About VTI

VTI carries out applied research and development, investigations, measurement and testing. Our activities and operations concern all modes of transport. The institute has a broad competence profile, with its key capabilities in the areas of safety, economics, the environment, traffic and transport analysis, public transport, behaviour and human-vehicle-transport system interaction, and in road design, operation and maintenance.

VTI’s head office is in Linköping where most of the activities and operations are based along with the institute’s laboratory resources and heavy research equipment. The institute also has branch offices in Borlänge and Stockholm, where the emphasis is on transport economics and transport policy, in Gothenburg with a research focus on vehicle technology and vehicle safety and in Lund with focus on public transport. VTI has about 200 employees.
Facts and figures from 2016

Professors at VTI

Jan-Eric Nilsson
Transport Economics, in conjunction with KTH Royal Institute of Technology.

Jane Summerton
Technology & Social Change, in conjunction with Linköping University.

Sigurdur Erlingsson
Pavement Technology, in conjunction with KTH Royal Institute of Technology och Iceland University.

Jan Andersson
Human-machine-interaction (HMI) within the transport sector, in conjunction with Linköping University.

Yvonne Andersson-Sköld
Environmental analysis, in conjunction with with the Department of Civil and Environmental Engineering at Chalmers University of Technology.

Staff distribution

Gender among staff 2016

43% of the staff have Licentiate or Doctoral degree.
21 Doctoral students have been located at VTI during the year.

Number of employees: 200 persons
Average age: 44.5 years
Recruited during the year: 16 persons
Licentiate and doctor’s degree: 86 persons
Doctoral students: 21 persons
Degree students: 6 persons

Income from (SEK million) and number of foreign clients

- EU
- ERAnet/CEDR
- Other
- Quantity

Women 42%
Men 58%

Facts and figures from 2016

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- EU
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Men 58%
Transportforum started off the year

Transportforum was held on 12–13 January and drew just over 1700 attendees while offering 85 sessions and 44 exhibitors. The number of attendees has remained fairly consistent from year to year, but the number of submitted proposals for presentation at the conference has increased by about 20 percent each year. Just over 420 proposals were submitted for Transportforum 2016. After the conference, a questionnaire was sent to everyone who had been at the conference. As a forum for exchanging knowledge, Transportforum 2016 was given a grade of 4.0 by attendees and 4.1 by participants (i.e., presenters and session leaders) on a five-point scale. As a forum for making contacts the grade was 4.0, while the grade for the overall quality of the event was 3.9. Transportforum is constantly striving to improve as a forum for disseminating knowledge and facilitating contacts in the transport and infrastructure industries.

Prizes and stipends

Stipend to Astrid Linder
Each year the Håkan Frisinger Foundation for Transportation Research awards an SEK 250,000 stipend to a prominent researcher. This year Doctor Astrid Linder (VTI) and Professor of Personal Injury Prevention Mats Svensson (Chalmers University of Technology) shared the prize money for their groundbreaking efforts in biomechanical research and innovative crash-test dummy development, respectively.

Anna Niska was awarded the 2016 Traffic Prize
Researcher Anna Niska, who has been working on bicycle-related issues for nearly 20 years, was awarded the 2016 Traffic Prize in conjunction with the Swedish Association of Transportation Planner’s annual meeting in April. The rationale for the award was as follows: “Anna Niska is being awarded the Swedish Association of Transportation Planner’s Traffic Prize for her many years of work on improving opportunities to enable more people to choose to walk or cycle. Based on research and data-driven analyses, she has shed light on the importance of operation and maintenance for pedestrians and cyclists, in both winter and summer. One specific example is her role in developing and evaluating methods for snow removal by sweeping and spreading salt, yielding direct results in the form of increased traffic safety and security, with positive consequences for both individual health and the traffic system as a whole”.

Sound Prize to Ulf Sandberg
Research Director Ulf Sandberg was awarded the Swedish Acoustical Society’s 2015 Sound Prize for his internationally successful efforts in the field of tyre-roadway noise.
Noise from road traffic is viewed as the biggest negative environmental factor in Europe, and is estimated to affect one in four Europeans. This noise derives primarily from tyre-roadway contact. The problem is especially severe in Sweden, where the roadways generate high noise levels because they are built very durably to withstand wear from studded tyres. Studded tyres also generate particularly high noise levels.

