New urban structures, dream and reality

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Summary (Abstract)
Urban design plays an important role. Not only in how people experience the livability of their city or district but also how it interacts with mobility. As mobility, especially transport of goods and passengers is still the dominant contributor to noise and other environmental pollutants in urban areas it is not enough to work on new mobility patterns solely. Also, the urban structure should be considered when planning new districts or re-considered in existing situations. Shape and structure of cities usually have a purpose. In medieval times, concentric cities were built. This due to the fortress that was built to protect the city from attacks. The circle is the shape with the smallest circumference relative to surface area. It was chosen for economic reasons. Enlargements were made in the same way. Examples of this structure can be found in the city centers of Amsterdam, Utrecht and Cologne. However, in those times cars and trucks were not seen as a threat or enemy affecting human health. On the contrary, Haussmann's renovation (1853-1870) restructuring Paris gave the city its present form with long, straight and wide boulevards. Haussmann's restructuring made Paris popular throughout the world. The wide roads meant that the army and police could travel quickly throughout Paris in order to quash the riots that often took place at that time. On the other hand, the Haussmann's plan has – probably unintentionally - opened Paris up for cars and another kind of motorized vehicles. The city now faces many problems such as noise, poor air quality, congestion, fragmentation of the city, et cetera. Many European cities have road structures that are inviting to cars; some examples are Belfast, Rotterdam and Gothenburg. These traffic arterials should be re-built into more spacious and attractive veins, offering space for pedestrians, bikers, green and public transport.

1. Introduction

Nowadays noise, especially transportation noise dominates the city. Besides poor air quality is noise, especially long term exposure to noise, one of the biggest treats for human health in cities. Many factors are important when considering transportation noise in urban areas. Not only densification, technology, social and societal changes, individualization, et cetera play an important role. Also urban structure, shape and form play a crucial role. Transportation is important for cities. Deliveries of goods and people and also to bring the goods with added value to other places. Some have opened up the city and the city center for cars, vans and trucks. Especially modern or modernized cities built or rebuilt after World War II, facilitate car use. Cities are more than a couple of streets, building and parks. It is a fabric of many elements. In this paper we will shine a light on the history of cities, the characteristics of cities, the dilemmas of the compact cities and how to resolve the noise problems as a result of the transition towards a compact city.

2. History of cities?

Approximately ten thousand year ago homo-sapiens, mainly nomadic hunters, decided to settle along rivers and forest trails and started to live from agriculture and domesticate animals. When living there, other nomadic hunters passing by settled as well because these places offered some advantages due to the vicinity of resources like fish, wild, fresh water, safety and (social) security. These settlements could be considered as the earliest form of a community. Millenniums later, around 4000 and 3000 BC, these communities could be considered as the first cities. The first cities were found in Mesopotamia and Sumer. At that time more than 20 cities were founded, having between 10,000 and 50,000 inhabitants. Cities emerged because there was a surplus on storable food, trade and other advantages. Again, millenniums later, after the Egyptian Kingdoms, the phenomena of a city went northward and the Greeks founded cities (800-500 BC). For instance, Knossos was already known as a city in 177 B.C. having 15,000 inhabitants. Till then cities could be recognised due to the presence of a wall and religious or government buildings. Even in Uruk, see below, this was already available. (After the Greeks the Roman Empire arose. The Romans built many colonial and military settlements and cities.

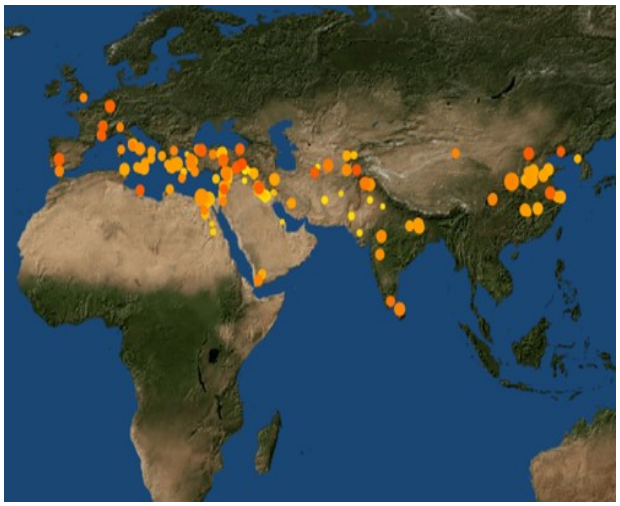

Figure 1: Cities around 500 A.D.

