ARTISTS
Arterial Streets Towards Sustainability

Internal Guidance Note

“perceptions of indicators and descriptors”

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ARTISTS – PERCEPTIONS OF INDICATORS AND DESCRIPTORS

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INTRODUCTION

This document comprises a description and perception of our descriptors and indicators used in ARTISTS project. In this 'perception of indicators and descriptors' different indicators were combined to one descriptor. All indicators we collected in our street cases are included and centralised to descriptors.

A lot of indicators and descriptors are classified in categories. All categories are classified in 6 parts from 1 to 6, like marks in German school system. On the scale of 1-6: 1 is the highest (very good), 6 is the lowest score (very bad). The minimum score required to pass is 4. The aim is to make a focus point on sustainability, because of the aim of the project, also good qualities for pedestrians or residents have a first priority.

Sustainability in the opinion of the author means better living conditions, air quality and less noise and other nuisances in the street. We have to carry out measures, for example slow down cars, so that pedestrians can cross again the street, that people can stay in the street talking without being bothered by traffic noise, that residents again can sleep with open windows without being waked up every night, perhaps children want again playing on the sidewalk or the new rebuilt places. Streets towards sustainability mean streets where people are proud to live, streets that are liveable, attractive and enjoyable places, streets that provide a dramatic improvement in our quality of life.

Some indicators or descriptors cannot be categorised in good or bad or compatible or not, then the numbers within the categories are circuited and are looking like c to h. Other indicators are not centralised in categories, because it's not possible, but are put together in a description of effects or ration.

These categories or descriptions will be taken over to the EXCEL-datasheets of the streets to make a calculation in that way, that we can say, how sustainable our streets are.

In a first step not all descriptors will be calculated, only the very important ones. One reason is that in the beginning we don't know all classification of the different categories. And in the first step we only want a first estimation of the different streets. Later on we will calculate all different indicators and study relations on different descriptors for identifying current problems of each arterial street.

... 

Colin Buchanan said 1963 in 'Traffic in Towns':
"... the freedom with which a person can walk about and look around is a very useful guide to the civilised quality of an urban area."

Seems to be a very good first comprehensive definition how to estimate and qualify our streets.
1 BUILT FORM

Under this headline “BUILT FORM” there are only indicators or descriptors of the street. This indicators and descriptors describe the street, the structure of the street, street definition etc. Here we can find the built volumes. These indicators or descriptors cannot be elements of the street, which we can rebuild in our project (demonstration site). They serve (only) for a description, how the street looks like and for street definition.

STREET DEFINITION

1.1 Street dimensions

Street definition: Dimensions, street scale and enclosure are indicators for the description how the street looks like. How is the enclosure of the street? Is there existing a canyon effect or is the street not enclosed? The ratio of street width to the building high gives an impression of the street: Is it a more opened or more closed space, is there existing a definition of space?

Enclosure can be made by buildings at the roadside that are high enough, but also by trees and other greenery, when this green shapes the street space.

Also spacing of buildings results in less definition of the street and in less enclosure. The more opened the spacing the less the enclosure and street definition.

We need this description of enclosure to define the street, to have an impression how the streets looks like, how the feeling is when people are in the street. But also for a description how car drivers are conducted in the street. Car drivers often are incited to drive faster when street space is not defined and enclosed.

ratio of street width to building height: _____ / _____ = _____
The different ratios have different effects:

- high/width ratio: 1: impression: "alley", enclosure
- high/width ratio: >2: impression: "street", no perception of upper space limits
- high/width ratio: 4: impression: "square", no enclosure

We cannot say which ratio is "the best one", because all ratios have their own characteristics. Some streets are more enclosed than others, but this does not bear to the quality of the street. These indicators are not one we can change, so we have to arrange with status quo.

**primary descriptors:**

1.1.1 Building Height
1.1.2 Street Width (Distance between building lines)
1.1.3 Spacing of buildings
1.1.4 Width of "side space" (both side 'a' and side 'b')
1.1.5 Width between "side space"
1.1.6 Trees and other greenery

**categories:**

1. Green shapes the street space and is an important formative element, unmistakable of the street
2. Green has an influence on the street space / Green outweighs over technical installations.
3. Green does not shape the street space / Green and other installations cancel each other
4. Green has no influence on the street space / Green sporadic exist
5. There is no Green
6. The green is in that way that it threats and makes barriers to pedestrians, cyclists and residents.
1.2 Outfit and Quality

Again street definition, but here focuses on outfit (quantity) and design (quality) and not on structure of buildings. Quality of design of the street and its buildings mean quality for inhabitation and staying for users. With design of buildings for example you can define an atmosphere. With a lot of historical buildings and old little shops you can have the feeling of an old grown town or street. The users can have a feeling of tradition, idyll, it's more emotional. If there are many new well-designed buildings, the feeling of the street is more objective and modern.