Get the latest updates from VTI

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Prestigious distinctions in road and railway track engineering

Sigurdur Erlingsson, professor i väg och hanteknik vid VTI, har tillsammans med olika medförfattare, nyligen fått två hedrande utmärkelser för sin forskning. I den internationellt erkända tidskriften Road Materials and Pavement Design belönas han med ”Best Scientific Paper Award 2015” för sitt paper ”Modelling of responses and rutting profile of a flexible pavement structure”. Här bygger forskningsdata på omfattande försök med VTI:s Heavy vehicle simulator (HVS), en forskningsutrustning där man simulerar verklig belastning från tunga fordon och studerar hur olika typer av väguppbyggnader klarar tung trafik. Utmärkelsen delar han med sin medförfattare Thorbjorg Saevarsdottir.

För sin rapport ”Characterizing the Permanent Deformation of Silty Sand Subgrades Using a Model Based on Multistage Repeated Load Triaxial Testing” får han utmärkelsen ”Sections 2016 Best paper Award” av Transportation Research Board (TRB) Geological and Geoenvironmental Engineering Section. TRB är en av sju programenhetar inom amerikanska National Academies of Sciences, Engineering, and Medicine. Rapporten har han skrivit tillsammans med VTIkollegen Shafiqur Rahman och Farhad Salour, Trafikverket.

VTI organised Hyperloop seminar

On 7 April, working together with the Royal Institute of Technology and others, VTI organised a seminar on the Hyperloop, a high-speed train transport concept initially created by entrepreneur Elon Musk. The seminar dealt primarily with potential Hyperloop service between Sweden, Åland, and Finland, and how that would fit with plans for high-speed rail service between Stockholm, Malmö, and Gothenburg.

RS5C (Road Safety on Five Continents)

RS5C was organised by VTI and held on 17–19 May in Rio de Janeiro, Brazil, in collaboration with ANPET (the Brazilian National Association for Transportation Research and Education). RS5C is an international conference with the goal of improving traffic safety globally by providing a platform for exchanging knowledge and helping the participant countries strike a healthy balance between traffic safety and mobility. Traffic accidents and fatalities are a major world health problem, leading to 1.24 million deaths each year. Many countries have learned how to reduce the number of traffic accidents, but much remains to be done.

New professorship in environmental analysis

VTI has created a new professorship in environmental analysis with a focus on shipping, appointing Yvonne Andersson-Sköld as professor. The position is the result of a cooperative arrangement with the Department of Civil and Environmental Engineering at Chalmers University of Technology. The focus for Andersson-Sköld will be on taking a holistic approach and expanding opportunities for cooperation, including through a broader doctoral programme. She will also be working to promote more international publication and collaboration at international conferences and in EU projects. Andersson-Sköld’s expertise in the environmental field will enable VTI to strengthen and enhance the Department’s ability to explore issues related to the transportation sector and climate change. The environmental field comprises so much more than just climate issues, and Andersson-Sköld’s broad knowledge will afford VTI greater means of addressing the total environmental impact of transportation as well.
Increasing focus on transforming the transport system

The need to transition to a more sustainable transport system and society is increasingly obvious to the Society, Environment, and Transport (SAMT) Department. Several major societal trends are related to this shift, affecting many of the research projects assigned in the Department. One such trend concerns increasing automation in the traffic field, while another concerns how a transport system not dependent on fossil fuels can be achieved through, for example, digitalisation.

Automation of the transport system will entail major changes. “Although technical advances are happening very quickly in this field, we know little about the expected effects of the automation of various parts of the traffic system. We have a lot of research to do there”, said Department Head Mattias Viklund. As a result, two doctoral projects concerning the effects of automation on traffic have been launched at the Centre for Traffic Research (CTR), in which the Swedish Road and Transport Research Institute (VTI) is a main partner. The aim is to refine existing traffic models. One project concerns the gradual evolution of self-driving vehicles from their current state of incorporating multiple semi-automated driving systems, to fully autonomous vehicles. The project will map the deficiencies of existing models for simulating partly or fully self-driving vehicles, and offer suggestions for further development. The second doctoral project will focus on the prospect of a future when all vehicles are autonomous. How will the traffic system function in such a future? What effects can be expected in terms of, for example, capacity, travel patterns, and fuel consumption?

