# Innovative solutions for mobility and environment

**TNO** | K**n**owledge for busi**n**ess


TNO has clustered its strengths to contribute to feasible solutions for quieter, cleaner and more energy-efficient mobility.

# space and activitie


*TNO supports and advises the authorities and other organisations in preparing, implementing and evaluating policy with regard to quieter, cleaner and more energy-efficient mobility. We also help companies make their systems and products more environmentally friendly in an affordable way.*

*TNO works on solutions whereby the whole chain, from source to effects on health, is tackled in its fullest extent. Such solutions cannot be generated by technological know-how alone. A multidisciplinary approach – which incorporates the environment, the attitude of stakeholders, policy, legislation and policy acceptance - is necessary to tackle the challenges towards a liveable and sustainable mobility. TNO experts from a variety of disciplines work together on mobility and the environment, not only in terms of road traffic but also other forms of modality like rail, air and water. This is where the many technologies and areas of expertise within the TNO organisation come into play.*

Future mobility will have to be quieter, cleaner and more energy-efficient. Innovative solutions are becoming more necessary than ever, not just technologically but also in various processes that can contribute to achieving our environmental objectives. TNO is working on such solutions.


Together with DAF Trucks and the Eindhoven University of Technology, TNO has developed mild-full hybrid distribution trucks for urban use. The aim is to reduce fuel consumption and $CO_2$ production as well as substantially limit the amount of noise produced. The system uses a 44 kW electrical engine in a parallel hybrid configuration with lithium ion batteries. TNO has selected and tested these components and is ensuring that the control system of the entire powertrain enables optimum performance.

TNO has developed VERSIT+, an advanced model that is able to calculate the emission factors of different categories of vehicle in real traffic conditions. The model is based on the many laboratory measurements of various vehicle types and is regularly supplemented with the data of new vehicle and fuel types. This model calculates standard emission factors that are used by TNO and others.

## Development of powertrain technology

TNO develops and improves powertrains and components to make them more energy-efficient, cleaner, quieter and safer. In the past TNO built its reputation on its work in alternative fuels. This field of work has since been expanded to include advanced (hybrid) powertrains, diesel-emission limitation and powertrain control systems. We have sophisticated test and analysis facilities available for this work. By coupling knowledge of legislation and technology, TNO is especially well placed to advise on development options.

## Vehicle emissions and the use of fuels

For government policy to be substantiated with regard to vehicle emissions, specific and detailed knowledge is required on current and future actual vehicle emissions. Such knowledge is derived in part through various and extensive measurement programmes. TNO is the 'national' supplier of emission factors on all kinds of scales, and these are

# abitat ➔ health


**What TNO has to offer**

The activities of TNO in mobility and the environment are:

- Strategic policy advice
- Policy-supporting and substantive research
- Infrastructure studies and projects
- Development and production of modes
- Design and management of information systems
- Measurements and evaluation of tests
- Technology development
- Programme management
- Costs and benefits analysis

then used by others for a variety of purposes. TNO develops advanced emission models that can also be used for calculating the effect of traffic measures on the environment. TNO has specialist knowledge of the application of conventional and alternative fuels in respect of greenhouse gases ("well-to-wheel" analysis) and other emissions.

## Traffic and air quality

TNO has extensive knowledge and facilities to establish or, in the case of new infrastructure, predict the effect of traffic on local air quality. Mathematical models can calculate the distribution of traffic emissions for specific locations or areas. The various sources (traffic, industry, etc) are combined to determine the local air quality and to check it against the respective standards. Measurements can help monitor the actual levels of contaminating substances. For instance, the impact of new building development can also be investigated in detail in the wind tunnel. To determine the effects of traffic measures on the air quality, emission, traffic and distribution models are combined.

TNO is part of the BEST Europe project (Sixth Framework Programme) in which both users, biofuel producers and vehicle suppliers are participating. Using TNO's scientific knowledge is helping new technologies and improved applications for biofuels in the EU to be explored.

TNO has developed models to predict railway noise. These are used to make quieter rolling stock, rails and steel rail bridges.


## Noise: emission and distribution

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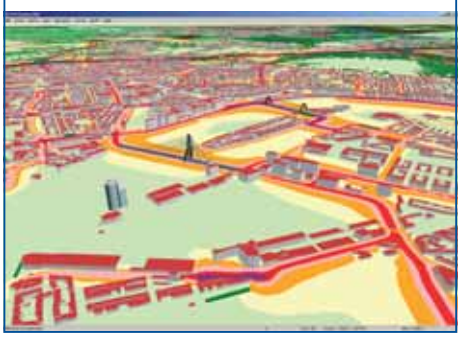
## Quality of habitat and health

To be able to assess the quality of the local habitat as the consequence of environmental and traffic measures an increasingly comprehensive approach has to be taken, one that incorporates the role of air quality, noise, odour and external safety aspects. Given our knowledge in these fields, TNO is perfectly suited to supporting local policymakers and implementing bodies with such a comprehensive approach, developing and applying special strategies and resources. TNO also investigates sleep disturbance and the impact on health of road and rail noise.

## Strategic advice

A broad knowledge base enables TNO to advise government and industry on strategic choices related to the environmental impact of mobility. TNO undertakes social cost-benefits analyses and process analyses whereby specific technology and process knowledge within the organisation is a strong point. TNO has the requisite models and methods for these activities.

Urban Strategy is a decision-support system developed by TNO for policymakers in which they can immediately and interactively see the impact of interventions on the local habitat (for example, traffic flow, noise, air quality, safety, accessibility, green and groundwater).



# National and international collaboration

The importance and influence of the European Union are increasing, by European law and legislation on the one hand and by the effects of the common market and emergence of a European knowledge infrastructure on the other. TNO works closely with universities and knowledge centres at home and abroad, and with the research departments of major companies. In addition, TNO participates in many European framework projects that relate to the environment and mobility. We also take part in a variety of international networks and collaborative ventures such as different Implementing Agreements of the IEA (International Energy Agency). This way we keep our knowledge up to date and keep our the service to our customers optimal.

## Research facilities

TNO has a broad range of advanced facilities for R&D and advice on mobility and the environment, like:

- Engine and Emissions Laboratory, with test facilities for engines, powertrains and vehicles (renovated and expanded in 2008 in Helmond)
- VERSIT+ models for the emissions of different vehicle categories
- Sampling and monitoring equipment for Nox, PM10, SO2, BTX and other substances
- Chemical laboratory
- Wind tunnel
- Pluim Snelweg and CAR model: respective detailed and simplified model for calculating air pollution along roads and streets
- Pluim Vaarweg: model for calculating air pollution along waterways and harbours
- Simulation and evaluation models to determine the effects of traffic on the environment at various levels and for various scenarios (ITS modeller, TRANSMOVE, Indy)
- Numeric modelling of atmospheric noise propagation (as in complex shaped screens, screen top effects)
- Acoustic camera
- Monitoring system for the detailed analysis of traffic noise.
- Urban Strategy: interactive, decision-support system for the local habitat.

**Mobiliteit**

As an independent organisation, TNO turns knowledge into practical applications and so contributes to the innovative capacity of business, both at home and abroad, as well as social and international organisations. TNO has a broad package of products and services.

The expertise of the more than 4,700 TNO employees has been brought under five core areas:

- TNO Quality of Life
- TNO Defence, Security and Safety
- TNO Science and Industry
- TNO Built Environment and Geosciences
- TNO Information and Communication Technology

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