Quality of sojourns and so also for living can be increased by making well-designed and enough people spaces, where people can sit and congregate and where children can play.

Greenery in the street produces quality of living and staying, for example because greenery makes a subjective reduction of noise. Conversion of CO$_2$ to O$_2$ has a positive/lasting effect on climate changes.

But also bushes and trees and other greenery in the street can have the opposite effect. Bushes and trees can produce barriers in that way that pedestrians or bicycles are not allowed crossing the street for example. Also bushes can make a feeling of threat or insecureness, when they are not integrated in the scene/design of the street.

Also guard railings can have different impressions/qualities; on the one hand guard railing make footpaths more safe (e.g. in front of schools), on the other hand railings constrain pedestrians in free movement.

Lighting is a very good element for street -design. Lighting also have two effects. At first it makes space bright, dark places of fear can be changed and rebounded.

**categories:**

1. highest quality of street design  
2. high quality of street design  
3. street design is good  
4. street design is ok  
5. low quality of street design  
6. lowest quality of street design

**primary descriptors:**

1.2.1 Width of median and description  
1.2.2 Use of guard railing  
1.2.3 Number and nature of “people spaces”  
1.2.4 Historically important buildings or significant structures  
Are there historical important sites / buildings in the street?  
what? how many? does this historical site attracts attention?  
Qualitative description.
1.2.5 Qualitative description of the built fabric, quality of design, maintenance, building complementary

1.2.6 Description of street surfaces and furniture and other design elements

1.2.7 Lighting

categories:
1 the street space is very well lit, illumination is part of design of the space
2 the street space are very well lit
3 the street spaces and footpaths are illuminated
4 only some parts of the street space are lit, for example only one side is lit or the lighting is only at the median
5 sporadic lighting
6 it is dark, no light (the places and street space are places of fear)

colour of light? __________________
aesthetically pleasing?

1.2.8 Trees and other greenery

1.3 Transparency

Open or closed frontages define transparency and in the same manner define street. Open frontages can give an impression of safety. The people in the street can look inside houses or shop windows and can see what's going on. The space is perhaps not longer a space of fear because lights from windows illuminate the sidewalk. For pedestrians and window shoppers illuminates shop windows are much more pleasant than for example closed walls. Walls furthermore have an effect of constriction and makes space smaller and unpleasant.

Transparency could also be made by cafés in the street, on the sidewalk, on squares. The atmosphere of an open street is much better for all street users when frontages are active and doorways opening on public realm.

ratio of length of inactive frontages to active frontages: _____ / _____ = _____

categories:
1 ratio ≤ 1
2 ratio ≤ 0,8
3 ratio ≤ 0,6
4 ratio ≤ 0,4
5 ratio ≤ 0,2
6 ratio = 0

primary descriptors:
1.3.1 Inactive frontages
1.3.2 Doorways opening onto the public realm
2 FUNCTION / REGULATION / MANAGEMENT

Under this headline “FUNCTION / REGULATION / MANAGEMENT” there are only indicators or descriptors of regulation of the street. This indicators and descriptors describe the regulation of the street and the management. There is existing a wide range of measures that is impossible to cover them all, e.g.: speed limits, one-way street, redesign of junctions, on street parking controls, bus ways / bus roads, priority for buses at intersections, …. All these measures have been shown to have beneficial impacts on travel time, accidents and PT prioritisation. But it is necessary to bear in mind, that it is possible that some regulations can have adverse impacts. Accessibility may be reduced for certain users: one-way workings streets for example pose problems for bus services and deliveries, in the extreme regulations can make a street and quarters unattractive. Other physical methods are: traffic calming, pedestrian priority, bicycle lanes and bike roads, ….

Regulations of traffic can make traffic more acceptable/bearable.

An effect of lower speed limits can be made by traffic calming measures like enclosure by trees and pedestrian crossing assistances. Also bus stops in front of cars force car drivers to drive more slowly. The same effects have bikes and parking cars. Other road users (car drivers) have to be considerate.

Street regulations can be combined by level of speed. If the regulations in the street are working, speed will be reduced for an acceptable traffic for non-motorised road users like pedestrians, cyclists and residents. For motorised road users perhaps lower speed limits are not so accepted, but have to be adhered to car drivers.

