SUSTAINABLE SAFETY IN THE NETHERLANDS AND THE APPLICABILITY IN SOUTH AFRICA

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ABSTRACT

The Sustainable Safety programme in The Netherlands is a proactive road safety approach focussed on the prevention of unsafe human acts. The Sustainable Safety programme is based on three main principles: the functionality of roads, the predictability of traffic situations and the homogeneity of masses and speed. The definition of a functional classification of all roads within the road network is a very important aspect of the programme. For each road category in the classification system, dedicated safety characteristics, such as speed limits, are defined.

The Sustainable Safety programme has been successful in reducing the number of road accident fatalities in The Netherlands over the last 15 years. This is mainly the result of the (relatively) low cost infrastructure measures that have been realised following an agreement between the national Ministry of Transport and regional and local authorities.

In South Africa the number of road accident fatalities per million inhabitants has strongly been increasing over recent years. The lack of high quality road safety engineering is an important cause of the worrying road safety situation in South Africa. A Sustainable Safety programme based on the Dutch model could provide South Africa with a valuable framework for the implementation of road safety engineering improvements. The road classification that is proposed by the National Department of Transport in the RISFSA document would be a very suitable starting point for a Sustainable Safety programme in South Africa.

1. INTRODUCTION

The goal of the Dutch Sustainable Safety programme is to prevent collisions and, where this is not possible, to reduce the chance of severe injuries. The programme was introduced in 1992, but only got seriously underway with the launch of the Start-up Programme in 1997. This agreement between the national, regional and local authorities contained 24 action plans and an extensive subsidy scheme. The programme has been successful in the reduction of number of road accident fatalities in The Netherlands in the last 15 years. The Sustainable Safety programme is promoted by the World Health Organisation and the World Bank as the leading example of good practice (World Health Organisation and World Bank, 2004), together with the Swedish Vision Zero programme.

The road safety situation in South Africa has worsened over the last couple of years. The paper aims to find out whether a road safety programme based on the Sustainable Safety programme as implemented in The Netherlands could be valuable in the current South African situation.

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The paper will start with the discussion of the Sustainable Safety programme in The Netherlands, firstly in theory (Section 2) and secondly in practice (Section 3). Section 4 of the paper deals with the applicability of the programme in South Africa. A brief overview of the current road safety situation in South Africa and some relevant traffic planning developments are given. Consequently the possible benefits of a Sustainable Safety programme in South Africa are discussed. Section 5 of the paper contains the conclusions.

2. THEORY BEHIND THE SUSTAINABLE SAFETY PROGRAMME

2.1 A proactive approach to prevent unsafe human acts

Human behaviour is the starting point of the Sustainable Safety programme. The approach recognizes people's physical vulnerability, but also their restricted capabilities (people make errors, after all) and willingness (people do not always abide by the rules). The programme acknowledges that the responsibility of safe traffic does not only lie with road users, but also with those who design the elements of the traffic system, such as infrastructure, vehicles and education. By optimising these three aspects, errors in human behaviour are prevented and/or the consequences of these errors are minimised. This requires that road users are sufficiently trained in their task of traffic participation on the one hand, while the road design should meet their expectations and encourage safe behaviour on the other hand (SWOV, 2006).

2.2 Three main principles

The Sustainable Safety programme is based on three main principles: the functionality of roads, the predictability of traffic situations and the homogeneity of masses and speed. These principles are explained in table 1.

Table 1: Three main principles of the Sustainable Safety programme

Functionality	Three functional road categories are recognized: • Through roads: high level roads connecting the main economic focus points in the country or region; • Distribution roads: main arterials connecting towns and neighbourhoods with the through roads; • Access roads: local roads connecting properties with the distribution roads An important aspect of the Sustainable Safety programme is that the different functionalities of these categories require different road safety features.
Homogeneity	Road users/vehicles with large differences in mass and/or speed will be physically separated as much as possible. If, as a result of environmental or cost restrictions, this is not possible, the travel speed must be reduced to create an acceptable road safety situation.
Predictability	A continuous and consistent road design will support the road user's expectations along the entire route, while all elements of the road design should conform to these expectations. This predictability will ensure that road users know which driving behaviour is expected and encourage them to drive appropriately.

The application of this vision on infrastructure has resulted in these main principles of the Sustainable Safety programme finding their way into manuals and guidelines for road design in The Netherlands and it is being implemented in practice as well.

2.3 Functional network hierarchy

Designing a functional road network is in the first place a traffic planning issue. A well designed road network will lead to the appropriate usage of the different road links in the network. Through roads will be used by long distance traffic, urban arterials will be used by traffic with a destination in the concerning urban areas and access roads will only be used by traffic to the surrounding properties.