During this Roman domination (emperor August) huge road networks were constructed. Main reason behind was to conquer with tribes or to enhance trade between communities. This period, in the first centuries of our era population and economic growth was observed. Many European cities London and Paris, exempli gratia, stem from the Roman time. The medieval cities we know have small and narrow streets and are pretty well appreciated by tourists. However, during the Roman period as the medieval cities were crowded, filthy and noisy. A well-known letter from the Roman period is the letter from the satirical poet Martial who wrote his friend Sparsus the next [1]:

"Do you want to know why I often seek refuge in my small fields and squalid villa at arid Nomentum? Because, Sparsus, there is no place in the city where a poor man may have a quiet moment for thought. In the morning schoolteachers won't let you live; before dawn bakers disturb you; and the whole day the hammers of coppersmiths jar your nerves. Over there the moneychanger idly jangles Neronian coins on his filthy table; over there a man hammering Spanish gold dust pounds his well-worn stone with a shiny mallet. The frenzied band of Bellona's priests never stops chanting; nor does the sailor, who survived a shipwreck but lost a limb, ever cease his begging; and the Jew, taught by his mother to panhandle, and the half-blind huckster of

sulphur products continually solicit money from passers-by…you, Sparsus, know nothing of these things, nor can you ever know, you who enjoy the luxury of a mansion, you whose home looks down on the hilltops, you who own a country estate right here in Rome…You enjoy deep sleep and stillness disturbed by no voices; the daylight never shines in unless you let it. But I am awakened by the laugher of the passing crowd, and all of Rome, it seems, stands near my bed. So, whenever I am weary of these torments and wish to sleep, I go to my villa."

In medieval times a lot of small enterprises and services were within the city boundaries causing a lot of noise themselves or due to the delivering of goods or exporting them. This would last until the years after World War II.

During the Renaissance period cities changed remarkably. Aesthetics was introduced in the cities design. Shape became important and cities were seen as a piece of architecture. Some examples are Rome, Florence and other Italian cities [2].

From the time the first cities arose until the beginning of our era most cities appeared in North-Africa, Eurasia and Central America and in Asia. First between the 30° and 45° latitude and later between the 20° and 60° latitude. This due to the availability of animals that could be domesticated (mules, cows, lama's, camels, horses, et cetera.). where, in other parts of the world (e.g. Southern Africa) these animals were missing [3]. The availability of those domesticated animal boosted wellbeing, prosperity and health of people living in those area's and it caused the first population density. That is the reason that at the beginning of our era cities are situated in this zone. A zone with a moderate climate and favourable geography.

Cities from prehistory that are well known are Damascus, Jericho, Uruk and Ur. Some of them we know from the Hebrew Bible and others still exist.

Thus infrastructure, like rivers, forest trails were conditionals inviting people to settle. Trade between communities, already identified in the Bronze Age, went originally via the rivers and the pathways through the swamps, forests, hills, mountains et cetera. Having cattle was seen as a sign of prosperity and chiefs were chosen to protect this prosperity. Having leaders over these chiefdoms it also meant that if there was a shortage of resources or jealousy, these chiefs turned into warriors starting raids and fights with neighboring settlements to take this after a won.

3. Characteristics of cities

Cities are engines of growth and development. They boost human productivity, wealth, innovation, energy and social mobility. At a first glance, cities are a complex fabric of all kind of elements. Main visible elements of a city can be categorized in:

1. Buildings (houses, offices, etc.)
2. Networks (roads, waterways, etc.)
3. Open spaces (squares, parks, etc.)

Cities, small or large are physical, economic and social networks. Physical networks are the waterways, the roads, the tramways, the network of electricity, gas, drinking water, telephone and internet and also the sewers. See for a few figure 2. Beside these physical