Digitalisation for fossil-free mobility

Sweden’s goal of becoming one of the world’s first fossil-free countries will require major changes in the transport sector. As a result, the Swedish Foundation for Strategic Environmental Research (Mistra) has chosen to provide SEK 40 million in funding to the Sustainable Accessibility and Mobility Services (SAMS) research programme, a Royal Institute of Technology (KTH) and VTI-led consortium working closely with the City of Stockholm and several research and societal partners. The overall aim of the programme is to study and continue to develop mobility services that can, for example, make it more attractive to forego travel by personal car, resulting in the more efficient utilisation of existing infrastructure. Researchers from the SAMT Department are looking more closely at non-technical elements.

New professors, broader competence

The SAMT Department is growing and broadening its competence. “We have been strong primarily in the area of road-related research, but now we are gaining ground in the area of railways. We have also broadened and developed our competence in aviation and maritime operations, particularly through the assignment from the government, which addressed the socioeconomic costs of various types of transport”, said Viklund.

Yvonne Andersson-Sköld assumed her duties as a professor at VTI in the environmental field during the year, and the process of engaging a new professor in economics has entered its final stages.
A new start for the Department, and major projects

During the year, the Department of Traffic and Road Users (TRAF) reorganised itself into four units instead of the former three, and three new unit managers were installed over the summer. The results of these strategic initiatives in the areas of automation, train simulation, and driving ability assessment are starting to be seen in the form of new projects.

“We are in the last phase of establishing our new structure, and hope that the reorganisation will lead to greater strategic strength, new contract projects, and a higher number of competent researchers”, said TRAF Department Manager Jonas Jansson. The Department has a number of new recruitment efforts underway in 2017, including in the areas of automation, electric roads, traffic safety, railways, and road equipment.

Driving ability assessments represent yet another area in which VTI and TRAF are expanding. “During the year, at VTI in Linköping we performed numerous driving ability assessments of individuals with loss of field of vision. We also delivered and have new orders for a number of smaller driving ability-assessment simulators, including for various hospitals, where we see a need and a growing market”, said Jansson. Simulator II was upgraded with a new modern Scania cab and a new visual system during the year.

Prestigious project headed by the VTI

TRAF became involved in numerous major projects during the year. The most prestigious, ADAS& ME, is the biggest project VTI has ever coordinated. This EU project addresses automation and how it relates to the driver’s state. “We will study how automated vehicles can be adapted to environment context and driver state. The project is relevant to the development of this entire field in terms of both research and innovation – an exciting project for all of Sweden”, Jansson explained.

Electric roads represent another interesting area for research. The work that began last year has now advanced to stage two, with VTI and Viktoria Swedish ICT driving forward a coherent initiative focusing on innovation and knowledge related to electric roads. One electric road project that advanced during the year concerns the simulation of an electrified bus route in Lund. The simulated environment will demonstrate to stakeholders and the public what it would be like to have an electric road for buses in Lund.

Major commitment to train simulation

TRAF employees have developed a railway simulator that can simulate the train drivers work environment and be configured in various ways, as needed. Train projects completed and ongoing during the year addressed energy-efficient operation, signal systems, and driving simulations for use in training. TRAF has developed a number of smaller train simulators, including for Bombardier, ProTrain, and Järnvägsskolan (Railway Training Centre). During the year, VTI also created the “TUFFA” forum for those with VTI train simulators, to enable them to share their experience and help VTI continue improving the simulators based on input from forum members.

Plans for 2017 include even more activities in the automation field. Because the goal of a fossil-free vehicle fleet by 2030 is still in place, there is a major need for research into, for example, automated vehicles, changes leading to more energy-efficient behaviour, and more environmentally friendly vehicles.
Broad range of contract projects and testing activities

The activities of the Infrastructure Department were characterised by a variety of contract projects in 2016. As usual, there was a strong focus on measurement, for example, of friction and texture, but exciting projects with completely different orientations are underway in the Department as well.

“It is an asset that the National Road and Transport Research Institute (VTI) has such a range of experience, and can consequently collaborate on so many different types of projects”, said INFRA Department Manager Anita Ihs. Researchers in the Operation and Maintenance Unit are working on four new Swedish Transport Agency projects having to do with “safety in use” requirements associated with road equipment, friction, local disuniformities, and pedestrian accidents caused by falling. Researchers in the Road and Railway Track Engineering Unit are focused in part on hard urban surfaces in combination with vegetation.

