

INTERACTIVE PATHWAYS AS A NEW SUSTAINABLE TREND IN THE BUILT ENVIRONMENT

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Abstract

Nowadays urban cities are facing many challenges, like accelerating globalization, social, demographic changes and urban growth. From this point of view, the idea of interactive cities begins. Interactive cities, from the technological side, is a cutting-edge project. Its objective is exploring how the digital, social media and other interactive ways improve the urban management. Interactive cities will not only focus on the technological side but it also focus on how this kind of innovation can be useful for our community, changing the way of designing and promoting better urban governance, citizen participation, and economic growth. Pathways in our community are one of the most substantial elements affecting our urban life, the city image depends mainly on pathways; as there is a direct relationship between it and the way of transportation, whatever a car, bus, bicycle, or even if you are a pedestrian. Interactive pathways outline a new planning paradigm pertinent to urban development. This study discusses the idea of interactive pathways which appears in different forms. One of the essential problems in Egypt is that many design principles which activate the idea of positive interaction are neglected. Thus, neglecting the users' perceptual levels and the street lifestyle at all. The main objective is to clarify the design criteria which activate the idea of interaction in the design of urban paths, then the study focuses on the role of pathways in urban life, determining the pathways definitions and levels, Sustainability Concept, Sustainable planning and design criteria for the pathway and the ways of Interaction.

Keywords

Urban Design, Pathways, Sustainable, Interaction.

1. Introduction

1.1. Background

The pathway is the connector of the city, and interaction is the key which adds new dimensions on the elements of the city, converting the sense of the space from static to dynamic.

1.2. The problem

In Egypt, many design principles which activate the idea of positive interaction are neglected, also convenience and safety of pathways have been seriously ignored; Since the vehicle has been the dominant mode of transportation, planning was concerned with driving needs, building more roads and

even more driving and so on, therefore neglecting open public spaces, sidewalks, pedestrians' needs, the users' perceptual levels and the street lifestyle at all.

1.3. The Objective

The main objective is to determine the design criteria which activate the idea of interaction designing urban paths to reach the sustainable pathways.

1.4. The Research Hypothesis

Concentrated in: The interest in the design of interactive pathways results in sustainability in the urban areas

1.5. Methodology

To achieve the objective the methodology focuses on the role of pathways, sustainability concept, integrated planning and design principles of the movement network (automatic and pedestrian), ways of interaction.

2. Pathways

2.1. Pathways as one of the Urban Elements

History of the streets

By reviewing the historical development of urban planning, it was recognized that the cities were planning pedestrianized narrow organic streets in line with the topography of the earth in accordance with the human scale. The pedestrian movement was the one that was dominant before the industrial revolution. The streets were the arteries that provide the urban fabric with life, Reflecting the local and urban identity of the urban areas as shown in figure (1-2). It helps to form a mental image among many people within their cities when properly designed over the course of time (Mumford,1961).



Fig.1: Shows the Paths in the Past, Cairo, 1904. Source: www.masrzaman.com

The observation of the user or his perception for the ease of movement is a spacial and temporal sequence for a group of events.