2.1 Level of speed, V85

The speed level of the vehicle traffic is a highly decisive factor for the street’s usability as a place for sojourning as well as for the safety of the non-motorised road users. Moreover, the traffic speed influences the individual’s feeling of safety and therefore the well being of each person. After all, high levels of noise due to high speeds are also clearly connected when discussing city traffic.

<table>
<thead>
<tr>
<th>categories:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>30 km/h ≤</td>
</tr>
<tr>
<td>2</td>
<td>35 km/h ≤</td>
</tr>
<tr>
<td>3</td>
<td>40 km/h ≤</td>
</tr>
<tr>
<td>4</td>
<td>45 km/h ≤</td>
</tr>
<tr>
<td>5</td>
<td>50 km/h ≤</td>
</tr>
<tr>
<td>6</td>
<td>&gt; 50 km/h</td>
</tr>
</tbody>
</table>
primary descriptors:

2.1.1 Speed limit / V85 / level of speed
2.1.2 Traffic calming measures
2.1.3 Pedestrian crossings exist
2.1.4 Location and type of signal junction
2.1.5 Location and type of roundabout junction
2.1.6 Location and type of other junctions
2.1.7 One-way or two-way working
2.1.8 On-street parking
2.1.9 Cycle “lanes”
2.1.10 Bus stops

2.2 Proportion / partitioning of public street area

Further indicators that depend on street regulation describe the proportion of the street area. A wider carriageway at the expense of space on the sides means loss of functions in the areas of leisure, non-motorized street usage and residential environment. The reduction of the “visual” width through narrowing the carriageway, extending the sidewalks, installation of bicycle lanes, planting of trees does not only have functional effects such as speed reduction or separation of bicycle and car traffic, more justice in the division of the street area. In addition there is an urban design effect. The total street area should be divided in three part, in side space : carriageway : side space, and this division should have the partition of about 3:4:3.

Significant for the use of the street is the public street area, but due to the fact that the appearance of the street space is also strongly influenced by private areas (such as private parking lots or front gardens), the complete space between the adjacent buildings is decisive for the assessment.

The partitioning of the public street area into areas for vehicle traffic and areas for pedestrians and bicyclists (including green and resting areas) must be based on the requirements of the different user groups such as pedestrians, children playing in the surrounding areas, bicyclists, motorists.... The division of the total street area is more or less compatible to the access requirements of the user groups depending on the ratio of the width of the area for vehicle traffic to the width of the sidewalk, bicycle lane and green space. The criterion “proportion / partitioning of street area” is of special importance because it holds the highest potential for improvements in terms of higher design quality as well as higher usability. If the requirements from all three street functions of sojourning, development and traffic are equally considered, solutions focused solely on traffic with a dominant lane can be avoided.
Wider driving lanes as well as a street design focused on vehicle traffic provoke higher driving speeds and subsequently a higher endangerment of pedestrians and bicyclists as well as a massively constricted usability of the street space for adjacent owners, passer-bys and children, even if areas for uses like resting or playing are existent within the street space. Conversely narrow driving lanes combined with an appropriate design of the street space result in lower speeds. It is therefore obvious that the partitioning of the street area promotes or obstructs the compatibility of the requirements of the adjacent owners to their living environment to the vehicle traffic in multiple ways.

relation of the width of side space to width of carriage way:  _____ : _____ = _____

categories:

1. relation > 1,5
2. relation > 1 to ≤ 1,5
3. relation > 0,75 to ≤ 1
4. relation > 0,5 to ≤ 0,75
5. relation > 0,25 to ≤ 0,5
6. relation ≤ 0,25

primary descriptors:

2.2.1 Number of marked traffic lanes
2.2.2 Width of lanes
2.2.3 Visual width
2.2.4 Division/allocation of carriageway space
2.2.5 Division/allocation of side space
3 PATTERNS OF USE

Under this headline “PATTERNS OF USE” there are only indicators or descriptors of the patterns of use. These indicators and descriptors describe the users and user groups behaviour in the street. How many are they and what are they doing? These indicators or descriptors are for the indication of the level of service of different users and user groups and movement efficiency. With this information we reproduce if there are changes in the pattern of use (quantity and quality) before and after the reconstruction of our demonstration site.

TRAFFIC VALUES AND VOLUMES

The basic value of the surrounding compatible capacity refers to the traffic peaks. But the traffic loading during the “normal periods” are of additional importance for the assessment of the compatibility of sojourning and traffic functions.

