# Understanding the impact of the residential built environment design on inhabitants' wellbeing

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ABSTRACT: An increasing body of evidence suggests that some of the contemporary forms of the physical environment have a negative influence on the wellbeing of its inhabitants. This paper presents a literature review on the impact of the built environment on the inhabitants' wellbeing in the residential context. The paper reviews recent literature from various interconnected fields such as psychology, physiology, and sociology in the built environment context. Previous research has shown that the characteristics of the built environment can influence all aspects of human life. The effect of the built environment on the physical and psychological wellbeing is extensively investigated. However, there is limited research on the relationship between the residential built environment and social wellbeing, as measured by social integration and cohesion which suggests the need for more exploration, particularly in the context of the Middle-East. The lack of understanding results in a disconnection between the local communities' socio-cultural needs and actual design and supply of housing.
The relationship between housing and wellbeing is complex and multidimensional. Moreover, behavioural, biological, cultural, social, physical and political factors are variables that affect this relationship. While studying physical environments and users, various theories and concepts can be found such as wellbeing, quality of life, happiness, life satisfaction and sustainability. This paper, through an in depth literature review, aims to distinguish the relationships and the overlap between the concepts. A review of previous methods and indicators used to measure and evaluate wellbeing and the quality of residential built environment, organised to aid architects and planners to predict the impact of their designs on the wellbeing of users.
The broader aim of this research is to identify indicators that could be used in evaluating housing typologies and neighbourhoods in Qatar. Additionally, support in understanding the impact of the design on people's wellbeing within the case study context.

KEYWORDS: Wellbeing, Residential built environment, Indicators.

## INTRODUCTION

Human beings spend a considerable amount of time in the built environment, and they form an essential aspect of an individuals' daily life. Previous research has found that in the nineties, on average people spent almost 60% of their time at home in Germany (Brasche and Bischof 2005). With the development of technology and changes in lifestyle, the amount of time spent indoors has increased further. In 2001 the national human activity pattern survey (NHAPS) declared that the US population spent 87% of their time in their residence. The interest in wellbeing started to emerge as a result of the increase in general health issues arising as a consequence of lifestyle (Davies-Cooper, Burton, and Cooper 2014). Considering the residential built environment, the design plays a vital role in how it impacts the inhabitants. Recently, wellbeing broadly has been a focus for many countries; moreover, governments have invested in measuring and quantifying their nations' wellbeing. It is believed that the origin of this research interest traces back to ancient Greek philosophers. Like wellbeing many other terminologies such as quality of life, life satisfaction, and happiness are found in the ancient philosophers writings (Stoll and Laura 2014; Wadi and Furlan 2017). However, literature shows an obvious overlap in meaning, indicators, and measures of these concepts.
While studying wellbeing in the built environment context, research shows that aspects like physical, psychological, and social wellbeing are influenced by the design and condition of the surrounding environment (Cooper 2014; Hartig and Lawrence 2003). Much of the research on the effect of the quality and characteristics of the residential built environment on wellbeing of the inhabitants has been Eurocentric (Fuller et al. 1993b), and there is a lack of research on this topic in the Meddle-East where the culture and the family circumstances are different.
Qatar, since the discovery, production and export of oil and gas, has gone through tremendous and rapid transformations economically and socially. Doha, the capital of Qatar has developed rapidly during this period (Furlan 2016; Saeed and Furlan 2017; Wadi and Furlan 2017). This economic prosperity and opportunity has bought people to work there from many different countries, with a variety of culture. However, many of these immigrant communities and the native community live in isolated and segregated residential areas (Salama 2016). It is crucial to extend the research to include sensitive, conservative, non-Western cultures, and environmental contexts.

The paper begins with a brief background and describing the research gap. The next sections focus on definitions of wellbeing, introducing theories and concepts related to wellbeing. Later, current research on built environment and wellbeing, in addition to methods of assessment is presented.

