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

Chalmers’ Areas of Advance

Transport
Energy
Information and Communication Technology
Production
Health Engineering
Materials Science

The Areas of Advance are strong, challenge-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.

Founded in 1829
2 Campus
3,000 Staff
240 Senior faculty members in Transport research
10,000 Students
40 MSc program
2,600 Master’s students
900 International students
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 drive-lines, and improved efficiency of transport systems have so far proved insufficient in our efforts in proceeding towards sustainable transport and logistics systems.

**RESEARCH FOR A SUSTAINABLE FUTURE**

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. Addressing these challenges is an important part of reaching the Sustainable Development Goals set by the United Nations.

To approach the problems we 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.

We do this in the research areas identified within our excellence profiles. The areas are further promoted in three cross-disciplinary themes; Electromobility, Autonomous transports and Transition to future transport systems.

**TWO UNIVERSITIES JOINING FORCES**

University of Gothenburg is an integrated part of Area of Advance Transport. Together with the university’s core research group of logistics and transport management, 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 complement the research groups at Chalmers.
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.

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.
A sustainable transport system requires new solutions for propulsion systems and vehicle concepts. The research within this profile area targets solutions for a highly energy efficient transport system, that uses renewable energy sources, have no net emissions of greenhouse gases and no other harmful emissions to the environment.

Chalmers has a long scientific tradition and a set of strong research centres in this profile area which generates competence and knowledge within the fields of hybrid vehicles, electric drives, electric energy storages, combustion engines, after-treatment systems, reduced resistance and vehicle environmental impact. All conventional transport modes are represented.

Research and innovation are mainly conducted within four areas: 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.
SOCIETY AND INDUSTRY

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

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.

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. One example of this is the project DenCity, where a number of partners from private and public sector collaborate with Chalmers in developing innovative solutions for sustainable passenger and freight mobility in dense neighborhoods.

Area of Advance Transport’s major collaboration partners are listed below.
STRATEGIC PARTNERSHIPS

Area of Advance Transport is host of three of Chalmers’ strategic industrial partnerships, signed by the President of Chalmers. The partnerships promote collaboration between Chalmers and the industry through research, competence provisioning, technology development and innovation. The possibilities of industrial PhD students and adjunct researchers from the industry, joint knowledge networks and access to research infrastructure and labs, make the partnerships very rewarding. Statens Vegvesen choosing Chalmers as a strategic partner, is proof of our excellence in the field of transport.

Furthermore, three strategic academic partnerships are initiated with prioritized international partner universities. Together we collaborate in research projects, exchange researchers and arrange joint workshops and conferences. Promoting the exchange of researchers and PhD students, we enable exchange of ideas and create new research possibilities.

The strategic partners of Area of Advance Transport are listed below.

SAFER — Vehicle and Traffic Research Centre
Director Magnus Granström
safer@chalmers.se
www.saferresearch.com

Northern LEAD Logistics Centre
Director Jonas Floden
jonas.floden@handels.gu.se
www.chalmers.se/en/centres/lead

RELATED RESEARCH CENTRES

Mobility, Logistics and Automotive Technology Research Centre
www.mobi.vub.ac.be

University of Michigan Transportation Research Institute
www.umtri.umich.edu

Tongji University
en.tongji.edu.cn

Volvo Car Corporation
www.volvocars.com

Volvo Group
www.volvogroup.com

CEVT
www.cevt.se

PETER LINDWALL
Coordinator Strategic partnerships
+46 (0)31 772 25 58
peter.lindwall@chalmers.se

Photo: Göteborgs Hamn
Gothenburg is the planned site of a national electromobility lab. The facility will provide Sweden with arena for research and development of new technologies for electrified vehicles and vessels, as well as strengthening the expertise.

In order to place Swedish vehicle and marine industry at the forefront, and make them benefit from the ongoing technology shift, the Swedish government is investing one billion kronor in the transition to an electrified transport sector. An important part of the initiative is a test lab for electromobility, to be located in Gothenburg. The lab will be a creative and competence-enhancing node for Swedish automotive industry, marine industry, research institutes and universities. Chalmers and Rise Research Institutes of Sweden will jointly build and own the facility.

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

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

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. 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 has focus on self-driving vehicles, active safety and vehicle dynamics. The 400 square metre lab includes test vehicles (light and heavy vehicles), environment sensors and simulators among other vehicle-related equipment.
EDUCATION

Chalmers’ digital campus ChalmersX offers moocs, open online courses. In 2018, Chalmers launched Scandinavia’s first MicroMasters® programme, on Emerging Automotive Technologies. The programme provides a holistic perspective on emerging technologies fostering sustainability and digitalization within the automotive industry through seven courses and a final capstone exam. It represents the equivalent of ca 20 credits of coursework at the Chalmers Masters programmes Automotive Engineering or Systems, Control and Mechatronics.

ChalmersX also offers moocs on Supply Chain Management and Logistics, teaching the basics of designing sound and effective systems that save time, money and energy.

Since many years, Chalmers runs a joint student project on BSc-level together with Penn State University and the Volvo Group. The aim of the project is to significantly enhance the global awareness of engineering students, to better prepare them to work in a global economy. The vision entails student teams at Chalmers and Penn State working together on industry supplied projects. The student collaboration mimics the operation of multinational corporate global engineering teams and is basically a non-travel based activity.

We are now planning to expand the program and start projects together with other universities and companies, in particular Volvo Cars.

...AND COMPETITION

Formula Student is the largest engineering competition in the world. The year-long project of building a competitive race car provides Chalmers students with immense knowledge and experience. Close cooperation with the automotive industry also gives the students access to state-of-the-art equipment, and make them highly attractive for a future career in industry.

In collaboration with University of Gothenburg, Chalmers participates in the driverless class in 2018.

Another educational and highly challenging student competition is the Shell Eco-marathon where students around the world compete in designing, building and driving the most energy-efficient car. In 2018, Chalmers students participate in the competition in France.
LEARN MORE
For more information of our activities, events and research in the Area of Advance Transport visit our website:

www.chalmers.se/transport
transport@chalmers.se