

Automotive in Brainport Eindhoven Smart & Green Mobility



Roland Berger & KPMG: The Netherlands is the place to be for smart & green mobility

Netherlands ranks number 1 globally on the [Roland Berger's Automotive Disruption Radar](#) which monitors evolutions in the global auto industry by screening 25 indicators. Holland reached the top of the ranking due to the country's winning combination of comparatively high electronic vehicle (EV) sales, a very good EV charging infrastructure and a strong interest in autonomous driving.

KPMG ranks the Netherlands ^{TU}1st in autonomous vehicles readiness.

The Netherlands leads this index because it performs strongly across all four pillars of research (policy & legislation, technology & innovation, infrastructure, consumer acceptance) showing how both its private and public sectors are highly engaged. It is already a big user of electric vehicles but it also has excellent infrastructure and a government determined to take advantage of AV.

The Netherlands: Key automotive facts and figures

Export of suppliers-products

88%

Export of Suppliers

44% to Germany

Total turnover

€ 9,2B

OEMs; trucks, busses and cars

Majority business from suppliers

Fastest growing export to

USA

Automotive
Companies

> 400

Dutch Automotive Industry

45,000 workers



Brainport Eindhoven's ecosystem in a nutshell

HOW?

Exceptional collaboration between OEM's and suppliers but also between companies, knowledge institutes and governments, open supply chains, OEM whitebox model, room to experiment, innovative pioneering, Informal, open attitude.



CORE COMPETENCES

Design thinking System integration High precision engineering Material knowledge
 Mechatronics Data science Human Technology Interaction



TECHNOLOGIES

Information Technology Optics Components and circuits flexible electronics
 Additive manufacturing Imaging Advanced manufacturing systems Thin film solar AR/VR Nano-electronics
 IoT Sensor technology Integrated photonics Robotics EUV Advanced materials IT



MARKET

High tech systems Smart City Design Agri food
 Aerospace Automotive Semiconductors Energy Safety Health Printing Lighting
 Industry 4.0

WHAT WE EXCEL AT

Navigation systems Smart and connected driving Fast charging Electric vehicles
 car2x communication Advanced driver-assistance systems Heavy duty Powertrain(s)



AUTOMOTIVE

OEMs

- DAF/PACCAR
- Tesla
- VDL
- Scania
- Ebusco

Suppliers

- Siemens
- Bosch
- Altran
- TNO
- NXP
- TomTom
- HERE

Start-ups/Student teams

- Lightyear
- Amber Mobility
- Eneco Jedlix
- Team FAST
- Solar Team Eindhoven

Knowledge institutes

- TNO
- Eindhoven University of Technology
- High Tech Systems Center
- Siemens
- Dinalog
- Holst Centre

Shared R&D facilities

- Homologations
- Ultra fast charging
- Powertrain and emission
- Passive and active safety
- Traffic Management Innovation Center
- Cooperative and Automated Driving Testbed
 - Closed
 - Controlled open
 - Open
- Rolling Road Testbench

Platforms

- Automotive Campus
- Automotive NL

Smart mobility in Brainport Eindhoven

The highly advanced infrastructure and dense traffic network in the Netherlands, real-time traffic management and the 4G penetration rate make the **Netherlands ideally suited for developing, testing and implementing Smart Mobility applications.** For example, in the Netherlands the world's first shockwave reduction project, which applies car2x communication in 'normal' traffic, was introduced on a major highway that is equipped with cooperative roadside units (WiFi-P). In several cities traffic lights are equipped with communication technology (4G and DSRC) to give personalized advice to improve traffic flow. The Netherlands initiated the European Truck Platooning Challenge in 2016 and next steps are being made.

The Netherlands is the place to be for green mobility

Thanks to the Dutch thirst for innovation and sustainable mobility, the Netherlands now ranks number 1 globally on the Automotive Disruption Radar. [Roland Berger's Automotive Disruption Radar](#) monitors evolutions in the global auto industry by screening 25 indicators. Holland reached the top of the ranking due to the country's winning combination of comparatively high electronic vehicle (EV) sales, a very good EV charging infrastructure and a strong interest in autonomous driving.

New registrations of electric cars hit a new record in 2016, with over 750 thousand sales worldwide. With a 29% market share, Norway has incontestably achieved the most successful deployment of electric cars in terms of market share, globally. It is followed by the Netherlands, with a 6.4% electric car market share, and Sweden with 3.4% ([International Energy Agency](#)). [Hyperloop](#), [Tesla](#), [Ventac Group](#) and [Apollo Tyres](#) are all join the growing list of automotive companies moving to our country.