## 1.0 DEFINITION OF WELLBEING

Wellbeing was developed throughout history in different phases; each was characterized by a different theme. Starting with Ancient Greece, philosophers described wellbeing as happiness and pleasure. Later, it was the Enlightenment era, philosophical happiness turned into scientific wellbeing that could be measured. During the next couple of centuries, the sociologists, psychologists, and political philosophers entered this research area. The subjective wellbeing measurement was improved later in the second half of the twentieth century (Stoll and Laura 2014).
The World Health Organization (WHO) identified wellbeing as "Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity." Hartig and Lawrence (2003) agreed that health has several facets, involving personal characteristics, behavioural aspects, and socio-physical environment features. On the other hand, sociologists defined social wellbeing as a combination of five dimensions includes coherence, integration, actualization, contribution, and acceptance. Social cohesion and integration were discussed in an urban context (Keyes 2016). Keyes (2016) argues that social wellbeing correlates with other indicators of life satisfaction, happiness, and dysphoria. However, residents describe community wellbeing as availability of attractive setting, social offering, and different cultures acceptance (Kruger 2011). Kostas (2017) believes that social wellbeing in the residential context can be influenced by the social capital, sense of community, neighbours ties, and the social interaction. His literature suggests that subjective wellbeing is affected by good relationship like having friends, spending time with family members, and marriages and romantic relationships.

## 2.0 THEORIES AND CONCEPTS OVERLAP

There have been numerous people interested in studying the typical, large city issues of isolation, traffic, neighbourhood degradation etc. Therefore, concepts like quality of life, quality of space, liveability, residential evaluation, satisfaction, and sustainability have emerged and usually are used as synonyms since their meanings overlap (Kamp et al. 2003). Furthermore, some of these terminologies are used to define each other. In this context, it is claimed that these notions are not original as anything can fit. The origin of these notions can be traced in multiple research studies into health, safety, wellbeing, residential satisfaction, and urban physical environment (Kamp et al. 2003). Kostas (2017) argue that these concepts come from subjective wellbeing perspectives including; hedonic, eudemonic, and life satisfaction. Moreover, his literature shows a confirmed distinction between different terms by many researchers as; hedonic wellbeing (psychological wellbeing), life satisfaction (prudential happiness), and eudemonic (perfectionist happiness). The below sections aim to briefly clarify and distinguish wellbeing from other terms.

### 2.1. Wellbeing vs. social sustainability

The IUCN (1980) defined sustainability as "development that improves the quality of human life while living within the carrying capacity of supporting ecosystems." However, Flores et al. (2000) defined it as "long-term liveability." Although sustainability is usually narrowed to cover the physical terms, yet the common definition is to sustain non-declining wellbeing (Neumayer 2004). Social sustainability in the urban context has been explored in two domains; physical and non-physical factors that contribute to the community sustainability. Researchers listed social interaction, participation, and networks in the community, community stability, sense of place, safety and security as measurements of communities' sustainability (Dempsey et al. 2009). There are several tools that integrate wellbeing and sustainability for example the Gross National Product (GNP), and the Index of Sustainable Economic Welfare (ISEW) Neumayer (2004) argued that wellbeing indicators ignore sustainability and vice versa.
While wellbeing is defined as the satisfaction of human preferences, which are present oriented, sustainability is a more future-oriented notion (Neumayer 2004). A big difference between sustainability and wellbeing is the scale. Wellbeing in sustainability is an overall population satisfaction. However, it is more focused on an actual setting of a neighbourhood, a housing, a population in wellbeing studies.

### 2. 2. Wellbeing vs. Quality of Life (QOL)

It is widely agreed that quality of life is multidimensional. Hence, it is argued that it is not possible to find a universal definition (Das 2008; Kamp et al. 2003). WHO-QOL group defined the quality of life broadly as "an individual's perception of his/her position in life in the context of the culture and value systems in which he/she lives and about his/her goals, expectation, standards and concerns." Das (2008) subdivided quality of life into subjective QOL and objective QOL. The external, tangible conditions of life are described as the objective QOL; however, the subjective QOL depends on life satisfaction, job satisfaction, personal happiness (Das 2008). Theofilou (2013) is concerned about the differentiation between the terms 'quality of life' and 'subjective wellbeing'. Felce and Perry (1995) proposed a model of quality of life or overall wellbeing which includes objective and subjective indicators: objective life

conditions (physical, material, social, emotional wellbeing, and development & activity), 'subjective feeling of wellbeing' (*Satisfaction with*: these objective life conditions), and 'personal values and aspirations' (*Importance of*: these conditions).
Similar to 'wellbeing', it is believed that the concept of 'QOL' was derived from ancient philosophers such as Aristotle. The concept's elements may be influenced by the context, era, society, and values. Wadi and Furlan (2017) believe that QOL depends on the inhabitants' sociological and psychological well-being. Das (2008) believe that 'subjective wellbeing' comes under 'objective QOL'. In Therfilou's (2013) literature, 'objective life conditions' come under 'wellbeing', though the quality of life should be limited to peoples' subjective life assessment. Moreover, he expressed that subjective wellbeing has both an effective component and a cognitive component. Diener (2006) disagrees and believes that QOL is objective and wellbeing as a concept is subjective.