Temporary high traffic volumes affect the requirements of the living environment less than constantly high volumes. The ratio between the traffic load during the “normal hour” (N-h) (usually between 10 a.m. and 11 a.m.) and the traffic load during the afternoon peak hour (Sp-h) (generally between 4:30 p.m. and 5:30 p.m.) is used to measure the daily load variations of traffic volume.

Large daily loading variations with equally high peak hour loads which are represented by a low N-h/Sp-h ratio signify a strong reduction in the traffic loading during normal periods. Large daily load variations are subsequently more compatible to the sojourn function than small variations according to this definition.

3.1 Ratio of normal traffic to peak traffic

\[
\frac{\text{normal traffic}}{\text{peak traffic}} = \text{ratio}
\]

**categories:**

1 \( \leq 0.3 \)
2 \( \leq 0.4 \)
3 \( \leq 0.5 \)
4 \( \leq 0.6 \)
5 \( \leq 0.7 \)
6 \( > 0.7 \)

**primary descriptors:**

3.1.1 Average vehicle flow x type
3.1.2 Peak vehicle flow
3.1.3 Flow of vehicles x type across the street
3.2 Percentage of Heavy Good Vehicles

The share of heavy traffic within the total traffic is an important indicator for the disturbing effect of vehicle traffic as it highly affects residential peace and traffic safety. Also the percentage of heavy traffic has influence on noise and air pollution.

The assessment of the compatibility of heavy traffic is based on the traffic volume outside the peak hours, since heavy traffic is especially disturbing if the overall traffic load is rather small.

The percentage of heavy traffic within a city usually varies between 3 and 15%; a share of approximately 5% is considered “normal” and generally accepted.

<table>
<thead>
<tr>
<th>categories:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 ≤ 3 %</td>
</tr>
<tr>
<td>2 ≤ 6 %</td>
</tr>
<tr>
<td>3 ≤ 9 %</td>
</tr>
<tr>
<td>4 ≤ 12 %</td>
</tr>
<tr>
<td>5 ≤ 15 %</td>
</tr>
<tr>
<td>6 &gt; 15 %</td>
</tr>
</tbody>
</table>

**primary descriptors:**

3.2.1 % of trucks (>3,5t) outside peak

**LAND USE DENSITY AND DIVERSITY, PUBLIC FUNCTION WITHIN THE CITY**

Land use density and diversity is a descriptor for how street area is used and which is the public function of the quarter within the city. It is very important to integrate land uses in the estimation of our streets because utilisations in the street in addition to living make a street more attractive for pedestrians, window shoppers and customers. Residences have the facility to go shopping in the street without using a car. The street is busy and animated. Negative facets should be more car traffic and consequently more noise and pollution and other adversities for residents. More industrial or business areas have another atmosphere. In such areas traffic is more compatible and living less attractive.

<table>
<thead>
<tr>
<th>categories:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 primary business area</td>
</tr>
<tr>
<td>2 primary industrial area</td>
</tr>
<tr>
<td>3 primary area of shopping facilities (retail: convenience, comparison, durables, services, shopping-centre)</td>
</tr>
<tr>
<td>4 primary area of social / public services (education, culture, health, administration, sport)</td>
</tr>
<tr>
<td>5 primary residential area</td>
</tr>
<tr>
<td>6 no primary / balance</td>
</tr>
</tbody>
</table>
3.3 Proportions of business and industrial in relation to living

\[
\frac{\text{_____}}{\text{_____}} = \text{_____}
\]

primary descriptors:

3.3.1 Upper floors land use
3.3.2 Ground floor land use

3.4 Proportions of shopping facilities in relation to living

\[
\frac{\text{_____}}{\text{_____}} = \text{_____}
\]

primary descriptors:

3.4.1 Upper floors land use
3.4.2 Ground floor land use

3.5 Proportion of social + public services in relation to living

\[
\frac{\text{_____}}{\text{_____}} = \text{_____}
\]

primary descriptors:

3.5.1 Upper floors land use
3.5.2 Ground floor land use

**Movement Efficiency / People's Movement**

The usability of a street for pedestrians (and bicyclists) is usually portrayed by how easily a street is crossed (see i.e. Apel/Brandt, 1982). The pedestrian flowing with the normal car traffic and the respective traffic volume is thereby not completely considered. In contrast, this assessment is based on the actual observed volume of the length- and crosswise pedestrian traffic, including persons lingering on the street. Furthermore, the people in buses or trams are included.