How Brainport Eindhoven's automotive cluster enforces your business

A global testbed on both green and smart mobility, with strong government support

There are various initiatives and facilities to make the region the international testing environment of Europe. Diverse systems can be tested, because there is (almost) no influence or involvement of brand-bound activity as car manufacturers are independent.

Working together on and accelerating innovation

Organisations and knowledge institutes such as the Automotive Campus, TNO, NXP and VDL are market-driven partners that develop and accelerate your innovations with you.

Homologations

Brainport Eindhoven can provide the final and independent verification of your product's compliance against worldwide standards. Guarantee quality, reduce risk, speed time-to-market and increase product value.

Many promising start-ups, ideal place for technology spotting

A lot of promising start-ups and innovations can be found in Brainport Eindhoven because of its high amount of fundamental research, co-creation by companies and knowledge institutes and crosspollination from other sectors. This makes the region an ideal place for technology spotting.

Easy market access – soft landing

The Automotive Campus Helmond offers a national and international hotspot, meeting place and a potential business location for automotive business. To experience the benefits of the automotive campus and get acquainted with the Dutch automotive and mobility ecosystem the campus offers a special partnership for foreign companies.

Homologations: Guiding you through worldwide product certification

The last hurdle in going to market is product homologation. Brainport Eindhoven can provide the final and independent verification of your product's compliance with worldwide standards. Time is money. Rejection is bad news. Outstanding test procedures and expert consultancy make the difference.

- ✓ Enter profitable markets
- ✓ Guarantee quality, reduce risk
- ✓ Speed time-to-market
- ✓ Increase product value
- ✓ Keep test results confidential
- ✓ Stay current with certification issues
- ✓ Partner with a safety innovator
- ✓ Rely upon our excellent facilities and services

The driving forces of the local industry

DAF

- Development and production of light, medium and heavy-duty commercial vehicles
- 15.5% EU market share heavy segment
- 10.1% EU market share light segment TOMTOM
- DAF's New CF and XF trucks are chosen 'International Truck of the Year 2018'



TOMTOM

- Global leader in navigation and mapping products
- Largest supplier in fleet management in Europe with 625,000 drivers
- Navigable maps cover 135 countries reaching more than 4 billion people



VDL

- R&D, car assembly, manufacturing of busses and chassis modules
- VDL announced to present its New Electric Truck in Q1 2018



NXP

- Global automotive semiconductors, in-vehicle network, secure car access, auto analogue ASSP, and more

Siemens (former Tass International)

- Global provider of simulation software and engineering and test services to further strengthen Siemens' PLM Software automotive offering
- Solutions aimed primarily at autonomous driving, integrated safety, advanced driver assistance systems, and tyre modelling



Our knowledge institutes support our industry

Eindhoven University of Technology

- Smart Mobility & Energy (green mobility) are main strategic research areas.
- The Automotive Engineering Science (AES) laboratory

High Tech Systems Center

- Complex equipment, instruments, manufacturing systems and systems-of-systems
- Precise position technologies, mechatronics and robotics

Dinalog

- Dutch Institute for Advanced Logistics

TNO

- Dutch applied research institute
- Powertrains, vehicle safety and vehicle control
- Model Based Control for Safe, Clean and Reliable mobility.

Holst Center

- Wireless sensor technology and systems-in-foil, in-mold electronics and flexible electronics (solar and lighting).



Our top educational institutes foster talent

Research University (master and bachelor)
University of Applied Sciences (bachelor)
Vocational Education
Professional doctorate of engineering