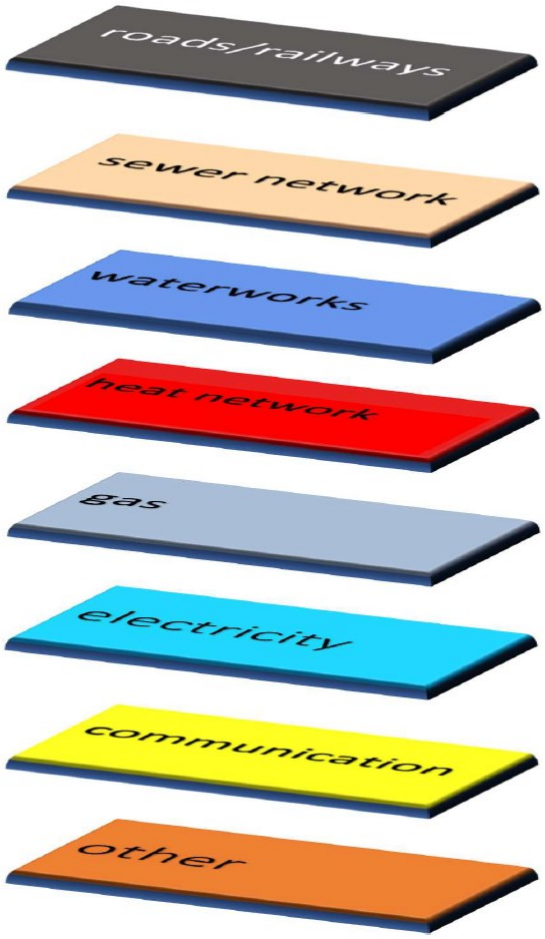

Figure 2: Layers of networks

networks communities and cities exist of

social networks like families, schools, churches, sport clubs, unions, et cetera, but also the professional and business networks. Not to speak about the communication networks such as social media networks. However, the latter is not only limited to cities, it is spread over the whole world. These days cities are responsible for 70% of the GDP [4] and are hotbeds of innovation. Although approximately two or three percent of the global surface is occupied by cities it houses more than 50% of the population (2018) and it is expected that this will grow to more than 70% by 2050. This growth is an enormous challenge for the city's administration. Currently, many cities deal with a housing shortage. Not only due to the population growth (from 7 billion to 9 billion worldwide) but also due to the phenomena of family dilution (more single households). The demand for single household houses has increased drastically the last decades. Future residents need, beside housing, food and energy also infrastructures in order to meet their daily needs and to travel to their work, sport club and other destinies. As the period of suburbanization lies behind due to the unsustainable effects of urban sprawl and an increase of car-mobility there is a tendency to build more compact. It is called the compact city. Housing more people per hectare is the challenge the coming decades. The concept of a compact city has its benefits. Not only avoiding deterioration of rural or nature areas but other benefits too. Exempli gratia: doubling the number of residents in one city means that around 15% can be saved in infrastructure. For instance, a city with 2 million residents need only 85% of the infrastructure and amenities compared to two cities of each 1 million residents [5]. From a governance perspective it appeared that due to the short distance between the city administration and the citizen it is more appropriate, efficient, effective and appreciated [6].

4. Compact city and its dilemmas

A compact city has its challenges, constraints and its dilemma's. Because intensification it leads also to more criminality, diseases and other inconveniences such as poor air quality and noise affecting the livability of the city. Other disadvantages are the danger of increased mobility, losing open and/or green spaces and also massive high-rise buildings and building blocks that makes the city stony. The first idea of a compact city that this type of city is composed of massive buildings and less variation in houses, less green, less open spaces like square and parks. The development that an average family house in a city demands about 150m^2 which is almost doubled after World War II is a dilemma not reported yet, which also plays a role, as well as the fact that potential buyer want a house that has a sufficient private and an outdoor space being safe, secure district, visual and acoustics attractive. And, there is also the problem of accessibility and mobility. Direct accessibility and close proximity of public transport stops is also desired. Then the danger of gentrification which makes that middle class families leave the city center, just because they cannot afford renting or buying a house in the city center and move away to the outskirts of the cities. This makes the city center a hotbed of young high income people and business or touristic areas with shops, offices, museums, entertainment, et cetera. Diversification is scarcely found. Even if young families can afford to rent or buy a house in the city center there is a lack of playgrounds, other children to play with, parks and other amenities like schools that makes life pleasant for children. Elderly people often remain living in those areas and become disconnected to their immediate environment, getting isolated. This could be manifesto in a compact city.

Last decades new urbanism, a process of shaping or re-shaping the city into human centered cities with walkable neighborhoods and mixed use, diversity in housing and jobs influences urban planning processes is introduced. Human scale, and citizen's involvement (co-shaping) are central elements. Partnering with other stakeholders like universities, entrepreneurs and NGO is expected to be business as usual. The morphology or landscape will be no longer dominated by politicians, architects. Designing massive buildings being landmarks, monuments or megalomaniac designs meant as an object of remembrance for the future. The voice of the resident's and other

stakeholders plays a role, which is important and desirable but has beside its pro's also its con's.

