SWOV Fact sheet

Zones 30: urban residential areas

Summary
Sustainable Safety uses a road categorization which concentrates through traffic on motorways and other main roads. In residential areas, which have a living, shopping, or work function, through traffic is discouraged by setting a speed limit of 30 km/h, and by speed reducing measures such as speed humps, road narrowing etc. When a 50 km/h residential area is redesigned into a 'Zone 30', the average decrease of the number of injuries is approximately 25%. The Zones 30 also have a positive effect on the quality of life: there is less noise, crossing the road is easier, and the emissions are less. According to the Sustainable Safety requirements, residential areas should be as big as possible, but 2 km^2 is the largest feasible area. A road structure of the 'limited access' type is the most suitable for a 30 km/h area.

What are residential areas?
Residential areas are unbroken areas with a living, shopping, or work function. According to the Sustainable Safety principles, the only cars allowed are those with their origin or destination in that area. Through traffic should make use of roads and streets that are meant for that purpose as much as possible. According to the road categorization, these are distributor roads, urban and rural main roads with speed limits of 50 and 80 km/h respectively, and through-roads, usually motorways and trunk roads with a speed limit of 100 or 120 km/h.
According to Sustainable Safety, residential areas have a speed limit of 30 km/h because collisions at speeds lower than 30 km/h rarely result in fatal crashes. Slow traffic (pedestrians, cyclists, and (light) moped riders) and motor vehicles can mix safely at this speed limit. The quality of life also improves (noise level, ease of crossing the road, amount of exhaust fumes).

Since 1983 it has been legally possible to set up a 30 km/h zone in the Netherlands. Originally, the demands for its design were published in the *Manual for 30 km/h measures* (Ministry of Transport, 1984). This design requires quite a few measures per kilometre road length. In 1997, about 15% of the total length of residential streets in the Netherlands had been converted into Zones 30. By late 2002, the Start-up Programme Sustainable Safety which was carried out in the period 1997-2002 had increased this to approximately 50% and to about 75% in 2007. However, the new 30-km/h zones have a low-cost design (Infopunt DV, 2000); there speed reducing measures were only used at 'dangerous' locations. The low-cost design is not the intended final situation, but a transition phase that is used to quickly install many Zones 30 at relatively low cost in order to speed up making the urban road categorizing visible.

How safe are residential areas?
It was illustrated above that since 1997 the area of 30-km/h zones has increased substantially. Next we will present some Dutch crash data for the developments in the period 1997-2002.

Crashes per motor vehicle kilometre travelled
The crash rate for streets with a 30 km/h speed limit has decreased considerably since 1997: in 1997 there were 0.53 severe crashes per million motor vehicle kilometres and in the period 2002-2007 the annual average was 0.34, a 36% decrease. With 18%, the decrease was smaller for the roads with a 50 or 70 km/h limit.

Crashes per road length
In the period 2002 – 2007 approximately half the urban road length consisted of streets with a 30 km/h speed limit; in 1997 this was 15%. In the period 2002-2007, approximately 12% of the severe urban crashes happened on those streets, and in 1997 the proportion was 5%. Reckoning per road length, streets with a limit 30 are therefore safer than the urban main roads. The difference has grown during the past ten years: in the period 2002-2007 there were 0.04 severe crashes per kilometre limit 30 road, as opposed to 0.31 for the limits 50 and 70; in 1997 the figures were 0.07 and 0.23 respectively.

Share of fatal crashes
In streets with a speed limit of 30 km/h the share of fatal crashes has remained about the same between 1997 and 2007. Approximately 3 in every 100 severe crashes in these areas are fatal. After an initial small decrease, the share has risen again from 2002 onward.