TU/e Fontys

rocterAA SUMMA
College

MAC
the art of automotive

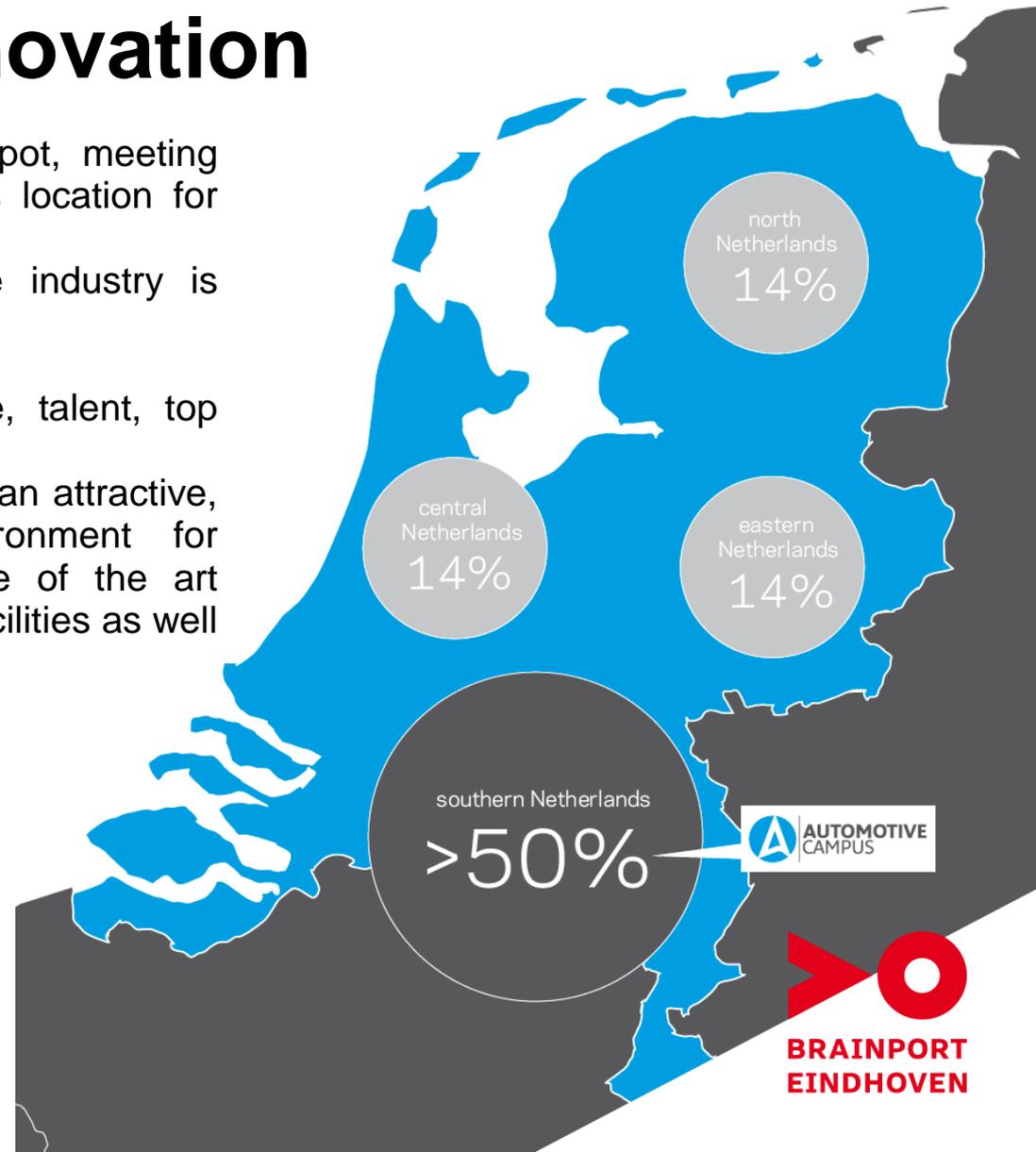
ACE
Automotive Center
of Excellence

Join our student teams in finding answers for the future

- Solar Team Eindhoven
Solar driven family cars like Stella-model
- University Racing Team
Electrical Formula-style race car
- TU/ecomotive
Biobased car like Lina-model
- InMotion
Electric racecar competing in the 24 Hours of le Mans
- Team FAST
H2 vehicles on formic acid

Automotive Campus: hotspot for automotive innovation

- National and international hotspot, meeting place and a potential business location for automotive business
- 50% of the Dutch automotive industry is based in Brainport Eindhoven
- Independent, neutral setting
- Access to partners, knowledge, talent, top facilities and networks
- The Automotive Campus offers an attractive, dynamic and inspiring environment for learning- and working, a state of the art technology and related (test-) facilities as well as flexible residential concepts.
 - 25 labs and test facilities
 - 500 automotive students
 - 45 companies



500 automotive students at the campus

The future talent pool is within direct reach on the automotive campus, through collaborations with:

- Eindhoven University of Technology
- Fontys University of Applied Sciences
- Summa Automotive (vocational education centre)
- MAC Automotive a collaboration between 4 vocational education centres



25 labs and test facilities

- Smart mobility
 - Computer simulation
 - Vehicle hardware in the Loop
 - Traffic management innovation centre
 - Cooperative and automated driving
 - Testbeds: closed, controlled open, open environment
- New energy carriers
 - Rolling road test bench
 - Hydrogen refuelling station
 - Dual fuel combustion programme
 - Ultra-fast charging
 - Advanced battery technologies (formic, acid)
- Heavy duty test centre
 - Rolling road test bench
 - Powertrain and emission
 - Crash centre
 - Climate/altitude chamber
- Others
 - Passive and active safety
 - Component and system testing
 - Prototyping facilities

