TRANSPORT
A CHALMERS AREA OF ADVANCE
An area of interaction between research, innovation and education at Chalmers resulting in scientific excellence and a potential to improve sustainability.

The Areas of Advance are strong, challenged driven thematic platforms for strategy and long-term collaboration that hunt down specific challenges, often directly relevant for industry and society. Here, participants from different corners of society gather around common objectives. The mobilisation integrates interdisciplinary research, education and innovation, and the aim is the creation of a sustainable future.

Chalmers’ Areas of Advance
- Transport
- Energy
- Building Futures
- Information and Communication Technology
- Production
- Life Science Engineering
- Materials Science
- Nano Science & Nano Technology
Transport
A Chalmers Area of Advance

Mobility of people and transport of goods are fundamental parts of the modern society and generates tremendous economic and social value. However, growing transport volumes pose challenges such as climate change, environmental pollution and traffic accidents.

Improvements in vehicle efficiency, the implementation of new drivelines, and improved efficiency of transport systems have so far proved insufficient in our efforts in proceeding towards sustainable transport and logistics systems. The difficult task we face is to create the potential for sustainable, safe transport systems and, at the same time, increase effectiveness and efficiency. Future development cannot be conducted by a single industrial, public or academic actor. Mitigating climate impact and reducing risks in the transport sector are serious challenges that require collaboration between various stakeholders, including industry actors and the society as a whole. To approach the problems associated with transport development there is a need to simultaneously address several levels in and perspectives on the transport system, taking into consideration the interaction of vehicles and vessels, networks of infrastructures and the demand and supply of transport and logistics services.

Societal transport challenges:
- environmental impact
- traffic accidents
- effective transports
- urbanisation
- land use
- limited resources

Our vision
To become leaders in research and education on green, safe and efficient transport solutions.

Traffic safety
Focus is on all aspects of safe road transport of or by people, including safe interconnections to other transport areas and modes.

Transport efficiency and customer adapted logistics
Focus is on all aspects of efficient and effective transport including and connecting several subsystems such as individuals’ mobility, companies’ logistics systems, transport and traffic systems.

Sustainable vehicle technologies
Focus is on electrification, hybridization, renewable fuels, catalysis, combustion engines, light weight materials – and their respective application for different modes of transport.

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TRAFFIC SAFETY

Sweden was the first country to express a Vision Zero (no fatalities or severe injuries in traffic accidents) thus making safety a systemic issue. Traffic safety research includes efforts to better understand real traffic environments, countermeasures to avoid accidents and prevent injuries, and actions to mitigate their consequences. Increasing worldwide efforts to develop connected and self-driving vehicles pose new challenges. The emerging technologies bring high hopes for a new paradigm in traffic safety with expectations on a dramatic decrease of accidents. Traffic safety is also a boundary condition for the automated transport system.

Research, innovation and education are targeting high achievement within three areas:

Field data collection and analysis aims at developing a holistic understanding of occurrence and effects of incidents and accidents; including the assessment of risk and benefit in automated systems compared to the safety levels of human drivers.

Accident avoidance and automation aims at developing new technologies and safety systems as well as developing better understanding of human factors, human behaviour and driver models.

Injury prevention aims at developing increased crashworthiness, advanced adaptive vehicle structures and protective systems. All collision types and all categories of road users are included.

TRANSPORT EFFICIENCY AND CUSTOMER ADAPTED LOGISTICS

Well-functioning transport systems are essential for the effectiveness and efficiency of logistics systems, and vice versa. Thereby, their mutual adaption is important for the competitiveness of firms as well as mobility for people and quality of life.

The profile includes two highly interrelated areas, reflecting two main perspectives, where researchers meet to jointly develop multidisciplinary research, education and innovation. These areas are: Demand for transport and logistics; and Supply of transport and logistics.

The two areas address challenges related to designing, enabling, managing and maintaining efficient, flexible and sustainable transport and logistics systems; as well as understanding the interplay – and facilitating coordination and cooperation – between actors in supply chains, operations and transport networks.

A growing awareness of the relationship between transport efficiency and the environmental consequences of different logistics and transport solutions also spurs the development of the research.
Chalmers has a long scientific tradition and a set of strong research centres in this profile area, which focuses on improving vehicles and vessels towards better fuel economy and less environmental impact. All conventional transport modes are represented.

Four areas have been identified: Combustion engine research and; electric and hybrid vehicles, both aiming to find sustainable solutions for how to propel vehicles in the future; Vehicle concepts and design aiming at reducing propulsion resistance; and Vehicle environmental impact aiming at analysing factors affecting future generations of vehicle powertrains and concepts towards more sustainable vehicle technologies.

In addition to the areas identified within each profile we are also promoting activities within three themes that cut across the excellence profiles: Autonomous Transport, Electromobility and Transition to Future Travel and Transport.