This because most of the people still desire to own a car, even when public transport is available at a short distance. As relatives are often living in other regions or in rural areas with poor public transport, one wants to have a car. Also for holidays or shopping people are "attached" to cars. Although a tendency is found that young people, living in cities, prefer to use a car (car-sharing) instead of owning it. In youngsters starting a family, getting children a change in attitude is found [7] and a part of them still buys a car. Enterprises and institutes want accessibility which does not always means accessibility by cars or vehicles. A phenomena of the last decade is the growing demand of ordering products online to be delivered overnight; the number of vans and also their mileage grows correspondingly. Those vans are often not the most clean and quiet vehicles when fossil fueled.

5. How to cope with the compact city dilemmas

Cities cannot function without transportation or mobility. The metabolism of a city needs input (e.g. food, energy, water) and it has its output, excretions (e.g. waste, grey water). Not all input nor output can be transported by pipelines or tubes. Ideal would be to make the city car-free. Because the best way to relieve the city from the transportation noise is to make the city car-free. However, this is against the will of most residents and entrepreneurs. A less rigorous measure is to make the inner-city car-free. This is already found in numerous cities. When providing sufficient public transport and other facilities such as car-sharing and alternative modes of good deliveries are at hand, the majority of residents will, in the end, agree with this. Entrepreneurs will resist, they fear less income. Thus, some exemptions should be offered at the same time. Delivering of goods for instance during certain hours (time windows).

Figure 3: Cargo hopper in Utrecht

City-logistics could be done by non-fossil fueled vehicles. Like the cargo hopper in Utrecht or by boat, tram, or riskja's, et cetera. Many sustainable alternatives are already at hand or are underway.

Still, the majority of the people is addicted to cars. This implies that politicians have to take this into account because the residents are the electorate. Embracing the adage that cities are for people [8] or better, cities are people. Cities [9] should be livable and also resilient. Free to Charles Darwin: not the strongest survives, not the smartest survive but the one that is the most adaptable to change. This was based on biological observations. Organisms living in the nature survive by adaptation to a changing environment. Cities should also be seen as an organism and must cope and deal with all kind of changes. Whether this is climate change, influx of migrants or other crises and developments, a city must be resilient or adaptive to survive. This also holds for compact cities. This means that green should be present in the city, for instance by green roofs or green façades or pocket parks or green in the immediate surrounding quite easy accessible by bike or public transport. Green makes the city more adaptable to heavy rainfalls, heat islands and preserves biodiversity. It also contributes to the health of residents, especially quiet green places are important. Beside sustainable use of resources social sustainability should also part of the planning process taken into account the basis needs of residents and special attention to the needs of vulnerable people like elderly people, children and disabled people. Quiet places like parks, courtyards and buildings like convents, cathedrals and libraries add to health as well. Connecting these places offers

not only the tourists but also inhabitants, when having free time and looking for distraction and relaxation, a safe haven to flee from the buzzing city.

Livable cities should have also open public spaces being used by people. Spaces that offers people to make contact with other people, building relations and strengthen social cohesion. This implies that these open spaces should be attractive. Too many open spaces designed in previous times are desolate, not destined for people but as a landmark. To make it more attractive to visit squares should be provided with seats, plants, flowers and trees or other elements attracting people. Squares attractive for people need sun. They also should be connected to walking routes or trails. The recommendations done by William H. Whyte in his movie "Social life of Urban spaces" from 1988 can be implemented to make square more attractive, livable and lively.

Another important factor to take into account is diversity. Density and diversity should go hand in hand. This implies that compact cities should encompass a diversity of housing, buildings, streets, squares, parks, et cetera as hard elements. Also soft elements should be diverse like a right mix of people in age, in education, profession, income and in ethnic background. The compact city should also provide diversity in small or medium size enterprises like shops, restaurants, dancing and cinema's. Chengdu or Masdar city an experiment of Siemens in Abu Dhabi could show the way although also these smart and compact cities do have their limitations.

A last important element for compact cities but also applicable to each community is human behavior. Behavior of residents, entrepreneurs, policymakers and politicians should be changed when striving towards a sustainable (compact) city. A lot of people are not aware of the environmental impact of transportation. And those that are aware, rely on innovation or deny these harmful effects. As a consequence of this it is important to inform, convince and even persuade them that current mobility patterns are devastating.