### 2.3. Wellbeing vs. Life satisfaction

Like the other terms, life satisfaction has different definitions, yet a majority described it as people's evaluation of their life as a whole (Diener 2006). Felce and Perry (1995) present several links that combine both life satisfaction and quality of life. They think that personal satisfaction could be a result of life conditions, or it could be combined with life condition to result in the quality of life.
Therfilou (2013) consider life satisfaction as a cognitive component. Furthermore, in Felce and Perry (1995) literature, they categorise wellbeing into four types; physical, material, social, and emotional wellbeing. Life satisfaction is a sub-section of the emotional wellbeing. Diener (2006) believe that life satisfaction is under subjective wellbeing. Mountford (2015) believe that life satisfaction and happiness are forms of mental wellbeing.

### 2.4. Wellbeing vs. happiness

Happiness has several meanings depending on the context. It can mean positive mood, life satisfaction evaluation, and the good life (Diener 2006). It is observed that external factors such as income, work, community, governance, values, and religion influence happiness as well as personal features like mental and physical health, family experience, education, gender, and age. A number of surveys are used to draw happiness data from such as Gallup World Poll (GWP), the World Values Survey (WVS), the European Values Survey (EVS), and the European Social Survey (ESS) (J. Helliwell, Layard, and Sachs 2012).
It seems that measuring happiness is part of a larger framework for understanding the wellbeing of nations. From the types of questions; the main happiness indicator appears to be how the person describes his/her happiness level, not how happy he/she looks. The coverage of the survey data is international, and most of the surveys ask subjective wellbeing questions – both experienced and remembered wellbeing- (J. Helliwell, Layard, and Sachs 2012).

## 3.0 Current research on the built environment and wellbeing

There are multiple dimensions for wellbeing in the built environment context: some have looked at social wellbeing and the built environment (Ellaway 2014; Brown and Lombard 2014; Miles, Coutts, and Mohamadi 2011; Allin 2014). Others looked at psychological wellbeing influenced by the built environment (R. Mitchell 2012; Evans 2003; R. J. Mitchell et al. 2015; White et al. 2013; Miles, Coutts, and Mohamadi 2011). While a large volume of research were found to focus on the health and the lifestyle association to the design of the built environment (Coombes, Jones, and Hillsdon 2010; Thompson Coon et al. 2011; Fraser and Lock 2011; Klepeis et al. 2001; Townshend 2014). The built environment relationship to wellbeing was explored on the national scale as well (R. J. Mitchell et al. 2015; Hartig and Lawrence 2003; Wiedmann, Salama, Ibrahim 2016).
The research on wellbeing can be measured in different scales including community and national level. Similarly, the physical environment can be further subcategorized to dwelling and neighbourhood scales. This literature is reviewing the impact of dwelling and neighbourhoods design impact on different aspects of inhabitants' wellbeing.

## 3.1 The dwelling scale of the residential built environment

The section on the dwelling will discuss research undertaken to study three types of wellbeing: social, physical, and psychological. The purpose of the work is to identify the connections between quality of dwelling and wellbeing found in the literature.

