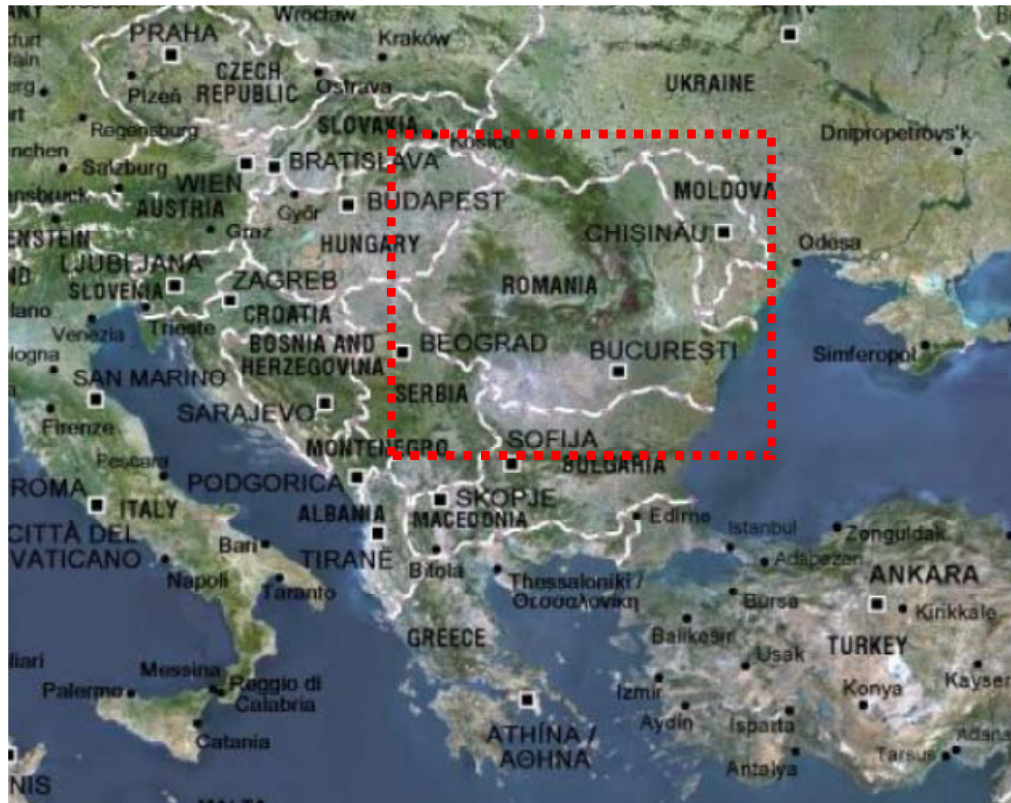




Rijkswaterstaat  
*Ministry of Infrastructure and the  
Environment*

## Vulnerable Road Users The Netherlands





## Vulnerable road users

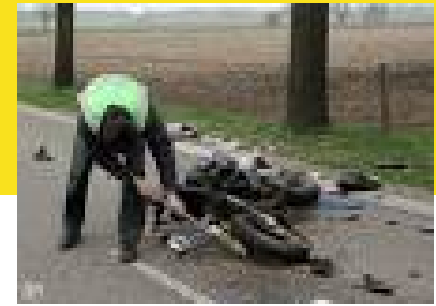
A group of road users can be defined as 'vulnerable' in a number of ways by the amount of:

- protection in traffic (e.g. pedestrians and cyclists)
- task capability (e.g. the young and the elderly).



### Vulnerable road users

- do not usually have a protective 'shell' (e.g. moped and light moped drivers)
- also the difference in mass between the colliding opponents is often an important factor (e.g. pedestrians, cyclists and mopeds).



## Vulnerable road users

Vulnerable road users can be spared by:

- limiting the driving speed of motorized vehicles;
- separating unequal road user types as much as possible
- adapting motor vehicles (e.g. by side-underrun-protection for trucks and collision friendly car fronts)

can lessen the injury severity of vulnerable road users.