Facilitating plants in the city

During the year, VTI completed Vinnova’s Grey–Green City Project along with 15 partners. VTI’s input dealt with the testing of paving stone surfaces. The basic idea was to create paved surfaces that work well with vegetation, while remaining durable and reducing stormwater runoff. Work on the Climate-Safe Solutions Project continues in 2017. “The solutions we are recommending must be environmentally sustainable, including in terms of the choices of materials and products. In the project we have tested solutions for hardened surfaces for pedestrian and bicycle paths, public areas, and parking facilities, both in the laboratory environment and in the field,” said Ihs.

Unusual crash tests

Tests involving cars, such as the testing of child safety seats and guardrails, are common at the Crash unit, but several somewhat more unusual projects were also conducted in 2016, including a commission from the Swedish Civil Contingencies Agency (MSB) to test various methods of extracting people from crashed cars, primarily those with neck injuries. The lab also conducted crash tests involving bicycles. “We have tested how different types of bicycles cause different injuries during a crash. The injuries that cyclists sustain in a falling accident depend in part on the height of the fall, velocity, and head exposure, with the riding position and bicycle design playing major roles. A report will come out in early 2017”, explained Ihs.

Vehicle testing with quality marks

VTI has long performed various types of testing on vehicles imported from countries outside the EU. VTI became accredited for brake and noise testing during the fall of 2016. The accreditation body Swedac conducted a competence test in accordance with European and international standards. Now those who engage VTI for brake or noise testing will be able to obtain a quality mark for the work performed. Vehicle testing is a relatively minor activity for VTI, but also an important one. VTI is the only Swedish agency performing brake testing.
International cooperation helps to disseminate VTI research

According to VTI’s mandate, the Institute is to engage in international collaborative efforts in fields that fall within its purview.

VTI has clear international ties through its collaborations in EU projects, involvement in organisations and networks, participation in scientific committees, bilateral cooperative arrangements, and international standardisation efforts.

These collaborative efforts bolster VTI’s status as a prominent research institution engaged in activities of high scientific quality. Such collaborations also help to ensure that project results can be disseminated and implemented in the Swedish and international transport systems.

EU framework programmes

VTI has a long-term objective in its collaboration in EU framework programmes, which will involve greater participation than in earlier framework programmes. The EU’s Eighth Framework Programme, Horizon 2020 (2014–2020), represents the world’s largest investment in research and innovation, with a total budget of roughly EUR 80 billion. The programme has three priorities: scientific excellence, industrial leadership, and societal challenges. VTI is involved in a number of projects within the Horizon 2020 framework programme.

ADAS&ME

ADAS&ME is the biggest EU project that VTI has ever coordinated, with a total budget of EUR 9.6 million (roughly SEK 89 million). VTI is renowned for its cutting-edge knowledge and research in the field of automated driving and its experience in coordinating EU projects. It is now taking yet another step to lead this research forward.

“We will be basing our work on user cases for cars, lorries, buses, and motorcycles, which reflect a major share of the traffic on European roads. The project will tie knowledge of the driver’s condition and skills together with automated vehicle functions”, said VTI Research Director Anna Anund, VTI’s coordinator for ADAS&ME.

Within the framework of the project we will develop systems that can detect when a driver is starting to become tired, inattentive, or affected by emotions such as anger or sadness, and then determine how appropriately to switch to or from automation, depending on the capabilities of the driver and the car.
In addition to its collaborations in Horizon 2020, VTI was also involved in the EU’s Seventh Framework Programme, FP7 (2007–2013). VTI participated in just over 30 FP7 projects, in five as the project coordinator. This can be compared with just over 20 projects in which VTI was involved in the Sixth Framework Programme, FP6 (2002–2006), while serving as project coordinator in three of them. It is clear that the Institute has enjoyed successful participation in the EU’s framework programmes to date.

**Involvement in EU’s Horizon 2020**
- ADAS&ME [VTI koordinator] – Adaptive ADAS to support incapacitated drivers Mitigate Effectively risks through tailor made HMI under automation
- XCYCLE – Advanced measures to reduce cyclists’ fatalities and increase comfort in the interaction with motorised vehicles
- NetIRail-INFRA – Needs Tailored Interoperable Railway
- SafetyCube – Safety CaUsation, Benefits and Efficiency
- PROSPECT – PROactive Safety for PEdestrians and CyclisTs
- USE-IT – Users, safety, security and energy in transport infrastructure