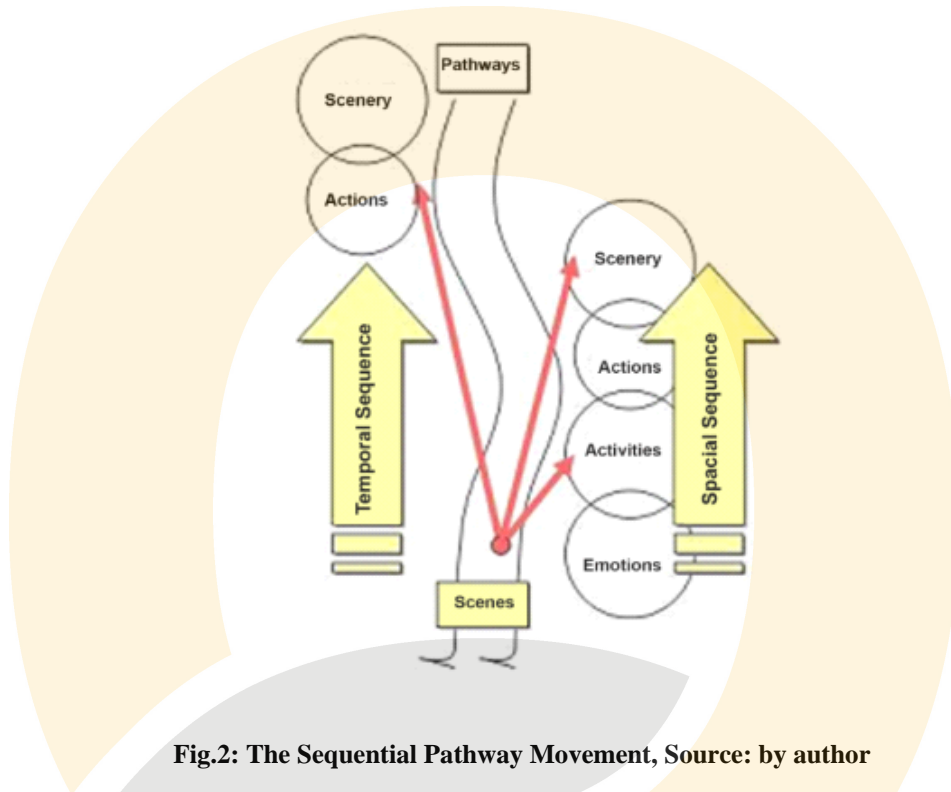


Fig.2: The Sequential Pathway Movement, Source: by author

3. The Relation between Man, Pathway and Time

People usually think about their pickups and destinations, so they are looking for the paths origin points and final destinations. Paths with obvious start and end points have stronger identities, helped in tying the city together (Ayman A. Hamid, 2008).

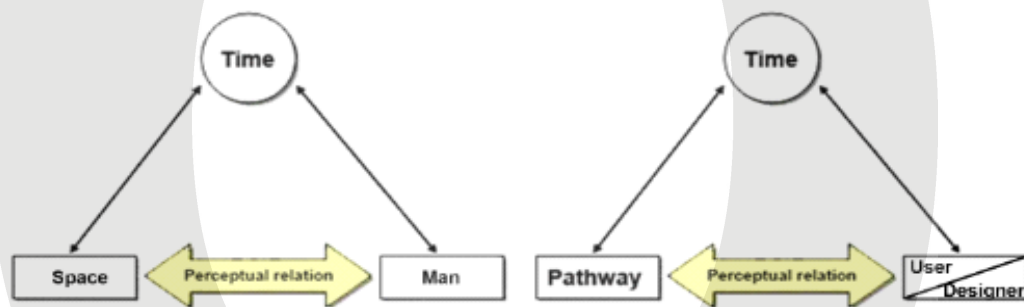


Fig.3: The Interactive Pathway Relation, Source: by author

The user's movement in space represents the fourth dimension which is the time dimension. Time affects directly the perceptual relation between user and pathway.

3.1. Designing for Public

The best scenario to design for public is to think like the everyday user. The users of the city systems are probably so different from their designers, as they have different perception levels for the city and its modes of

transport. The interaction purposes might be political, economical, ecological, sustainable, entertaining or social.

"The best streets encourage participation. People stop to talk or maybe they sit and watch... taking in what the street has to offer." Allan Jacobs, Great Streets"

What may differentiate Place making from other urban planning and design movements is its emphasis on spaces that facilitate interaction between people. Streets, more so than any other public space, have the potential to spark limitless interaction - planned and unplanned, long and short, between people of all ages and backgrounds. It's what builds a sense of community and place attachment. As Jane Jacobs said, 'The trust of a city street is formed over time from many, many little public sidewalk contacts.(Projects for public spaces, 2015)

" If you plan cities for cars and traffic, you get cars and traffic. If you plan for people and places, you get people and places". Fred Kent, Project for public spaces"

The successful design is the design that fits the users requirements and the successful designer is that knows the importance of the participatory design.