From a road safety point of view a functional network hierarchy and the appropriate usage of such a network has the advantage that the characteristics of traffic on the roads are predictable. As a result, the right road safety measures can be realised at the right place. Speed humps on access roads in residential areas will be appropriate to improve road safety. They will easily be accepted by road users, especially if it concerns traffic with a local destination only. On main city arterials other traffic calming measures would be more appropriate, because the traffic is travelling over longer distances and speed humps would seriously influence travel times.

The functionality and road safety can also strongly benefit from integration with urban planning during the network design process. This could avoid situations where through roads are cutting through residential areas where, for instance, learners have to cross several main arterials to reach there schools.

Obviously, a road is allocated to one of the three categories as a result of its function in the road network, as opposed to allocation by responsible authority. Provincial roads in The Netherlands can both be through roads and distributor roads. Municipal roads are categorised as distributor roads or access roads.

2.3 Road characteristics and speed limits

The road design and traffic environment should more or less automatically invite correct and safe behaviour by the road users. This can be encouraged by creating recognizable and predictable road characteristics. One of the main achievements of the Sustainable Safety programme is the strict allocation of road characteristics to all three distinguished functional road categories. These characteristics are shown in tables 2.

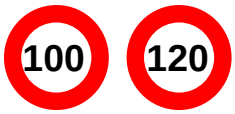
Table 2: Road characteristics by road type

Road type	**Characteristics**
Through road	• Median barrier to avoid head on collisions • No crossings at grade with other infrastructure • No physical traffic calming measures
Distributor road	• Traffic calming at specific locations only • Right-of-way over access roads • Main public transport routes
Access road	• No right-of-way between each other • Speed humps as traffic calming • Mixture of different kinds of traffic

Table 3 gives the speed limits Which are allocated to the road types. The basis for the allocation of speed limits is the possible conflicts between road users and the road safety consequences of these possible conflicts. Only on roads with no possible frontal or transverse conflicts between road users, speed limits of 100 km/h or more are suitable. On roads with possible frontal conflicts 70 or 80 km/h would be an appropriate speed limit. On intersections with the possibility of traverse conflicts 50 or 60 km/h is the correct maximum

speed. On roads with possible conflicts between cars and non-motorised transport 30 km/h is considered the appropriate speed (SWOV, 2006).

Table 3: Maximum speed allocation by road type

Road type	Built up areas	Other areas
Through road		
Distributor road		
Access road		

The strict allocation of speed limits is meant to make the road users familiar with a specific speed limit for each type of road. This will lead to a better understanding of the speed limits and consequently a better adherence to it.

3. THE SUSTAINABLE SAFETY PROGRAMME IN PRACTICE

3.1 Subsidy programme and agreement

To encourage regional and local authorities to implement the measures needed to create a sustainable safe road environment, an extensive subsidy programme was set up by the national Ministry of Transport. A total amount of about € 100 million was allocated to regional and local authorities to realise road safety measures. Provincial authorities were appointed to allocate the budgets between local municipalities. An important condition was that regional and local authorities pay for 50% of all projects by themselves (Ministry of Transport, 1997).

The subsidy programme was part of an agreement that was signed between national government and all regional and local authorities in 1997 to reduce the number of fatalities by 50% by 2010 (reference year 1986).

Over the last 10 years, the parties cooperated successfully, both in the preparation and in the implementation of the agreement. Regional and local authorities spent even more money in the implementation than actually planned in the subsidy arrangement. As a result, practically the entire road network has been categorized into three functional categories and a large number of infrastructure measures has been implemented accordingly.

3.2 Focus on low-cost infrastructure measures

Measures mentioned in the agreement between national, regional and local authorities included the following:

- Manuals and guidelines for road design;
- Realisation of 30 km/h zones in residential urban areas;
- Realisation of 60 km/h zones in rural areas;
- Right-of-way at distributor roads;
- Road categorisation programme
- Additional effort on enforcement
- Education and information

Figure 1: Typical traffic calming at access roads (30 km/h zone)

In practice the Sustainable Safety programme resulted predominantly in low-cost traffic calming measures at access roads (30 and 60 km/h zones). This emphasise on access roads is a result of the wide support among the Dutch population to do something about these roads (SWOV, 2006). Distributor roads have a relatively high accident rate, but it has been difficult to introduce sustainable safety principles in practice. This is why little has been done as yet to deal with distributor roads, other than the construction of roundabouts, cycle tracks and pedestrian crossings.

Figure 2: Typical traffic calming measures at distributor roads (pedestrian crossing)

Figure 3: Typical difference between 30 km/h zone and distributor road

3.3 RESULTS

Together with the United Kingdom and Sweden, The Netherlands is one of the safest countries in the European Union and the world as it comes to road safety (ECMT, 2004 and 2006). Although it is difficult to determine the exact contribution of the Sustainable Safety programme to the road safety situation in The Netherlands, the figures in table 3.1 show clearly that the reduction in the number of fatalities per million inhabitants per year is recently increasing. This effect it seems is mainly attributable to the above mentioned road infrastructure improvements, implemented since 1997.