In crashes involving only vulnerable road users and no other road users, it is mainly the infrastructure that is important for the prevention and limitation of injury





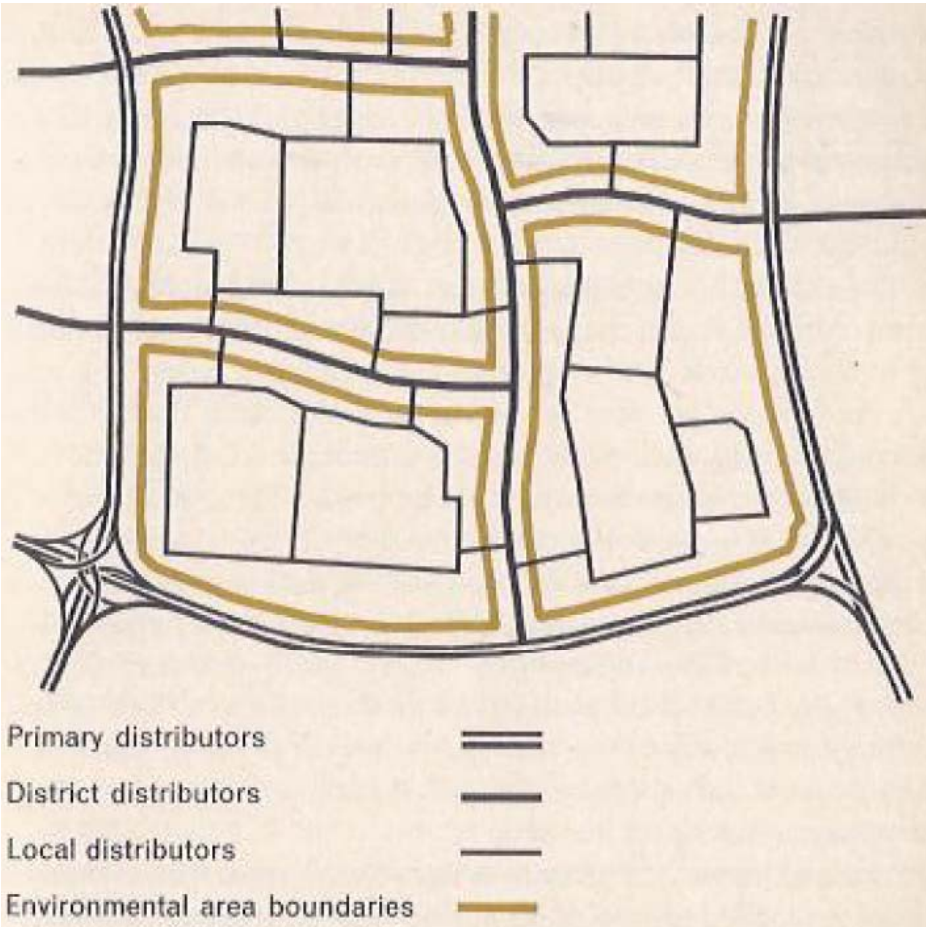
## Vulnerable road users

Safe system approach (sustainable safety)

Key principles are

- ⇒ functionality,
- ⇒ homogeneity,
- ⇒ predictability,
- ⇒ and forgiveness

# Functionality



- Hierarchical classification of roads:
  - Through roads with a flow function
  - Access roads to give access and for sojourning
  - In between are distributor roads to connect through roads and access roads:
    - Flow function on road sections
    - Exchange of traffic at intersections



## Homogeneity

- Equality in speed, direction, and mass at medium and high speeds
- Crash energy should not exceed the biomechanical tolerance of the human body
- 30 km/h can be considered a safe speed to mix cyclists with motorized traffic; separation is needed at higher speeds