Fig.4: The Effect of the User Experience on the Design, Source: the Difference between UX and UI Design-A Layman's Guide, 2016

4. Street Levels in the City: Levels of Pathways

Hence, the pathways are an important and effective part of an urban area. Its main role is to accommodate all kinds of transportation, in addition, to facilitate the pedestrian movement safely and the interaction between different parts of the urban area. The pathway is a part of the urban space which adds to its visual aspects. Here we find the functional classification of the pathways, whether it is the arterial street, transitional street, local street and collector street as shown in figure 5. (Garyhack, 2009)

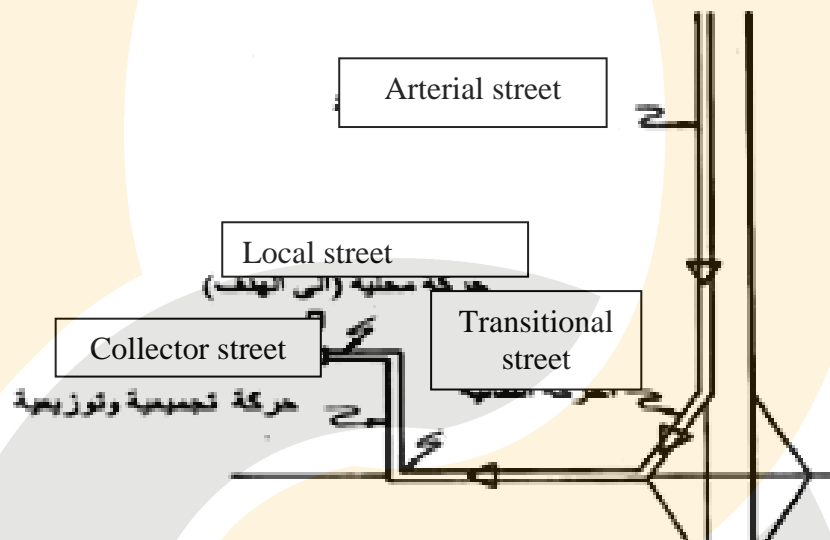


Fig.5: The Functional Classification of Pathways www.momra.gov.sa

4.1. Local (Service) Streets for Residents

Its function is to provide a direct access for the car or pedestrian to the plots adjacent to the street borders, provide an aesthetic urban space comprehensive with trees, shrubs, flowers, provide a place to extend public utility lines, and also provide an open place between the houses for ventilation and lighting. The most common forms in the local streets are cul-de-sac and loop, preferably 10 m wide and not less than 8 m. These roads shall be ringed or closed, with a length not exceeding 150 m.

4.2. Collector Streets

The collector street is the backbone of the residential neighbourhood where the local streets are connected with each other. They should be designed in a manner that does not encourage foreign traffic to be used for short passage. The transit of main or secondary street jobs is preferably not less than 12 m.

4.3. Arterial Streets

It may be called arteries or traffic streets and is divided into major arterial streets and secondary arterial streets and will be clarified.

4.3.1. Main Street (Arterial)

It is the most important and tallest streets in the city. Its traffic density is high, and it provides connectivity to the city and the incoming and outgoing traffic to and from it with the highways. These streets link the feeding streets to the main traffic streets of the city. The main function is to move large amounts of traffic and preferably not less than 16 m.

4.3.2. Secondary Arterial Streets (Minor Arterial)

It works as a secondary street from the main arterial streets and connects between the centres of the city. Its length is less as well as the volume of traffic and traffic density less as well as speeds and passes near neighbourhoods and communities.

4.4. High Ways

It is designed to have entrances and exits. In general, in the design of residential areas, there is a complex street that serves the whole area without allowing traffic to penetrate and gets out of the local ways to reach the buildings.

5. Urban Sustainable Planning Concept

To understand the concept of sustainable urban planning in its proper form, it is necessary to clarify the concept of sustainability first and then how to achieve it in urban planning to achieve the sustainable development of the urban environment.

5.1. Sustainability Concept

Sustainability is a comprehensive term linked to the development required for human society. It calls for attention to the human future and thus to preserve the environment that gives continuity to humanity in order to achieve environmental, social and economic sustainability and meet the needs of current and future generations.

Environmental problems such as environmental pollution, global warming and climate change resulting from increased energy consumption and depletion of natural resources in various construction and urbanization have made it necessary to think of sustainability as a way of life.

With the technological development and the information revolution, it is necessary to look for advanced methods and creative ideas to deal with natural resources to focus on environmentally friendly technologies especially in the field of building and urban planning.