Because the pedestrian and bicycle volume can be very dependent on the street situation (i.e. narrow sidewalks, no bicycle paths, high vehicle loading, alternative paths through side streets), the considered pedestrian volume is used as an indicator for a minimum claim.

The assessment assumes that pedestrians and bicyclists generally feel disrupted from their activities, in other words, being harassed and endangered by vehicle traffic no matter how high the traffic volume actually is. The more people are on the street indicated by a high number of people the higher are the acceptance and usability of the road but also the higher
are the aims of the pedestrians. A low claim to the usability of the street by pedestrians indicated by a low number of pedestrians is thereby rather more compatible to a volume of vehicle traffic than a high claim, indicated by a high number of pedestrians.

Also a lot of people in the street make a feeling of safety, because of the social control of the other people in the street.

But we have to bear in mind that too much people in the street have an effect of standstills. Walking speeds are severally restricted, and forward progress is made only by "shuffling". There must be a balance between too much people and a low number of people in the street.

### 3.6 Quantity of people movement

**categories: (level of service for pedestrians)**

1. $\leq 0.10$ ped/m²  
   Pedestrians basically move in desired paths without altering their movements in response to other pedestrians. Walking speeds are freely selected, and conflicts between pedestrians are unlikely.

2. $\leq 0.25$ ped/m²  
   Sufficient area is provided to allow pedestrians to freely select walking speeds, to bypass other pedestrians, and to avoid crossing conflicts with others. At this level, pedestrians begin to aware of other pedestrians, and to respond to their presence in the selection of walking path.

3. $\leq 0.40$ ped/m²  
   Sufficient space is available to select normal walking speeds, and to bypass other pedestrians in primarily unidirectional streams. Where reverse direction or crossing movements exist, minor conflicts will occur, and speeds and volume will be somewhat lower.

4. $\leq 0.70$ ped/m²  
   Freedom to select individual walking speed and to bypass other pedestrians is restricted. Where crossings or reverse-flow movements exists, the probability of conflicts is high, and its avoidance requires frequent changes in speed and position. The LOS provides reasonably fluid flows; however, considerable friction and interaction between pedestrians is likely occur.

5. $\leq 1.80$ ped/m²  
   Virtually all pedestrians would have their normal walking speed restricted, requiring frequent adjustment of gait. At the lower range of this OS, forward movement is possible only by "shuffling". Insufficient space is provided for passing of slower
pedestrians. Cross- or reverse-flow movements are possible only with extreme difficulties. Design volumes approach the limit of walkway capacity, with resulting stoppages and interruptions to flow.

\[ 6 > 1.80 \text{ ped/m}^2 \]

All walking speeds are severally restricted, and forward progress is made only by “shuffling”. There is frequent, unavoidable contact with other pedestrians. Cross- and reverse-flow movements are virtually impossible. Flow is sporadic and unstable. Space is more characteristic of queued pedestrians than of moving pedestrian streams.

**primary descriptors:**

3.6.1 Street activities and behaviours

3.6.2 Pedestrian movement along the street, number of pedestrians along per m² (density) (in the peak hour) (see above)

### 3.7 Ratio of people moving along to vehicles

\[ \frac{\text{---}}{\text{---}} = \text{---} \]

**primary descriptors:**

3.7.1 Total number of vehicles

3.7.2 Pedestrian movement along the street, number of pedestrians along per m² (density) (in the peak hour) (see above)

3.7.3 Pedestrian movement across the street

3.7.4 Vehicle occupancy

3.7.5 Degree of utilisation of the buses: Number of passengers in PT-vehicles

**categories:**

1. Within the PT-vehicles a generous available space exists.
2. The seat availability within the PT-vehicles is so large that passengers do not have to stand.
3. The seat offer within the PT-vehicles is sufficient. There are only occasionally standing passengers.
4. Available space within the PT-vehicles is sufficient.
5. The space conditions in the vehicles are restrained.
6. The PT-vehicles are overcrowded.
3.8 Ratio of people moving along to street width

\[
\frac{\text{number of pedestrians}}{\text{street width}} = \text{ratio}
\]

**primary descriptors:**

3.8.1 Street width
3.8.2 Street activities and behaviours
3.8.3 Pedestrian movement along the street, number of pedestrians along per m² (density) (in the peak hour) (see above)
3.8.4 Pedestrian movement across the street
3.8.5 Vehicle occupancy
3.8.6 Degree of utilisation of the buses: Number of passengers in PT-vehicles
4 PERFORMANCE / EFFECTS / OUTCOMES

Under this headline “PERFORMANCE / EFFECTS / OUTCOMES” the effects of the built form, the function, regulation and management and the patterns of use are described. These performance indicators or descriptors are as well for the indication of requirements of quality characteristics for different users and user groups and the quality of life. With this information we can reproduce if the quality of life and the quality of characteristics for different users have changed (quantity and quality) before and after the reconstruction of our demonstration site.