Involvement of cyclists and/or pedestrians
In an absolute sense, the involvement of cyclists and/or pedestrians in severe crashes is somewhat higher on 30 km/h streets than on roads with a limit of 50 or 70 km/h, 51% and 46% in the period 2002-2007 respectively. Relatively speaking, therefore, their crash involvement is less in streets with a 30 limit because these streets probably have much more cyclist and pedestrian road users than other roads in urban areas. Janssen (to be published) estimates that in 30 km/h streets the crash rate (crashes per motor vehicle kilometre travelled) between fast and slow traffic has decreased for some years after 1997 to show an increase once more in the following period. Roads and streets with a 50 km/h limit show a continuing small decrease of the crash rate for these types of conflict. The absolute crash rate is somewhat higher than that on streets with a 30 km/h limit.

What is the safety effect of a 30 km/h area?
The fact that 30 km/h areas have a positive road safety effect has been established in many Dutch and foreign studies. The average number of injury crashes decreases by about 25% when a residential area with a speed limit of 50 km/h is redesigned as a Zone 30 (Elvik, 2001); the dispersion of this average is more than 20%. Vis & Kaal (1993) found a decrease of 22% (with a dispersion of 13%) in the number of injury crashes in 150 Dutch 30 km/h areas. The large dispersions of crash reduction are mainly due to the large differences in the characteristics of the areas studied. These are especially the size, the building density, the nature of the chosen speed reducing measures, and the traffic volume. Wegman et al. (2006) estimate that in the Netherlands in 2002 around 3% of the serious casualties (fatalities and severely injured) were saved as a result of the construction of a large number of Zones 30 in the period 1997-2002.

What is the maximum size of a residential area?
According to the requirements of Sustainable Safety, residential areas should be 'as large as possible'; there is no more exact indication. Their size is dependent on the structure and density of the road network; this is often determined by geographical features. In practice, the size therefore varies considerably, from 0.2 km^2 to 2 km^2. Quality of life (noise level, ease of crossing the road, emission) does not allow more than 5,000 motor vehicles travelling through a 30 km/h street per 24-hours. Large areas can also comply with this by increasing the number of entries to the area to be proportional to the area size (for example 2 entries for 0.2 km^2 and 16 for 2 km^2). General rule is that for a Zone 30 larger than 2 km^2 it is not possible anymore to keep the 24-hour traffic volumes at an acceptable level. For a residential area larger than 1 km^2, the surrounding roads will have (too) many motor vehicles per hour. This will make it more difficult for especially pedestrians and cyclists to cross these roads.

Which road structure is suitable for a residential area?
Traffic engineers usually make a distinction between three specific road structures for residential areas: 1) a grid or lattice structure (Alexander, 1966), 2) a tree or organic structure (Reichow, 1959), and 3) a mixed or 'limited access' structure (Marks, 1957); see *Figure 1*. According to Dijkstra (2000), history teaches us that road safety in residential areas is best served by a system based on limitations of entry and speed; this is the case in the organic structure and the limited access structure.

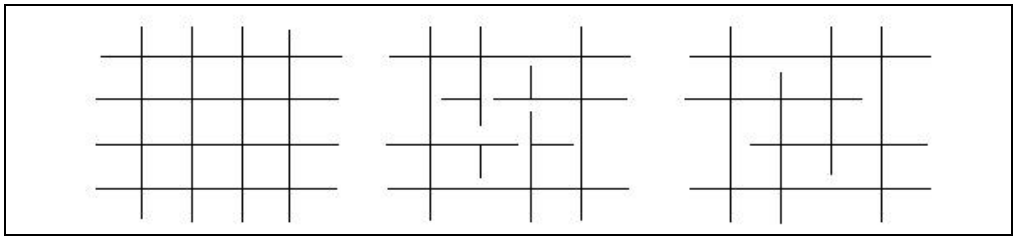

Figure 1. *Traffic structures, from left to right: grid or lattice, organic or tree, mixed or limited access.*

The quality of life and accessibility are optimal in a grid structure in which the traffic is dispersed over many streets. The construction and maintenance costs of the traffic structure are most favourable for the 'limited access' structure because of the lesser total road length in the area. If all the features of

these structure types are considered, the 'limited access' structure scores positively in all aspects (Dijkstra, 2000).