# Functionality and homogeneity

## Access/ exchange

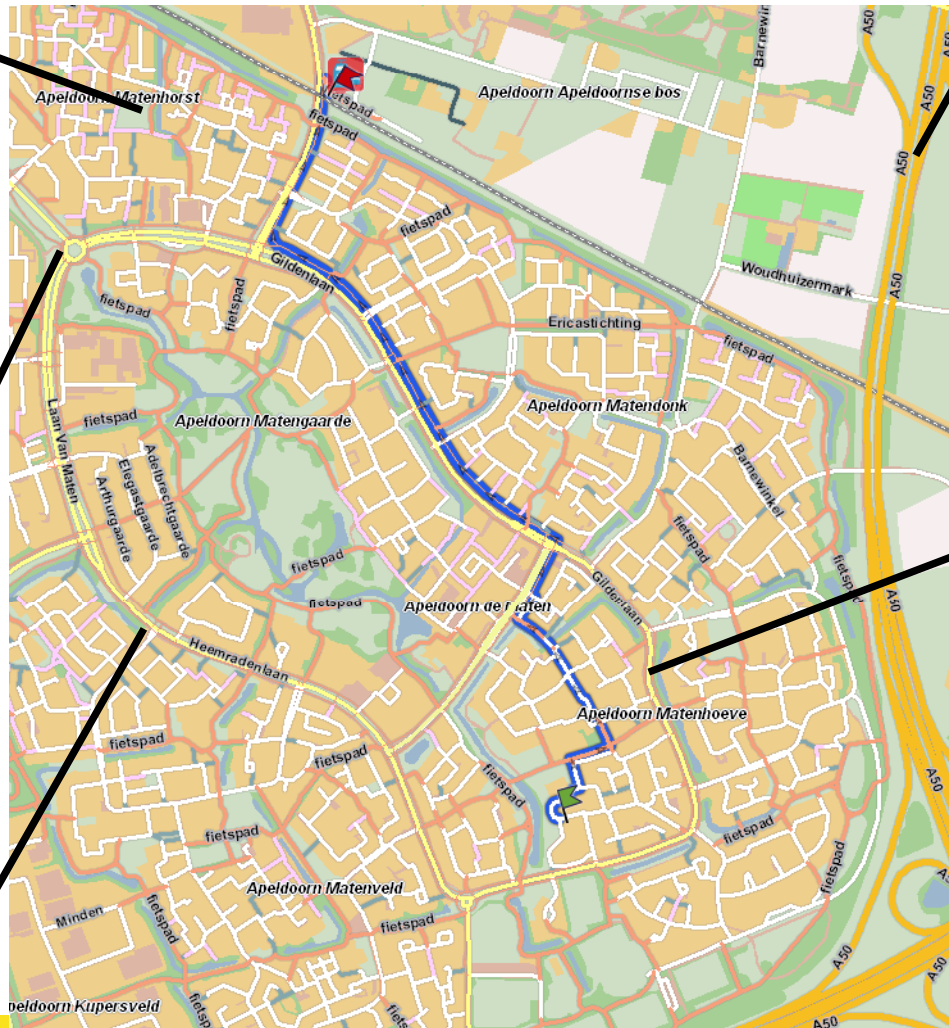
## Flow



**Access roads:**  
cyclists and motorists  
are mixed



**Through roads:**  
no cyclists allowed



**Road sections of  
distributor roads:**  
cyclists preferably  
separated by bicycle tracks



**Intersections of  
distributor roads:**  
preferably speed



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## Recognisability

- The principle is linked to the concept of Self-Explaining Roads (SER): a traffic environment which elicits safe behaviour simply by its design
- Link with road classification: road features are homogeneous within road types and physically different from other types
- Road users know which other roads are to be expected and what behaviour is expected of them





# An impression: along distributors





# Interventions to reduce risks cycling infrastructure

- **Roundabouts**

- Well designed roundabouts improve road safety considerably, also for cyclists
- Roundabouts with bicycle tracks are safest