"ARTERIAL" PERFORMANCE / QUALITY CHARACTERISTICS FOR DIFFERENT ROAD USERS / REQUIREMENTS

The "Arterial" performance is the performance of the street itself and its users and user groups. Under this headline we can find the level of services from the different user groups and different circumstances in the street. (Level of Service in this draft according to HBS in Germany and HCM in USA.) The arterial performance indicators give us information about how the traffic and the technical facilities work, if they work in that way we want to or not. Beyond it the requirements of uses are described.

The quality descriptors of the arterial performance are all categorised in 6 levels, from the highest level (1) to the lowest level (6) as aforementioned. There should be a qualitative judgement by experts, who categories the quality for different user groups in the different streets by using collected data and photos, or better go on site.

4.1 Quality for pedestrians moving

The requirements of walking pedestrians are:

- direct path guidance
- closed route network
- orientation/navigation
- straightforwardness
- wide footpaths
- unhindered flow along and across
- attractive paths
- pedestrian crossing facilities
- no waiting time
- short paths
- safety
primary descriptors:
4.1.1 Street definition quality and outfit
4.1.2 Transparency
4.1.3 Street regulations
4.1.4 Proportion / partitioning of public street area
4.1.5 Movement efficiency
4.1.6 Noise, air quality

4.2 Quality for pedestrians staying and talking and lingering

The requirements of standing and talking pedestrians are:
- noise, air quality
- meeting point for different user groups (children, teenagers, hooligans, elderly,...)
- nice places which invite to stay
- safety

primary descriptors:
4.2.1 Trees and other greenery
4.2.2 Places to stay

4.3 Quality for cyclists

The requirements of cyclists are:
- need of parking facilities
- short paths
- unhindered flow
- attractive environment
- safety
- crossing facilities
- noise, air quality

primary descriptors:
4.3.1 Level of service: cyclists
categories:
1 hindrances ≤ 10% Uninterrupted bicycle flow possible, hindrance (number of events) has unique characteristic.
2 hindrances > 10 - 20%
3 hindrances > 20 – 40%
4 hindrances > 40 – 70%
5 hindrances >70 - 100%
6 hindrances = 100% The boundary of 100% hindrance is archived at a flow level well below the facility capacity.

(Hindrance is difficult to measure directly. A surrogate, the number of events encountered by a bicyclist per unit of time, can be used instead.)

This level of service only can be used, when bicycle lanes or path or something near it exists. Also we can use this measurement, when we have zones with low speeds (<30km/h, for example the “Tempo-30-Zone” in Germany)without any special bike lane. The speeds from the motorised vehicles have to be at the same level as the bicyclists. The higher the speeds get the less the bicyclist have the possibility to drive with the vehicle flow, the level of service, the quality for bikes to drive, gets very bad.

When bicyclists have to drive on the carriageway without any bicycle lane and the speed levels are higher than 30km/h than LOS is already bad and there is no need to measure hindrances.

4.4 Quality for PT users

The requirements of PT users are:
- speediness/celerity
- timeliness
- own lane
- bus/tram stops, when possible with shelters
- safety
- design

primary descriptors:

4.4.1 Level of service: PT
categories:
1 The operating speed is very high. There are no troubles at the (bus-) stops. Within the PT-vehicles a generous available space exists.
2 The operating speed is high. The probability of troubles at (bus-) stops is small. The seat availability within the PT-vehicles is so large that passengers do not have to stand.
3 The operating speed is satisfying. Troubles at (bus-) stops become noticeable. The seat offer within the PT-vehicles is sufficient. There are only occasionally standing passengers.
4 The operating speed is low. Troubles at (bus-) stops results in waiting queues. Available space within the PT-vehicles is sufficient.
5 The operating speed is very low. Constantly obstructions between PT-vehicles and the other road users/uses occurs. The capacity is reached. The space conditions in the vehicles is restrained.
6 The operating speed is extremely low. Routes/lines and (bus-) stops are overloaded. The demand is greater than the capacity. The PT-vehicles are overcrowded.