The Definition of Brand Tland (BRUNDTLAND) has been an international recognition since the beginning of the dialogue on this concept. The report known as our common future in 1987, was an attempt to define sustainable

development as the ability to meet our needs in the present, Prior to that date, the element of the environment had no interest. how the emphasis was on the economic factor and the social factor. (Edwards and Hyett, 2002).

5.2. Key Dimensions of Sustainability

Sustainable development: Three main axes linked to each other cannot be separated from each other. Figure (6) shows how to achieve sustainability as follows:

- Environmental dimension: which is concerned with ecological balance and preservation of the environment, whether natural or built.
- Society dimension: which is concerned with achieving social empowerment and stability in various human societies.
- Economical dimension, which is concerned with achieving economic development, increasing productivity and achieving economic efficiency (Al-Zubaidi, 30-31, 2006).

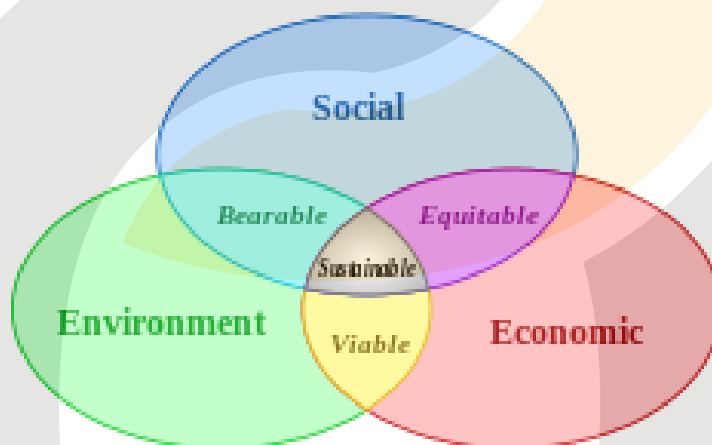


Fig.6: Key Dimensions of Sustainability www.arch.hku.hk/rsearch/BEER/sustain.com

5.3. Sustainability in Urban Planning

Sustainable urban planning includes all the basics of classical urban planning as well as more attention to the environmental, climatic and local characteristics of the region in all its cultural and social contents, and ensures the best utilization of its resources. This trend is increasing especially after environmental degradation and taking advantage of technological development.

Sustainable urban planning aspires to achieve the idea of sustainable cities that meet the cultural, political, environmental, social and economic and

physical objectives. It is a dynamic and complex organization that responds to changes. Sustainable cities are multi-faceted cities (Lynch, 1979).

1. A beautiful city: art, architecture and gardens drive imagination and spirit.
2. Innovative city: respond to changes with a rapidly expanding horizons and experiences.
3. Environmental city: reduce the environmental impact and balanced gardens with the building part and the buildings and infrastructure is safe and the sources are used effectively.
4. Easy to communicate: where the community is encouraged and flexibility and the exchange of information face to face and electronically.
5. A diverse city: It creates diverse cross-cutting activities, in which movement and inspiration feed vital public life.
6. Energy metric directive:

Power consumption guidance is divided into two axes:

The first axis: the approach to renewable energy sources (sun, wind).

The second axis: includes the rationalization of energy consumption.

5.4. Main Principles for New Urbanism

5.4.1. Walkability

The design of the pedestrian streets to break the car tracks and reduce the speed if forced to enter the residential areas, the street design to be a friend of the pedestrian, and provide all the amenities and entertainment.

5.4.2. Connectivity: Connectivity

- Network street connection that distributes traffic and makes walking easy.
- The hierarchy of narrow streets and the network of walkways.
- High-quality public domain making walker more satisfactory

5.4.3. Multiple use and Diversity: (Mixed-use & Diversity)

A mix of shops, offices, apartments and houses throughout the urban design.

B - Diversity of people from different works, classes, cultures and ethnicities.



Fig.7: Interaction is one of the Principles that Makes a Great Place, Source: Projects for public spaces, 2015

6. Ways of Interaction

6.1. Negative Interaction

We recommend to study the most important issues in Egypt which are; traffic and street vendors as examples for negative interactions.