Table 4: Development of fatalities per million inhabitants in The Netherlands

Year	Fatalities per million inhabitants	Development
1990	92	
1995	86	– 7%
2000	68	– 21%
2005	46	– 32%

Source: ECMT, 2004 and 2006

3.4 Advanced Sustainable Safety

As shown above, the implementation of Sustainable Safety resulted in many improvements during the period 1990-2005. However, there has been too little focus on the non-infrastructural aspects of the Sustainable Safety vision. The Advanced Sustainable Safety programme, launched in 2006, focuses more on road user behaviour. Two new main principles have been added: the enhancement of the awareness of the road user and the realisation of an anticipating road environment (SWOV, 2006).

Together with higher traffic volumes and traffic densities, we have to face increasing problems of aggression and intolerance in traffic. People not only make traffic unsafe by unintentional errors but also by deliberate violations. When the traffic environment does not more or less automatically invite correct and safe behaviour, road users should comply with the rules from an inner motive. To improve rule acceptation, rules should be appropriate to the traffic environment and credible to road users, and people should be educated to accept the usefulness of rules (SWOV, 2006).

4. APPLICABILITY OF THE PROGRAMME IN SOUTH AFRICA

4.1 Road safety in South Africa

Recently the number of road accident fatalities per million inhabitants in South Africa has strongly been increasing. Between 1998 and 2005 this increase was 38%. Table 4 shows a decrease in the early 1990s, but an increase in the new millennium (RTMC, 2006).

The poorest population groups in South Africa are also the most vulnerable in traffic. More than 40% of the road accident fatalities are pedestrians, while minibus taxi users are also exposed to more than average risks.

Road accidents are costing the country about R40 billion per annum. This cost includes aspects like medical cost, damage to infrastructure and vehicles, etc. It doesn't take into consideration loss off skills or disabled persons unable to fully function. More than 40.000 people are seriously injured annually (Broom, 2006).

Table 4: Development of fatalities per million inhabitants in South Africa

Year	Fatalities per million inhabitants	Development
1990	365	
1995	252	– 31%
2000	250	– 1%
2005	297	+ 19%

The focus of South African Road safety policy currently lies with awareness raising and traffic law enforcement. Very little is being done about the engineering side of road safety problems.

In its 2005 Road Traffic Report the Road Traffic Management Corporation (RTMC) concludes that the ever-growing number of road traffic accidents and related deaths demonstrate that the current systems for combating traffic offences are proving to be inadequate. Subsequently the RTMC attributes the level of un-safety only to the increasing degree of lawlessness on the roads in South Africa (RTMC, 2006). Without any doubt this alleged lawlessness is worrying and has a negative effect on road safety, but it doesn't seem to be the only problem regarding road safety in South Africa.

Figure 4: Lack of pedestrian facilities and complex road designs in South Africa

From an engineering point of view the lack of pedestrian facilities, lack of median barriers on high speed roads and the prevailing wide and complex intersection designs are just a few causes of the high level of un-safety on South Africa's roads. A few examples are shown in figure 4. The road design should encourage road users to obey the traffic rules. In addition, the road design should minimise the consequences in case they unfortunately don't. Traffic calming measures should not focus only on speed humps, but a variety of engineering options. Traffic calming measures can significantly decrease the number of traffic accidents, injuries and fatalities (Broom, 2006).

4.2 Road network classification

In the National Department of Transport's Road Infrastructure Strategic Framework for South Africa (RISFSA) a road network classification system based on the function and significance of roads within the network is proposed. This strategic road classification system aims to support government's social economic development goals. The road classification is not intended to impose or change ownership and administrative responsibilities. The classification system intends to guarantee an integrated road system (Department of Transport, 2005).

The classification system in the RISFSA document distinguishes six road categories with a certain strategic function and an indication of the nature of the concerning roads. The following categories are proposed (Department of Transport, 2005):

- Primary distributor roads;
- Regional distributor roads;
- District distributor roads;
- District collector roads;
- Access roads;
- Non-motorized access ways.

A classification like this seems a very important aspect of the traffic and transportation planning in South Africa. It could also very well be extended with the allocation of road safety requirements and design standards to the distinguished road classes. This way the RISFSA classification system seems very suitable as a basis for a South African Sustainable Safety programme.

The only drawback could be that the relatively high number of categories seems a bit complicated, both from a traffic planning point of view and from a road safety perspective. In The Netherlands three levels are generally considered the optimum in a transportation network hierarchy (both for road networks and public transport networks).

