assessment in Urban Design and Planning: The Manukau Experience" Ministry of Health, New Zealand September 2011, [www.moh.govt.nz](http://www.moh.govt.nz)
12. Nancy F. Huddleston, Laurie Geller, Sally Tyldesley and Tracey Elliott "Climate Change Evidence & Causes", An overview from the Royal Society and the US National Academy of Sciences,2013
13. VicHealth 2016, Planning and designing healthy new communities: Selandra Rise: Research summary, Victorian Health Promotion Foundation, Melbourne.