4.4.2 Quality of stay at the bus/tram stations on the street
(shelters/seating provided; enough place at the bus/tram stop, separate from walking area;...)

4.4.3 Bus/tram reliability

4.5 Quality for car-drivers

The requirements of car-drivers are:
- short travel time
- connection facilities
- orientation/navigation
- parking facilities
- safety

primary descriptors:

4.5.1 Level of service: junction with traffic lights
categories:
1 The majority of the road users can pass the junction unhindered. The delays are very short.
2 All road users arriving during the red light can proceed through in the following green light. The delays are short.
3 Almost all road users arriving during the red light can proceed though the junction in the following green light. The delays are noticeable.
Only minor traffic jams occur on average at the end of the green light concerning motor vehicle traffic.

4 Remaining traffic jams are constantly present for motor vehicle traffic. Not all vehicles can be dispatched during one circle time/circulation. The delays of all road users are considerable. The traffic condition is still stable.

5 The road users compete with each other. A cumulative traffic jam occurs in motor vehicle traffic. The delays are very long. The capacity is reached.

6 The demand exceeds the capacity. The vehicles have several stop and go phases (must wait through several green and red lights) before they can proceed through the junction. The traffic jam constantly grows. The delays are extremely long. The road infrastructure is overloaded.

4.5.2 Level of service: junction without traffic lights

categories:

1 The majority of the road users can proceed through the junction unhindered. The delays are very short.

2 The driving possibilities of the wait-requiring motor vehicle stream are affected by right-of-way traffic. The developing delays are small.

3 The drivers in the side streams must pay attention to a noticeable number of right-of-way road users. The delays are noticeable. Traffic jams occurs, but they cause only very small adverse effects.

4 The majority of drivers must accept stopping, combined with clear loss of time. Long waiting times may occur for some vehicles. Even if a temporary observable traffic jam flows into a side stream, it will build back up to its original length. The traffic condition is still stable.

5 Traffic jams build up which cannot be reduced through available means. The waiting times approach very high values. Small impairment of the parameters can lead to a traffic collapse. The capacity is reached.

6 The number of vehicles, which proceed through a junction per time unit, is larger than the capacity of this traffic flow over a longer period of time. Long, constantly growing line-ups with particularly high waiting times occur. This situation is first resolved through a clear reduction of the traffic intensity. The junction is overloaded.

4.5.3 Level of service: cars

categories:

1 The road users are rarely affected by other road users. They have enough desired freedom of movement, in the way which is allowed for the street infrastructure. The traffic flows freely.

2 The presence of other road users is noticeable, but causes only small adverse effects to others. The traffic flows almost freely.
3 The possibility of individual movement often depends on the behaviour of the remaining road users. The freedom of movement is noticeably reduced. The traffic condition is stable.

4 The traffic flow is characterized by high loads, which causes noticeable adverse effects in the freedom of movement of the road users. Interactions between road users almost constantly take place. The traffic condition is still stable.

5 Constantly mutual obstructions between the road users occur. Freedom of movement is given only to a very minor degree. Insignificant deterioration of the measurements of influence can cause a breakdown of the traffic flow. Traffic ranges between stable and unstable. The capacity is reached.

6 The demand exceeds the capacity. Road infrastructures are overloaded.

4.6 Quality for residents

The requirements of residents:

- noise, air quality
- good performance of street area
- social safety and usability
- attractive and mixed uses (retail and public)

primary descriptors:

4.6.1 Noise / air quality
4.6.2 Performance
4.6.3 Qualitative description of the built fabric, quality of design, maintenance, building complementary
4.6.4 Trees and other greenery
4.6.5 Upper and ground floor land use
The following descriptors of local performance, economy, society and security are also categorised in 6 levels, from the highest level (1) to the lowest level (6) as aforementioned. Here there should be a qualitative judgement by experts together with local authority to categories these following performance descriptors. The experts have to make a categorisation by using collected data in consideration of the knowledge of local authorities about local circumstances.

"LOCAL" PERFORMANCE

The "locale" performance indicators give us more information about the vitality of the street, the street area and the vitality of the uses in the street. It is an indicator of how the street is accepted in the city. Do people want to live there, do they want to go shopping there, and do they want to stay in the street and talk. Does the performance of the street invite people to rest? The "locale" performance indicators link to the "arterial" performance indicators. When arterial performance indicators have a high level, locale performance indicators will increase.