4.3 A South African Sustainable Safety programme?

Obviously, as a result of the differences in both the geographical and the socio-economic circumstances between the two countries, road safety issues in South Africa cannot always be directly related to situations in The Netherlands. In The Netherlands gravel roads are hardly used, no townships or slums exist and security problems are different from South Africa. Urban densities are much higher in The Netherlands, resulting in less space for road infrastructure.

The above mentioned differences do, however, not necessarily mean that South Africa would not be able to benefit from a Sustainable Safety programme, based on the successful programme in The Netherlands. In the first place, besides differences, a number of similarities exist. Like The Netherlands (and other developed countries), South Africa owns a modern network of road infrastructure, both on a national level and in urban areas. Another notable similarity is the large modal share of non-motorised transport (mainly cyclists in The Netherlands and pedestrians in South Africa). Furthermore, the Sustainable Safety programme is founded on general road safety principles based on human behaviour (as described in paragraph 2.2), which doesn't fundamentally change from country to country.

As concluded above, the lack of high quality road safety engineering is an important cause for concern in South Africa. A programme similar to the Dutch Sustainable Safety programme would be particularly beneficial in implementing engineering improvements within a strong policy framework. The Dutch example shows that a formalised programme like that can significantly improve road safety.

Although the principles could be the same, a South African Sustainable Safety programme would probably lead to a different package of measures than those in The Netherlands. Even more than in The Netherlands, the implementation of infrastructural measures in South Africa will be restricted due to budget limitations. This doesn't affect the value of a Sustainable Safety programme, because it can be run on the long term and will ensure that all interventions are in line with the same national road safety policy framework.

Considering the current lack of, for instance, pedestrian facilities, the implementation of low cost, high impact measures could already cause an enormous improvement of the road safety situation.

A Sustainable Safety programme in South Africa should also incorporate enforcement and education policies. An integrated approach can strongly enhance the overall effectiveness of the South African road safety interventions. This would also add an important dimension to the Dutch Sustainable Safety programme, where the integration with enforcement and education policies is lacking.

Off course, the programme should not apply to the upgrading of existing situations only. It would also ensure that new road infrastructure would comply with the latest road safety design standards. These design standards would not necessarily replace the existing South African Road Safety Manual, although some alterations could be valuable, but would in the first place ensure that the right design standards are used at the right locations.

The implementation of a Sustainable Safety programme in South Africa could include the following steps:

- Define a road network according to the classification as proposed by the National Department of Transport in the RISFSA document;
- Establish sustainable road safety design standards for each of the distinguished road classes;
- Create a operational management system, including the delegation of budgets and responsibilities to different levels of authority;
- Determine the locations where the road infrastructure does not comply with the road safety design standards and prioritise potential projects;
- Set up a subsidy programme and an agreement with regional and local authorities.

5. CONCLUSIONS

The Sustainable Safety programme in The Netherlands has been successful in substantially reducing the number of road accident fatalities. This is mainly the result of the relatively low cost infrastructure measures that have been realised following an agreement between the national Ministry of Transport and regional and local authorities. The sustainable road safety design standards and guidelines are currently broadly accepted in traffic and transportation planning practices. The programme has been lacking in enforcement and education strategies for many years, which still needs further effort.

South Africa is currently lacking high quality road safety engineering. A Sustainable Safety programme based on the Dutch model could provide South Africa with a valuable framework for the implementation of road safety engineering improvements. Obviously, several aspects may require a different approach, because of different geographical and socio-economic circumstances in South Africa.

To ensure a consistent and clear road safety policy countrywide, the Sustainable Safety framework allocates specific road safety features to different categories in the road network. The road classification that is proposed by the National Department of Transport in the RISFSA document would therefore be a very suitable starting point for a Sustainable Safety programme in South Africa.

6. REFERENCES

[1] Broom, AJ, 2006, Standardising Traffic Calming Measures To Achieve Uniformity In Road Safety Procedures, 3rd Annual African Road Safety Conference

[2] Department of Transport, 2005, Road Infrastructure Strategic Framework for South Africa (RIFSFA)

[3] European Conference of Ministers of Transport (ECMT), 2004, Preliminary Data on Road Safety in Europe in 2004

[4] European Conference of Ministers of Transport (ECMT), 2006, Preliminary Data on Road Safety in Europe in 2006

[5] Ministry of Transport (The Netherlands), 1997, Convenant Duurzaam Veilig (Agreement Sustainable Safety)

[6] Road Traffic Management Corporation (RTMC), 2006, Road Traffic Report on Number of Registered, Un-Roadworthy and Un-Licenced Vehicles, Driving Licences, PrDPs, Traffic Volumes, Speed, Distance Travelled and Fatal Crashes

[7] SWOV (Institute for Road Safety Research, The Netherlands), 2006, Advancing Sustainable Safety, National Road Safety Exploration for 2005-2020

[8] World Health Organisation and World Bank, 2004, World Report on Road Traffic Injury Prevention