6.1.1. Traffic

Traffic is one of the important issues that result from negative interaction. The greater metropolitan area of Cairo is notorious for its extreme levels of traffic congestion. As a result of traffic accidents The World Bank reports at least 1,000 deaths annually, half of them are pedestrians. While an additional 4,000 Cairenes are injured from car accidents. (The World Bank, 2012)

The absence of parking areas forces the cars to park in illegal spaces, the chaos traffic signals is very confusing, and also the heavy pedestrian traffic with no sidewalks or crosswalks leads to unorganized mixed road use. (El-Kadi and Abdul-Wahab, 2013)



Fig.8: Traffic Problems in Egypt, Source: by author

6.1.2. Street Vendors

Another way of negative interaction is the attitude of street vendors. Many people blamed vendors for increasing the traffic problems. Many observers note that the existence of vendors has increased with the increase of unemployment over the past several years. The stands put up by the vendors in the heart of the city – like in Talaat Harb Street, 26 July Street, and Ramses Street in central Cairo -. Unfortunately, there are a lot of other negative interaction ways which destroy urban communities because of the users bad behaviours, so we have to interact with these behaviours finding an applicable design approach to solve all street problems. (El-Kouny, 2012)



Fig.9: Street Vendors Problems in Egypt, Source: Elkony, 2012

6.2. Positive Interaction

After the concept of interactive cities had begun, many interactive effective concepts appeared, the study focuses on the most successful interactive concepts.

6.2.1. Reduce the Heat of the Atmosphere

The thermal comfort of cyclists and pedestrians is a major factor in choosing the style of transport. The streets and walkways in traditional Arab architecture were narrow and shaded by buildings. When the need for additional or temporary shade arose somewhere, the solution is to create wooden or cloth umbrellas to stretch over areas of the street adjacent to the buildings, especially those areas where the activity is concentrated, creating a comfortable environment for pedestrians.



Fig.10: Methods of Shading Pedestrian Paths. Source: the Impact of Pedestrians Streets on Sustainability of Urban Areas Case Study, 2015

6.2.2. The Principles of Speed Management

The following design bases contribute to the management of speed and should be included in the process of street design as appropriate in urban areas (walking area)



Fig.11: Shows the Main Sections of Pedestrian Paths and Walking Area. Source: www.me.me

6.2.3. Urban Street Art

The evolution of urban street art, starting from the very first documented individuals that used the cities as canvases for their art which based mainly on interaction of designers and then users. Joseph kyselak (Vienna, 1799 - 1831), who is clearly one of the first precedents of modern graffiti, wrote his name throughout the Austro-Hungarian Empire in the early 19th century. Firstly in considered a vandalism and then it transformed into art by the interaction of people with this action, so it is converted from negative interaction to positive interaction.(Martin, 2010)

The global art style, street art, usually uses different parts of the world for its own evolution. The aesthetics of street art contribute greatly to the impact of its message and it serves as a tool in the community, a mean of communication, political expressions and revolutionary tool.



Fig.12: Urban Street Art in the World, Source: Martin, 2010



Fig.13: Urban Street Art in the World, Source: Martin, 2010



Fig.14: Urban Street Art in Egypt, Source: www.independent.co.uk

6.2.4. The Legible City

Is a work by Australian artist Jeffrey Shaw in collaboration with Dirk Groeneveld. The Legible City is a leading interactive facility where the visitor is riding a stationary bike through a simulated representation of a city that is constituted by computer-generated messages, three-dimensional words and phrases along both sides of the streets. Using the plans of actual cities-Manhattan, Amsterdam and Karlsruhe-The Legible City completely replaces the existing architecture of these cities with text formations written and compiled by Dirk Groeneveld.

Travelling through these texts is like a reading journey; choosing the path one takes creates a recombination of these words and spontaneous conjunctions of meaning. (Jeffrey Shaw, 1988)



Fig.15: The Legible City Works, Source: Jeffrey Shaw, 1988, "The Legible City", Jeffrey Shaw Compendium

6.2.5. Solar Roadways

Towards Smart Sustainable Pathways, on such a topic we cannot neglect the smart sustainable techniques. A vision of replacing the asphalt and parking lots with energy-producing solar panels that are strong enough to withstand vehicular traffic. After a lot of experimentation, the road panels don't just harvest solar energy, they are also equipped with circuit boards, programmable LEDs, and a heating element that melts ice and snow, all covered in "super-

strength" textured glass. The parking lot is equivalent to a 3,600-watt solar array.