### 3.1.1. Social impact of the dwelling

In the social wellbeing research, Cooper (2014) proved that children's wellbeing is influenced by many aspects of the built environment such as density, lack of privacy, lack of green and play areas. Moreover, he assigned safety, availability of public areas, and the condition of house maintenance as major indicators of adults' social wellbeing. It is believed that different housing typologies have unlike effects on the inhabitants' wellbeing. Professor Elizabeth (2014) explains that the local characteristics of buildings and neighbourhood better assist wellbeing as they increase the sense of belonging and attachment,

especially in children. It has been found that apartment buildings reduce social networking, which accordingly results in more loneliness for women as well as restricting children from playing outside the residential unit (Evans 2003). Further studies have identified spatial arrangement as a variable which can influence the inhabitants' wellbeing. Professor Elizabeth believes that the gradual transition between public and private through buffer zones helps to maintain the privacy of the household and reflect on the wellbeing of people. Additionally, the house's capacity to control the space of contact with others sustains a positive social psychological process (Lawrence 2012). As some behaviours require privacy, controlling the interaction between the people inside and outside the house is essential. Failing to do this may influence the psychological and social wellbeing of the inhabitants (Hartig and Lawrence 2003). Another issue while studying spatial arrangement and wellbeing is overcrowding. This influences social wellbeing since it increases the tension between adults and children (Cooper 2014).

### 3.1.2. Physiological impact of the dwelling

As for the research on physiological wellbeing, it has been found that high population density increase the chance of infection which influences pregnant women and the unborn children (Cooper 2014). Due to design problems and peoples' behaviour, wellbeing and health states of inhabitants is affected. Smoke from tobacco or wood-fire for heating or cooking, emissions from gas, and exposure to pollutants have very harmful effects on the health (Lawrence 2012 ; Hartig & Lawrence 2003 ; Cooper 2014). A significant volume of research evidences the influence of noise, light levels, access to natural views, air quality, and crowded spaces on the physical and psychological wellbeing of adults (Coombes, Jones, and Hillsdon 2010; Thompson Coon et al. 2011; Fuller et al. 1993a). Cooper (2014) investigated seniors' wellbeing in the built environment and found that the sleep patterns and agitation are influenced by the ability to see nature , as well as noise and light levels. In another dimension, maintenance is one of the most significant issues when looking into physical conditions of the house. It has been proved by Lawrence (2012) that mould growing in the house poses risks to the inhabitants' health. It can cause many problems such as asthma, chronic bronchitis, nasal allergies, and eczema. Maintenance include sewage and solid waste disposal as it can cause infectious diseases (Lawrence, 2012). Another danger on occupants' wellbeing is the safety of the physical conditions of the house. In the European region, more deaths are recorded from accidents inside or around the house than on the roads.

### 3.1.3. Psychological impacts of the dwelling

Evan (2003) claims that some genetic features make some people more likely to be affected mentally by the built environment. Also, he argued that high-rise housing units negatively impact the mental health of both housewives and children. Crowding - the number of people per room - in the home reduces privacy which results in psychological distress which is more common in some demographic groups like young women (Cooper 2014). Others argue that crowding affects people psychologically which consequently results in physical health problems (Fuller et al. 1993b). The indoor environmental quality is another concern for many researchers. Air quality, for example, is essential for good health, and it is associated with toxic building materials, heating or cooking. Cooper (2014) related psychological distress to air pollution, and the rates increase among people who have adverse life events. Noise prevents inhabitants from using their houses as an emotional retreat: if they suffer from noise, they will spend their leisure time outside the house (Hartig & Lawrence, 2003). Even more- ten percent of adults in Europe suffer from chronic sleep disturbance and need treatment (Lawrence, 2012). Although different age groups respond to lighting levels differently, poor daylight in the house causes poor mental health for the human being (Lawrence, 2012). Beside this, learning in early life can be affected by light quality and quantity (Cooper, 2014).

## 3.2 Neighbourhood scale of the residential built environment

### 3.2.1. Social impact of the neighbourhood

The larger context of housing is the city and urban planning impacts on how well the people are. It is advised to integrate different public gathering spaces into the street fabric; it could be parks, squares or public buildings. It has been found that such places impact different aspects of social wellbeing of various age groups (Brown and Lombard 2014; Cooper 2014; Qawasmeh 2014). Independence and accessibility of the neighbourhood are crucial specially for seniors' social wellbeing (Oswald et al. 2007). Ismail (1993 p 582) concluded in his socio-anthropological research that the change in the urban form of the neighbourhoods in Doha has resulted in a superficial and shallow relationship between inhabitants. Relationships of interest, and caution replace relations of affection, trust, and social solidarity. Furlan (2016) concluded that modern planning in Doha's built environment had neglected the liveability aspect. Bertha (2011) investigated the effect of the social network in neighborhoods on the wellbeing. The findings confirmed that living near to extended family members or with an ethnic group helped in reducing stress, encouraged people to interact, avoided isolation and loneliness. Although the research did not quantify proximity, people in this circumstances reported receiving emotional support, material support, household maintenance, and child welfare (Ochieng 2011). Judith (2013) proofed that by having good social life, mental wellbeing is improved consequently. Schoolers debated neighborhoods density. However in the western context, higher densities seems to be best for social interaction, personal relationships, widen the network and enable frequent socializing which considered as social support components (Mouratidis