How can you keep out through traffic in an existing structure?
It is possible to keep through traffic out of a residential area by making direct routes impossible or unattractive. This can be done by introducing detours, or by taking speed reduction measures such as speed humps, road narrowing, or zigzagging the road axis. These ways of limiting car traffic are not allowed to limit the area's accessibility for cyclists and pedestrians. Extra short cuts and priority regulation must prevent delay along bicycle routes.

How much extra travel time is there for emergency services and buses?
Larger Zones 30 lead to longer travel times for emergency services and buses. An emergency vehicle needs 11 seconds more in a 0.25 km^2 area, up to 31 seconds in a 2 km^2 area. A bus needs an extra minute in a 0.7 km^2 area. All these extra travel times have been calculated in comparison with an area the same size in a 50-km/h area.

Do motorists indeed keep to the 30 km/h limit?
During the first period after the introduction of the 'Zone 30' measure, speed measurements were conducted in areas that had been redesigned according to the Dutch *Manual for 30 km/h measures* (Vis, 1991). At that time, the driving speed of 85% of the motor vehicles then decreased to below the 35 km/h in practically all the investigated areas.
From 1997 onward, many low-cost design areas have been implemented. The speed reduction measures in those areas have been limited to a small number of relevant locations. The Dutch Traffic Safety Association (3VO, 2004) has conducted measurements throughout the Netherlands in dozens of 30-km/h areas, among which the low-cost design areas. Only 14% of motor vehicles drove slower than 30 km/h, but a vast majority of 85% did not drive faster than 45 km/h. According to a study of the characteristics of low-cost design areas (Steenaert, Overkamp & Kranenburg, 2004) residents accept that a speed is higher than 30 km/h on some road segments as long as speed reduction measures have been implemented at intersections.
The Bureau Traffic Enforcement of the Public Prosecution Service (Plasmans & Tuinenburg, 2006) evaluated enforcement projects that had been carried out in fourteen 'Zone 30' areas. Their report says: "Low-cost design areas in particular turn out to be complaint locations; a road which has the entire Sustainable Safety design often has no complaints at all. Enforcement in these low-cost design streets often has a temporary positive result". On average, each project had a duration of six months and also after this period enforcement was carried out regularly, until the infrastructure at that location had been adapted. The average percentage of vehicles driving faster than 30 km/h was 40% before and 20% after the enforcement projects had been carried out.

Is the speed hump necessary as a speed limiter?
The 'classic' speed hump regularly gets a lot of criticism. Speed measurements have shown that the 'classic' speed hump has the greatest effect of all speed reducing measures (Vis, 1991). For the time being, there is no good alternative for the speed hump so long as automatic speed limiters are not commonplace. The actual designs and location of speed humps sometimes deviate from the design guidelines (CROW, 2002). A better application of these guidelines would prevent a lot of nuisance for residents and those travelling through.
Restraint is required when using speed reduction measures on the surrounding through-roads, especially at places where there are many crossing movements. Too many impediments to the traffic flow on these through-roads can, after all, result in cars using roads and streets that they are not intended to.

How much do measures in residential areas cost?
SWOV has estimated the costs of low-cost design 30 km/h areas at about €22,000 per kilometre. This measure costs €86,000 per casualty saved (deaths or in-patients) (Wesemann, 2000).

Conclusions and recommendations
The road categorization in Sustainable Safety aims to concentrate through traffic on motorways and other main roads. Through traffic is kept out of the residential areas and in those areas slower speeds are ensured, especially by speed reduction measures. Decreasing through traffic and reducing speeds are indispensable for a successful residential area. Both road safety and the quality of life (noise level, road crossing, exhaust fumes) benefit. However, if a 30 km/h area is larger than 1 km^2, it puts a lot of

traffic pressure on the surrounding through-roads. We recommend taking this into account by limiting Zones 30 to a maximum of 1 km^2, or by adapting surrounding roads, especially improving their crossing facilities. We also recommend using a 'limited access' traffic structure for a Zone 30. This is favourable for all aspects: road safety, quality of life, accessibility, and construction and maintenance costs.

Publications and sources
(Most publications are in Dutch; SWOV reports contain an English summary)

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