Not only does the parking lot harvest energy, but it also incorporates overhead utilities and repositions underground utilities for more efficient use. Power and data cables line a cable corridor alongside the parking lot, which provides easy access to power and data companies. This eliminates the need for overhead power lines, also it has an incredible interactive way in lighting. The cable corridor is able to house all kinds of cables, including TV, fibre optics for high-speed internet, and phone. Another function of this incredibly smart parking lot is to store, treat and redistribute storm water. (Taz Loomans, 2014)

In short, Solar Roadways is a modular paving system built from hexagonal solar panels that are tough enough to withstand almost anything traffic can throw at them.

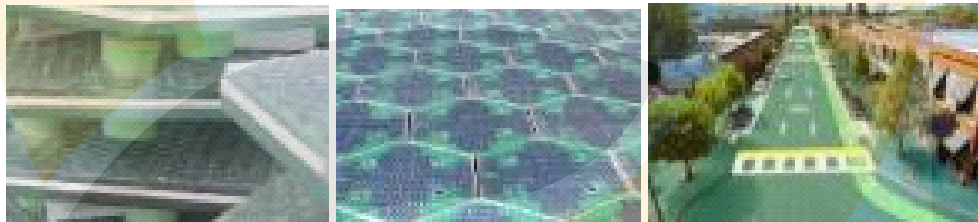


Fig.16: The Solar Roads Technique, Source: Beverly Mitchell, 2014, Solar Roadways Crowd funding Campaign Blitzes Goal, Raises Over \$1.5 Million, Inhabitat.

6.2.6. Electric Roads

In the not so distant future, wireless charging for electric vehicles may be coming to a highway near you. The government company that manages England's major roads, is set to conduct an 18-month trial to test wireless charging technology. The ultimate goal of the effort is to eventually incorporate this technology, so that drivers may charge as they cruise (Beach, 2015).



Fig.17: The Electric Road Lane, Source: Greg Beach, 2015, "The UK is rolling out electric highways that wirelessly charge EVs", Inhabitat.

Following the release of a comprehensive feasibility study, the field test was approved and will begin later. In the upcoming test, electric cars will be equipped with wireless equipment that is designed to capture and store energy transmitted by corresponding machines installed underneath the road's surface. These initial tests will occur on specially designed tracks.

In addition to the wireless charging project, Highways England has committed to a long-term EV infrastructure plan, in which plug-in charging stations will be installed every 20 miles along the country's highway system. If the energy for this system is sourced through solar power, whether from panels or actual solar roadways, England's future highways may become the greenest in the world (Greg Beach, 2015).



Fig.18: The Electric Road Technique, Source: Greg Beach, 2015, "The UK is rolling out electric highways that wirelessly charge EVs", Inhabitat.

Among the most ambitious ideas for the future of road travel are special lanes called Electric priority lanes which will allow drivers of electric cars to re-charge their vehicles as they travel along them are among the most ambitious ideas put forward.

Energy efficient which is another plan to fit motorways with lighting that brightens as vehicles approach then dims after they pass, saving electricity that would otherwise be wasted lighting empty roads (Damien Gayle, 2012).

6.2.7. Car Tubes

Imagine how peaceful our cities would be if we took honking, idling cars off the road and put them underground.

The Car Tube project proposes a network of underground tubes with massive conveyor belts that move vehicles from one place to another.

It is proposed to do away with above-ground roads altogether, availing space for parks and recreation. Integrating the existing roadways in large cities into a network of small underground tunnels.

Once there, the automatic cars would be moved along. This means the cars can travel closer quarters since the distance required for a human reaction isn't needed.

Thus, the tunnels can accommodate a higher capacity. With that in mind, such a tube system would double a city's transport capacity for about the same investment as your average public transit system – while also cutting down travel time by as much as 75 per cent (HYPERLINK "<http://www.dailymail.co.uk/home/search.html?s=&authormef=Damien+Gayle>" Colin Payne, 2016)



Fig.19: The Cartubes Section, Source: Colin Payne, 2016, "These crazy Car Tubes could move city traffic underground", Inhabitat.