2017; Judith E Montford 2013) Judith (2013) suggest that some characteristics in the building scale increase the interaction between neighbors such as the spatial arrangement, function and physical distance, multi-user and multi-purpose spaces.

### 3.2.3. Physical impact of the neighbourhood

No one can deny that walking in the neighbourhood promotes social as well as physical wellbeing. Researchers claim that a good mixture of uses within walkable distance promotes physical activity (Handy et al. 2002; Cooper 2014). It has been noticed that some design features of the neighbourhood may influence people's activity routines such as distances to destinations, direct routes, sidewalk situation, and availability of attractions along the roads (Townshend 2014). The design and location of facilities such as shops, leisure facilities, and residential areas impact not only peoples' general wellbeing or physical behaviours, but also diet and health (Cooper, 2014). A robust body of evidence supports the positive relationship between health, physical activity and, sequentially, the built environment. Research shows that insufficient physical activity causes death (1 in 6 deaths) and long-term diseases which increases the cost on the government (Lee et al. 2017). Research reported a positive relationship between the amount, proximity, of natural environment around the house and physical activities (Fraser and Lock 2011; Coombes, Jones, and Hillsdon 2010; Thompson Coon et al. 2011; Saeed and Furlan 2017).

### 3.2.4. Psychological impact of the neighbourhood

Alternatively, psychological wellbeing is linked to the design of the neighbourhood. Numerous surveys support better mental health as a result of exposure to greenery. The results vary according to socio-economic status, age, and gender (White et al. 2013). Further research was conducted to study the quantity and quality of the urban parks and its effect to the mental health of residence (Mitchell 2013; McEachan et al. 2016; Van Dillen et al. 2012; Cooper, 2014). As for the density, it was proved that higher housing density reduces depression symptoms among inhabitants. However, this result is not the same when the ratio of car usage to the land area increases, as noise exposure effect mental wellbeing (Miles et al. 2011).

## 4.0 Methods of assessing wellbeing and the built environment

### 4.1. Built environment assessment

To assess housing quality Hartig and Lawrence (2003) suggested mapping different layers that influence wellbeing. Measurements can be structured as: physical features of the house, location of the housing, landscape features and other land uses, distance to services, support for social contact, access to the house etc. To measure design or construction of the house and its impact on the health of residents, Hartig and Lawrence (2003) advise following the housing standards that describe the minimum qualities of the home required to satisfy physical and psychological wellbeing. Other researchers used computational tools to do the assessment of the built environment such as space syntax (Al-Jokhadar and Jabi 2017). Table 1 show indicators and tools used to assess the built environment.

**Table 1**: Built environment indicators used in previous research. Source: (Author 2018)

| Physical environment factor | Indicators | Assessment of the evidence | Source |
|---|---|---|---|
| Hierarchy of spaces | Spatial arrangement | AGraph | (Al-Jokhadar and Jabi 2017) |
| Social interaction | Spatial arrangement, Amount of living spaces | AGraph , VGA | |
| Visual privacy | Spatial arrangement | Syntax2D, VGA | |
| View to the exterior | Openings location | VGA | |
| Greenery | Quality and quantity of greenery | GIS analysis: greenery per dwelling.<br>Quantity and quality of greenery was assessed by observations. | (van Dillen et al. 2011) |
| Natural environment | Type of environment: natural, other type of environments. | Estimate the proportion of land cover in a respondent's area of residence that is green space. | (Mitchell 2012) |
| Green urban areas | Percentage of LSOA land cover | Data were derived from the Generalised Land Use Database | (White et al. 2013) |
| Common areas | Interaction in green areas | Site observation and analysis<br>In-depth interviews | (Saeed and Furlan 2017) |
| Quality of Urban Life | residents' perception of the physical environment, the social and perceptual factor | Site visits, observation<br>Walk through assessments<br>In-depth interviews with residents | (Wadi and Furlan 2017) |
| Quality of Urban Life | Residents real interaction and relationship with their living built environment | Interaction and urban activity<br>Residential satisfaction and attachment | (Qawasmeh 2014) |