4.7 Vitality

**primary descriptors:**

4.7.1 Number of people in street
4.7.2 Number of activities in street
4.7.3 Residential population
4.7.4 Working population

**ECONOMY**

The economy indicators give information about the viability of the area where the street belongs to. A high level of economy indicators says something about the society of the street. The economy indicators have a bearing on prestige of the street area. If the economy indicators have a low level it may indicate a high level of dilapidation and clutter on the street. Vacant buildings often don't look very nice and don't make a nice atmosphere.

4.8 Viability

**primary descriptors:**

4.8.1 Prime yield
4.8.2 Average yield
4.8.3 Vacancies (Retail, Office)

**SOCIETY**

The society indicators give information about affluence or deprivation of a street area. The society indicators also have a bearing on prestige of the street area. It is an indicator for a high or low development of an area. The society indicators have effects on economy and security indicators. The higher are the levels of affluence and health the lower are the levels of for example crime and vacancies.

4.9 **Affluence / Deprivation**

**primary descriptors:**

4.9.1 Unemployment
4.9.2 Income
4.9.3 Residential rents/purchase price

4.10 **Health**

**primary descriptors:**

4.10.1 Medical prescription issuing rate
4.10.2 Pollutants

**SECURITY**

Worldwide, death and injuries from road accidents have reached epidemic proportions. (C.A. O'Flaherty). One million people are killed in on year in the world. Collisions on road are now the main cause of death for young people in the age group 15-25 years. In our project safety and security are main aspects we have to pay attention to. For example children are landed to school by car, so that they reach school safe without getting hurt by other vehicles. The effects of the circumstance that children are not allowed going out without any companion, to
have freedom of movement and liberty of action, are serious. This circumstances change life in the city seriously.

Safety always depends on speeds in the street. A higher speed level in built-up roads results in more killed persons. But we have to bear in mind that comparison from fatalities and casualty rates in different countries must be treated with care as they contain results arising from different traffic compositions, variations in the proportions of travel occurring in built-up areas, differences in quality of street lighting, road standards, vehicle legislations, etc. Accident reporting produce also varies considerably between countries. Road fatalities are the simplest to compare but these are also complicated by problems of definition: in Britain and Germany a death is due to a road accident if it occurs within 30 days; in Italy, seven days; in France, six days; in Greece, three days; and in Japan, Spain and Portugal, one day.

THE VISION ZERO

In October 1997, the Road Traffic Safety Bill founded on Vision Zero was passed by a large majority in the Swedish parliament. The Vision Zero is that eventually no one will be killed or seriously injured within the road transport system (Ministry of Transport and Communications, 1997). The Vision is an expression of the ethical imperative that it can never be ethically acceptable that people are killed or seriously injured when moving within the road transport system.

4.11 Safety

**primary descriptors:**

4.11.1 Traffic death
4.11.2 Traffic injuries
4.11.3 Speed

4.12 Security

**primary descriptors:**

4.12.1 Reported crime
ENVIRONMENT

The environmental indicators are air quality (pollutants) and noise. Air quality and noise both have a very big influence on a lot of other descriptors. We have to take into account the effects of air quality and noise (traffic) to quality of people’s health.

Air quality is a very important qualitative indicator for all road users and user groups above all residents and children. The impact of pollution is not directly noticeable but compromise people’s health.

It is very difficult to compare different emissions of locally pollutants in different European cities, because the limit values in the cities in the EU are different, and according to this the motorised vehicles have different technical standards and different exhaust gas pollutions. Besides we have no influence on exhaustion of vehicles with planning methods. It's only a political and technical problem.

Also noises lower quality of live for residents and lower quality for staying in the street and talking. A lot of residents feel harassed by traffic noise. Some residents get ill because of the sound level of motorised traffic. Excessive noise can reduce the quality of life, for example, through lack of sleep or inability to concentrate. Noise is generally regarded as unwanted sound. It could be too loud, too intrusive or just happen at the wrong time or without warning. For example, nobody enjoys being woken up in the middle of the night by a faulty car alarm or too much heavy loads.

4.13 Air Quality

categories:
1 no pollutants
2 less pollutants
3 some pollutants
4 pollutants approximate limit values
5 pollutants exceed limit values
6 danger to health

primary descriptors:
4.13.1 Emissions of locally important pollutants

4.14 Noise

for noise estimation please see appendix I from Copenhagen

primary descriptors:
4.14.1 Outdoor daytime noise levels
4.14.2 Outdoor night time noise levels
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APPENDIX

ATKINS – A paper how to include noise in the ARTISTS project