6.2.8. Urban lamppost powered:

Hybrid models operate entirely off-grid, combining the power that is freely available from the wind and sun with three days of battery backup power. (UGE Products, 2016)



Fig.20: The Urban Lamp Post Powered, Source: UGE Products, 2016, Urban lam Post, Archiexpo.

6.2.9. Flowering Chairs

A Tulip Seat for Public Spaces, in Holland, tilt the design 90 degrees to prevent wet seats and add lights under seats to double as an ambient light source. (Bazar, 2013).



Fig.21: The Flowering Chairs, Source: Bazar, 2013, 20 Most Creative Garden Benches In The World, Bazar Creativo.

6.2.10. From Flower Powered Public Seating to Modular Public Seating

Although the world is becoming smaller, as our population grows people within larger societies become less friendly and more suspicious. Sad as that fact is, I feel that simple things, such as these peculiar public seats, are ways to help people stay connected (Meghan Young, 2010)

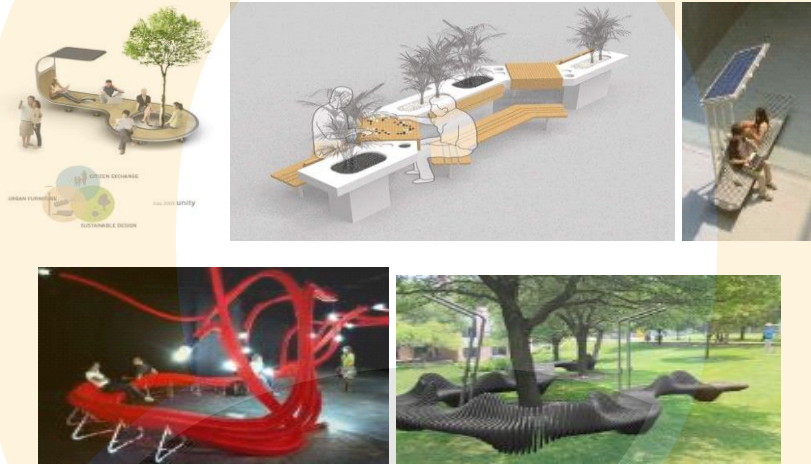


Fig.22: Interactive Seats, Source: Meghan Young, 2010,"From Flower Powered Public Seating to Modular Public Seating ", Trend Hunter Art and Design.

7. The Main Sustainable Planning and Design Criteria

Streets as Places is about Place making on one of the most important public spaces each community has - our streets. Strengthening the connection between people and the places they share, Place making refers to a collaborative process by which we can shape our public realm in order to maximize shared value. With community-based participation at its center, an effective Streets as Places process capitalizes on a local community's assets, inspiration, and potential, and results in streets that contribute to people's health, happiness, and well being.

These principles focus on ways to attract people to a street and to tap into its community-building potential. These guidelines closely parallel PPS's "What Makes a Great Place" diagram, which we have adapted to fit the context of streets.

7.1. Great Activities & Destinations

People need to have a reason to be, and stay, in a particular place. The more activities and options a street offers, the more it attracts diverse groups of people - which is essential for creating a place that feels vibrant and dynamic. That's the idea behind the Power of 10 concept - that great places tend to have at least 10 things to do in them, or some critical mass that attracts people and starts to create a buzz of activity.

Streets As Places Strategies: Programming during different times of the day, week, and year



Fig.23: Photo Courtesy of Scott Meivogel and Holland Visitors Bureau 8th Street - Holland, Michigan

7.2. Safe

No one wants to spend time in a place that is unsafe. Speeding cars pose the biggest threat on many of our streets, but crime - real or perceived - can also keep a street from teeming with life.