**CEDR (Conference of European Directors of Roads)**

The form that work takes at the EU level, where the national road administrations jointly finance the research, involves cooperation within CEDR. The purpose of this cooperation is to facilitate the exchange of experience and information, and to analyse and discuss all traffic-related issues in areas such as infrastructure, safety, transport, and the environment. This form of cooperation in CEDR projects is clearly becoming an increasingly important project category for VTI. VTI was involved in numerous CEDR projects in 2016:
- Harmony – Procedures for designing roads in harmony with wildlife
- HiSpeq – Highspeed survey specifications, explanations, and quality
- Prima – Proactive incident management
- Premium – Practical measurement, understanding, and management of road equipment

**European institutional collaboration**

During the year, VTI continued its involvement in umbrella organisations for research institutions in the transportation field. Such collaboration creates opportunities to influence the direction of the EU’s research programmes, prepare project applications, and facilitate consortium building. VTI has participated in EU projects and theme-based work groups within the frameworks of:
- Forum of European Highway Research Laboratories (FEHRL)
- European Conference of Transport Research Institutes (ECTRI)
- Forum of European Road Safety Institutes (FERSI)
- HUMANIST Virtual Centre of Excellence

**Other international collaborations and commitments**

In addition to the aforementioned organisations, VTI is involved in a highly developed array of international collaborative efforts and commitments. Our national and international networks and alliances guarantee that the knowledge we generate will be deep, broad-based, and multidisciplinary. Some examples:
- Nordiskt Vägforum (NVF, Nordic Road Association)
- World Road Association (Piarc)
- Transportation Research Board (TRB)
- Global Road Safety Partnership (GRSP)
- European Committee for Standardization (CEN)
- International Traffic Safety Data and Analysis Group (IRTAD, under OECD/ITF)
- The Joint OECD–ECMT Transport Research Centre (JTRC).

VTI was involved in many international visits during the year. In the spring, we visited the Korea Institute of Civil Engineering and Building Technology (KICT) in Seoul.
# Income statement

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<th>Amounts in SEK thousand</th>
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<th>2015</th>
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<td><strong>Operating income</strong></td>
<td></td>
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<tr>
<td>Income from appropriations</td>
<td>48,224</td>
<td>46,525</td>
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<tr>
<td>Income from fees, subsidies and other remuneration</td>
<td>56,177</td>
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<td>Income from grants</td>
<td>102,860</td>
<td>91,781</td>
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<td>Financial income</td>
<td>139</td>
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<tr>
<td><strong>Total income</strong></td>
<td>207,400</td>
<td>199,302</td>
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<td><strong>Operating costs</strong></td>
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<td>Staff costs</td>
<td>133,953</td>
<td>132,683</td>
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<td>Premises</td>
<td>20,472</td>
<td>20,330</td>
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<td>Other operating costs</td>
<td>43,765</td>
<td>41,679</td>
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<td>Financial expenses</td>
<td>458</td>
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<td>Depreciation and write-downs</td>
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<td>7,842</td>
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<td><strong>Total costs</strong></td>
<td>206,910</td>
<td>202,747</td>
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<tr>
<td>Operating results</td>
<td>490</td>
<td>-3,445</td>
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<tr>
<td><strong>Net change in capital</strong></td>
<td>490</td>
<td>-3,445</td>
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The Swedish National Road and Transport Research Institute (VTI), is an independent and internationally prominent research institute in the transport sector. Our principal task is to conduct research and development related to infrastructure, traffic and transport. We are dedicated to the continuous development of knowledge pertaining to the transport sector, and in this way contribute actively to the attainment of the goals of Swedish transport policy.

Our operations cover all modes of transport, and the subjects of pavement technology, infrastructure maintenance, vehicle technology, traffic safety, traffic analysis, users of the transport system, the environment, the planning and decision making processes, transport economics and transport systems. Knowledge that the institute develops provides a basis for decisions made by stakeholders in the transport sector. In many cases our findings lead to direct applications in both national and international transport policies.

VTI conducts commissioned research in an interdisciplinary organisation. Employees also conduct investigations, provide counseling and perform various services in measurement and testing. The institute has a wide range of advanced research equipment and world-class driving simulators. There are also laboratories for road material testing and crash safety testing.

In Sweden VTI cooperates with universities engaged in related research and education. We also participate continuously in international research projects, networks and alliances.

The Institute is an assignment-based authority under the Ministry of Enterprise, Energy and Communications. The institute holds the quality management systems certificate ISO 9001 and the environmental management systems certificate ISO 14001. Certain test methods used in our labs for crash safety testing and road materials testing are also certified by Swedac.

We have about 200 employees and are located in Linköping (head office), Stockholm, Gothenburg, Borlänge and Lund.