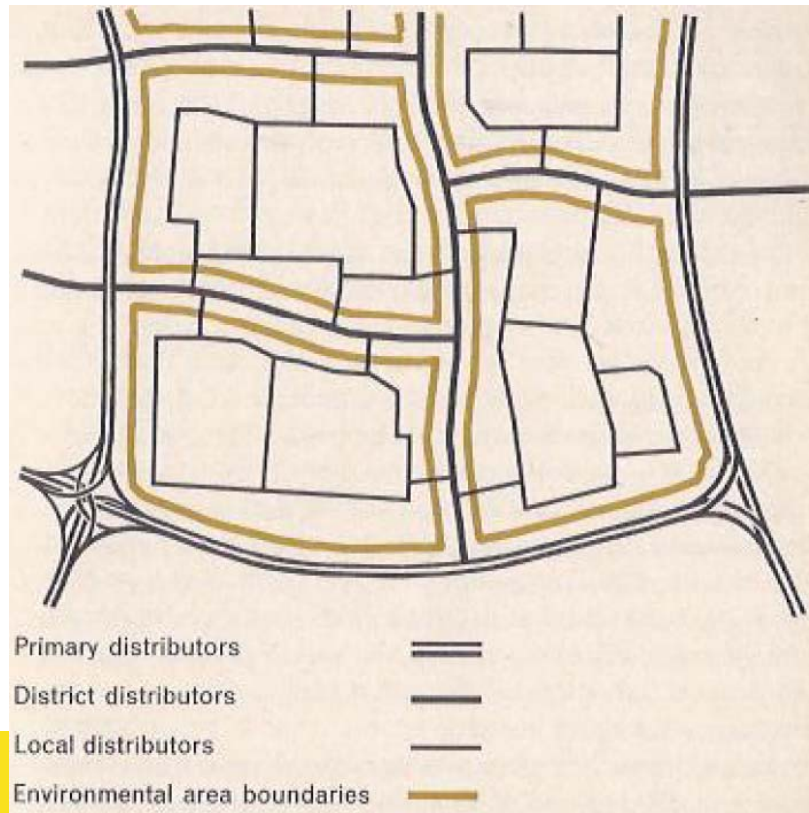






## Measures Vulnerable road user

- Complete separation of unequal types of road user is of course the best solution
- Construction of 30 km zones with distributor roads around this area



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## Measures Vulnerable road user

- Construction of raised junctions (distributor roads) or zones 30 at locations with mixed traffic and speed humps.



- With regard to facilities for motor vehicles, trucks (which are relatively often involved in crashes that have serious consequences for vulnerable road users) must be equipped with side-underrun-protection, and good side and rear view facilities to as much as possible limit the blind spot when turning right
- Bicycle helmets for cyclists and moped drivers



## Measures Vulnerable road user

- By constructing bicycle paths and pavements vulnerable road users on road sections can be separated from the other traffic. But crashes can also happen on pavements and bicycle paths.
- It is therefore not only important to provide facilities for a specific group of road users, but to also pay attention to safe design and layout, and good maintenance.
- Remove poles







## Measures Vulnerable road user

- Bicycle light and maintenance.





## Measures Vulnerable road user

- Driver training, public information campaigns and surveillance
  - As the car is the pedestrian's most frequent crash opponent, it is worthwhile educating learner drivers and ensuring that they learn safe behaviour during their driver training.
  - Police enforcement is important to increase drivers' compliance with the traffic regulations, particularly at pedestrian crossings.





## Measures Vulnerable road user



- School crossing patrol officers help children cross the road on their way to and from school. It is compulsory for drivers to stop for the stop signal of a school crossing patrol officer.



- Traffic education recommend keeping the expertise regarding traffic education accessible and to guarantee it by means of, for instance, a traffic education expertise centre. They also point out that, besides this formal training, parents and carers can also contribute to their children's traffic education.