| | | | |
|---|---|---|---|
| Crowding | Subjective housing quality measures<br>Objective crowding measures | Interviews<br>Satisfaction surveys | (Fuller et al. 1993b)(Qawasmeh 2014)(Qawasmeh 2014)(Qawasmeh 2014) |
| Housing density | Data were provided by the ABS | Dwelling density per hectare | (Badland et al. 2017) |
| Housing quality | Structural quality, clutter and cleanliness, hazards, indoor climate, and privacy/crowding | Walk-through rating | (Rollings et al. 2017; Poortinga et al. 2017) |

### 4.2. Wellbeing assessment

Modern governments and policymakers were interested in wellbeing. The level of happiness of countries are evaluated by the United Nations (UN) using six different indicators; freedom, generosity, health, social support, income and trustworthy governance (J. F. Helliwell, Layard, and Sachs 2017). Some research was found to use the gross domestic product (GDP) as an indicator of happiness and wellbeing of people. Paul argues that the GDP is a less reliable indicator since it gives a partial picture of social progress, quality of life, and the environment states. Growth matters but we cannot ignore other factors such as our families, relationships, and community in which we live. The social indicators movement was initiated against one-sided focus on economic security (Kamp et al. 2003). Table 2 show methods used to assess different types of wellbeing.

**Table 2:** Indicators of wellbeing used in previous research. Source: (Author 2018)

| Wellbeing perspective | Indicators | Assessment method | Source |
|---|---|---|---|
| Social | Social interaction | Content analysis, site observations, walking tour assessments | (Eissa et al. 2015) |
| Social | Affordable housing, density, and tenure. | Review urban planning documents<br>Neighbourhood spatial measures.<br>VicHealth Indicators Survey<br>Survey community satisfaction | (Badland et al. 2017) |
| General health | General health.<br>General mental health status | Self-reported health questionnaire (N.1641), Short-Form 36, (MHI-5). | (van Dillen et al. 2011) |
| Mental | Internal environment control<br>Design, maintenance, noise, density and escape | Postal survey: SF36 subscales for mental health (MH) and vitality (V). | (Guite, Clark, and Ackrill 2006) |
| Mental | Urban form : housing density, green spaces, density of auto commuters<br>Social environment | Validated measure of depressive symptoms | (Miles, Coutts, and Mohamadi 2011) |
| Mental | Environments grouped as natural or non-natural | General Health Questionnaire (GHQ)<br>Warwick Edinburgh Mental health and Wellbeing Score (WEMWBS) | (R. Mitchell 2012) |
| Mental | Distance to urban green spaces | Short-form, 12-item GHQ<br>Global life satisfaction survay | (White et al. 2013) |
| Mental | Neighbourhood characteristics or services | WHO-5 scale<br>Interviews<br>2012 European Quality of Life Survey (EQOLS) | (R. J. Mitchell et al. 2015) |
| Psychological | Household crowding | Survey on depression and anxiety | (Fuller et al. 1993b) |
| Psychological | Dwelling quality<br>Neighborhood quality and stability | Rutter Child Behaviour Questionnaire<br>Youth and Adult Self Report Scales | (Rollings et al. 2017) |

## CONCLUSION

It is not surprising that wellbeing research is getting more attention, as many of the residential built environments are prototyped and pre-fabricated, yet norms and cultures are marginalized. This literature review shows some dimensions of residential built environment impact on inhabitants' wellbeing. Furthermore, it forms a starting point for future investigation in this subject. The paper attempt to clarify briefly and distinguish overlapped terminologies used in wellbeing and built environment research. The lack of knowledge in this matter has resulted in miss-use and mixture of parameters. It is important to clarify these terms by comparing their definitions and their measures. It has been noticed that some of the objective wellbeing indicators like the quality of life are influencing the subjective wellbeing dimensions. This paper shows a great need for expansion of exploration on the impact of residential built environment on inhabitants' wellbeing beyond the Western region.

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