"The safety of a street works best... Most casually, and with least frequent taint of hostility... precisely when people are using and most enjoying the streets voluntarily. - Jane Jacobs



Fig.24: Avenue 16 de Septiembre - Mexico City, Mexico, Photo courtesy of Institute for Transportation and Development Policy - Streets as Places Strategies: Narrow vehicle lanes • Low vehicle speeds • Buffers between pedestrians and vehicular traffic

7.3. Designed for Lingerin

People spend more time in places where they feel comfortable, where there are features that capture their attention or interest, and where their basic needs are met - including having a place to sit if they're tired, a place to grab a drink or bite to eat when they're hungry, and a place to take refuge from the hot sun or pouring rain. Because of their sheer appeal and/or their adaptable design,

great streets will have people on them in the freezing cold of winter or the dead heat of summer.

Española Way is a charming pedestrian street in South Beach that is typically packed with people, due to its outdoor cafés, street vendors, and frequent dancing events in the street. Its Spanish-style buildings, bright colors, and lights hanging overhead give it a romantic ambiance and a wonderfully inviting atmosphere.



Fig.25: Photo Courtesy of Freepik - Española Way - Miami, Florida

7.4. Interactive and Social

"The best streets encourage participation. People stop to talk or maybe they sit and watch... taking in what the street has to offer."

- Allan Jacobs, "Great Streets"

What may differentiate Placemaking from other urban planning and design movements is its emphasis on spaces that facilitate interaction between people. Streets, more so than any other public space, have the potential to spark limitless interaction - planned and unplanned, long and short, between people of all ages and backgrounds. It's what builds a sense of community and place attachment



Fig.26: Photo courtesy of University City District, 30th Street Station - The Porch - Philadelphia, Pennsylvania - Streets as Places Strategies: Programming • Play equipment • Markets • Food vendors • Seating options



Fig.27: Photo Courtesy of the City Repair Project Sherrett Street & 9th Avenue - Share it Square - Portland, Oregon - Streets As Places Strategies: Pavement painting • Play equipment • Little Free Library • Neighborhood bulletin boards • Seating options

7.5. Accessible

When a street can be easily accessed by walking, biking, and transit, it attracts a wider variety of people to it than if it is only within reach of those with a car. And when a street is designed to be amenable to everyone, including those with special needs - like wheelchair or stroller accessibility, for example - it becomes a place that welcomes and prioritizes vulnerable populations in our communities.



Fig.28: Photo courtesy of Paula Pentel, Washington Avenue - Minneapolis, Minnesota - Streets As Places Strategies: Placemaking at transit stations • Accessible by multiple modes of travel • Protected bicycle lanes • Safe crossings for pedestrians and bicyclist

7.6. Flexible

The needs of our streets can change over time, and often even over the course of a week. A downtown street may be flooded with cars during the week, but home to more pedestrians than vehicles on the weekends

Washington DC's 7th Street is home to the historic Eastern Market, an important neighborhood anchor. An indoor market during the week, on Saturdays and Sundays the street is closed to vehicles so that the market can expand and use the full right-of-way. A large canopy on the Market Building's exterior offers shade and rain cover for pedestrians and street vendors. Special pavement across the right-of-way in historic stamp style adds to the charm of this street and serves as a signal to drivers to lower their speeds. Additionally, the street is closed to vehicular traffic for special events throughout the year



Fig.28: Photo courtesy of Project for Public Spaces, Streets As Places Strategies: Curbless street • Special events • Market Street • Changing the street layout during different days or times

8. Conclusion

In the case of designing pathways, we should consider the relationship between the man (user and designer), pathway and time dimension. The designers have to use the reached design criteria, it is not obligatory to use all the tools to reach the design solution but the designer has to use the tools suitable for the pathway and the problems types. The designers have to consider the positive interactive ways in their designs avoiding any negative interaction additive to them.

The importance of the streets in achieving sustainable urban design:

The pedestrian streets are very important in achieving sustainability in urban design. Their importance extends to the three dimensions of sustainability, which are the environmental axis, the social axis and the economic axis, which in turn enhances the interest in the streets of the pedestrian, which have a role in the sustainability of urban environment

9. Recommendations

The pathways are the main arteries of the city that provide the city with continuous movement and reflect each of its impact on the other to give the cultural identity that distinguishes the streets from each other. The streets have

different functions that harmonize and integrate among themselves. They perform social, cultural, economic, environmental and other functions. Invites us to pay more attention to the streets and the design principles for planning according to the criteria of sustainable development.

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