Most people cannot oversee the impact of their behavior of today on their wellbeing tomorrow or for the next generations [10]. Even being aware that choices, actions or inactions have negative consequences people persist in certain behavior that should be defined as unsustainable. This means that besides hard elements in urban planning also soft elements must be put in place, behavioral change is needed.

Hard elements being less parking space near houses and offices where possible combined with providing the needed services to residents and enterprises in the city in a sustainable way by means of sufficient, comfortable, safe, frequent, secure and reliable public transport well connected to other modes of transport (first- and last mile options). Good deliveries based on non-fossil fueled vehicles (electric, hydrogen, etc.) or alternatives replacing the current polluting deliveries.

Behavioral change can be achieved along two ways. The most friendly but most though way is to persuade people to change their habits, their mobility patterns, being a more psychological approach. This by means of information, education, rewarding, incentives, support, et cetera [11]. The other way is to put obstacles, constraints or elements in place that enforce or invites other behavior. Shaping or re-shaping urban areas can play an important role by introducing both elements. For instance by introduction of:

a. Priority lanes for bikers and pedestrians
b. Priority lanes/tracks for public transport
c. Re-designing road profiles, from multiple lanes to fewer lanes or assigning lanes taken from car use to public transport, bikers or pedestrians.
d. Restricted zones, only accessible for pedestrians, bikers, electric vehicles and public transport
e. Speed reduction in urban areas (e.g. 30 km/hr)
f. Less parking space/garages in the city center and residential buildings and offices.
g. Higher parking fees for those parking places within the city border.
h. Toll roads e.g. that enter the city (center)

i. New offices, schools, universities, hospital should be planned near public transport nodes or at the fringes of the city.

It is superfluously to mention that these tough car-unfriendly measures should go hand in hand with services that offer a good alternatives as good public transport, re-introduction of collective transport (e.g. school buses), e-facilities (e-learning, e-shopping, e-health, e-working, et cetera) and like Singapore parking facilities at the fringes of the city destined for commuters, visitors and car-owning inhabitants too.

People that visit the city for shopping can also use those parking's at the fringes of the city. Providing these parking's with counters (hubs) it is possible using sustainable urban transport to transfer goods in and out of the city from logistical hubs on the outskirts, reducing the environmental effects of the supply chain.

Cities that are less ambitious, not willing installing car-free districts could consider street narrowing. Re-designing wide streets, sometimes with more lanes, to two narrow lanes for cars and trucks and the other space designated for bikers, pedestrians, public transport and green strips. This is already done in Lyon (Rue Garibaldi) and Berlin and other places as well. Rotterdam considers two pilots. Those cities could also consider other obstacles to ban as much as possible the car from the city. For instance speed reduction, roundabouts, traffic lights that interferes the inbound traffic.

6. Conclusions

In previous times cities were filthy and contaminated with waste and dirt as sewers and waste; services were not invented yet. Most modern cities are still contaminated, not with waste and dirt but with (fossil) cars, dominating the street scene leading to poor air quality and poor acoustic quality. Assuming that replacing these cars by electric vehicles or even autonomous vehicles will probably lead to less car-ownership but not to less car use. The Marchetti constant and the BREVER law has proven to be valid in the past. Better or faster infrastructure only leads to more mileage and cars and the street scene will not be improved by all those electric or automated cars. Noise will not increase significant as speeds above 35 km/hr mean tyre-road noise dominates and at lower speeds additional noise (AVAS) will be introduced in order to mitigate the alleged treats of especially visual impaired pedestrians.

As seen above, urban design or re-design can contribute to a more sustainable city or city's districts by including or introducing vigorous elements that enforce automobilist to change their travel patterns.

Acknowledgement

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References

[1] Complete Works of Martial, Delphi books, 1994
[2] History of cities and city planning, Ellis, C
[3] Guns, Germs and Steel, Jared Diamond, 1997
[4] United Nations, www.un.org
[5] Scale, Geoff West, 2017
[6] If majors ruled the world, Benjamin Barber, Yale 2014
[7] Mijn auto, jouw auto, onze auto. Kennisinstituut voor mobiliteit (KIM), 2015
[8] Cities are for people, Jan Gehl 2010
[9] Brutus, William Shakespeare
[10] EdX course Sustainable Urban Design, 2018
[11] Behaviour change more challenging than noise reduction. Henk Wolfert, ICSV 2016.