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Collaboration between academia and industry enhances the exchange of knowledge in both directions. Chalmers has strategic long-term agreements with several large companies and organisations, and our researchers collaborate with hundreds of companies where the majority are involved in several projects. Numerous of Sweden’s leading companies as well as international companies utilize our research results. Our senior researchers are involved in private and public organisations, both national and international, to support in setting policies and standards. Collaboration with Science Parks, the School of Entrepreneurship and other actors in the innovation system to which Chalmers is linked creates a starting point for these efforts.

Collaboration with industry, organisations and the public sector permeates the majority of our activities. Through close interaction with society we build the conditions for sustainable development, both locally and globally.

The research centres facilitate and coordinate collaboration between academic researchers and industry. In order to further enhance the impact of our research on society, we develop additional platforms of interaction with industry and society as well as new ways of stimulating innovation to foster new transport solutions.
RELATED RESEARCH CENTRES

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ASTAZERO
AstaZero is the world’s first full-scale test environment for road safety. The test track is open for research, development and certification of future road safety systems, by vehicle manufacturers, suppliers, legislators, and universities from throughout the world. AstaZero is owned by Chalmers and RISE Research Institutes of Sweden.

The VTI simulator comprises three large, advanced driving simulators, a smaller training simulator and a rail simulator. A large part of VTI’s research concerns understanding the individual’s behaviour in the transport system.

REVERE – Resource for Vehicle Research at Chalmers focus on self-driving vehicles, active safety and vehicle dynamics. The 400 square metre lab includes test vehicles (light & heavy vehicles), environment sensors and simulators among other vehicle-related equipment.
**TESTBEDS AND MAJOR PROJECTS**

Gothenburg is the site of the world’s biggest large-scale, long-term test of autonomous cars – the Drive Me pilot run by Volvo Cars. And with the ElectriCity bus line as a live laboratory, Chalmers researchers are exploring sustainable public transportation services.

**Drive Me** – self-driving cars for sustainable mobility, involves 100 self-driving Volvo cars which are running on the roads of Gothenburg in 2017. Self-driving cars are viewed as an important solution in achieving the Swedish vision of zero fatalities in traffic. Chalmers is a preferred research partner to Volvo Group in the development of autonomous driving.

[www.volvocars.com/autonomousdriving](http://www.volvocars.com/autonomousdriving)

**ElectriCity**

The electric bus route ElectriCity gives research institutes and companies a live testbed for research and development of solutions for sustainable travel. Since 2015 three buses operate line 55 in Gothenburg, running on renewable electricity – quiet and entirely emission-free. On board the buses, passengers have free access to the latest technology. The bus stop next to Chalmers Lindholmen is indoors.

[www.goteborgelectricity.se/en/](http://www.goteborgelectricity.se/en/)

**WASP**

Wallenberg Autonomous Systems and Software Program (WASP) is Sweden’s largest ever individual research program. The program addresses research on autonomous systems acting in collaboration with humans, adapting to their environment through sensors, information and knowledge, and forming intelligent systems-of-systems. Software is the main enabler in autonomous systems, and is an integrated research theme of the program.

[www.wasp-sweden.org](http://www.wasp-sweden.org)

**COPPLAR**

Several research groups at Chalmers are involved in the project Cooperative Perception & Planning Platform (COPPLAR) which aims at a cooperative self-driving vehicle that can handle challenging city traffic and changing weather conditions. Other autonomous driving projects at Chalmers address aspects of human factors and engineering issues.

[www.chalmers.se/transport](http://www.chalmers.se/transport)
**EDUCATION AND COMPETITION**

Formula Student is the largest engineering competition in the world. The year long project of building a competent race car, provides Chalmers’ students with immense knowledge and experience. Close cooperation with the automotive industry also gives them access to state-of-the-art equipment, and making them highly attractive for a future career in industry. Additionally, Chalmers together with the University of Gothenburg are planning to participate in the Formula Student Driverless class in 2017.

Since the start in 2011, Chalmers has participated in the international event in the field of cooperative and automated driving: the Grand Cooperative Driving Challenge.

Another competition is the Shell Eco-marathon where the goal is to design, build, test and drive an ultra-energy-efficient vehicle.

At our digital campus ChalmersX we offer moocs, open online courses through edX. In two moocs on Supply Chain Management and Logistics, the participants learn the basics of designing sound and effective systems that save time, money and energy.

Chalmers is a Preferred Research and Talent Partner to Volvo Group. An example of a student collaboration project is ROAR, Robot-based Autonomous Refuse Handling. The students successfully developed and demonstrated a robot that, with the help of instructions from the truck’s operating system, could collect refuse bins in a neighborhood, bring them to a refuse truck and empty them.
University of Gothenburg is an integrated part of the transport research effort – the Sustainable Transport Initiative. Together with the core research group of logistics and transport management at University of Gothenburg, there is a wide range of researchers in fields such as applied IT, law, economics, global studies, psychology, marketing, organisation, human geography and chemistry, which complements the research groups at Chalmers.

COMMUNICATION AND SUPPORT
For more information of our activities, events and research in the Transport Area of Advance visit our website:

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