We are proud to present you some of our companies in green mobility (1)

VDL: electric buses

- Citea's SLFA Electric Buses
- Currently 43 in operation in Eindhoven City
 - One of Europe largest fleets
 - Extension to rest of Netherlands: Transport company Connexxion ordered 100 electric busses
- Plans to scale up towards 200 electric busses
- What's next: E-truck of 37 tonnes for 100 km in 2017

Heliox: High performance power conversion

- Speed charger for electric busses
- Their solutions:
 - Opportunity charging
 - Depot charging
 - Smart fleet charging
 - Connected services
 - Charger care
- With over 15 MW of installed power across 3 continents in Public Transport, Port Equipment and Mining, Heliox is Industry leader with >85% market share. Read more



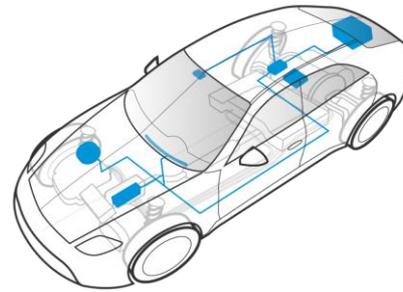
We are proud to present you to some of our companies in green mobility (2)

Prodrive technologies: automotive electronics

From garage start-up in 1993 to:

- HQ in Eindhoven, offices in Cambridge, Boston
- 700 employees
- + €100 million turnover
- Growth (2008-2013): 23,85%
- ROIC (2010-2013): 22,18%
- Supplier of BMW, Volkswagen, Audi

Powertrain, wireless chargers, converters, inverters, ECU, Vehicle to Cloud telematics



VDL Bus & Coach and Team FAST

- World's first formic acid-powered city bus
- Team FAST (Formic Acid Sustainable Transportation) is engaged in the development of technology that can use formic acid as a renewable, liquid, innovative energy carrier. Just four months after its foundation, they presented a model car powered by this new discovery. Since then, Team FAST has set to work to further develop its technology to make it suitable for large vehicles too

"We are constantly looking for new technologies that make it easier to extend the range of zero emission transportation. The conversion of formic acid to hydrogen is one of these promising new technologies"

Menno Kleingeld, Managing Director VDL ETS

We are proud to present you some of our companies in green mobility (3)

From student team to start-up
Stella Lux

- Solar Team Eindhoven that consists of students from Eindhoven University of Technology, has showed the world that it is possible to build energy efficient family cars
- Four-seat, solar-powered car
- Three-time world champion in the World Solar Challenge
- Winner of TechCrunch beating Apple, SpaceX, Bitcoin. [Read more](#)

Lightyear

- Lightyear is developing an electric car that charges itself with clean solar power. In sunny conditions it can drive for months without charging, driving between 400 to 800 km.
- Ambition: driving one lightyear on solar energy by 2035
- First car “One” has a virtual prototype and can already be ordered in advance
- Currently 94 fulltime employees

The background of the slide is a photograph of a car's interior from the driver's perspective. A semi-transparent white box is overlaid on the left side, containing text. The car's dashboard, steering wheel, and side mirror are visible. The side mirror shows a car in the adjacent lane.

Brainport Eindhoven builds the smart car of tomorrow

By 2050, 40 percent of vehicles are expected to be fully autonomous. More than a quarter of cars are expected to come with higher levels of automatic driver assistance programs, like pedestrian detection and lane departure warnings, within two years, and the industry is forecast to generate annual global revenue of \$27 billion by 2020, according to Bernstein research. In Brainport Eindhoven we are working towards that near future. Innovation is in our DNA and we are developing the components and parts for the autonomous, automated and connected car of tomorrow.

“No other country in the world is as active in the field of smart mobility as the Netherlands. We truly lead the world, and we are proud of it”

Guido Dierick, CEO NXP Netherlands

Vehicle detected in blind spot
Automatic overtake not possible

A global testbed on both green and smart mobility, with strong support of the government

Brainport Eindhoven is seen as *the* test environment in Europe. There are various initiatives and facilities to make the region a global testing environment. We are the only country in the world where diverse systems can be tested. This is possible because there is no heavy influence of car manufacturers.

<u>Closed environment</u>	<u>Living Labs</u>	<u>Open environment (A58)</u>
<p>Closed track of Rijksdienst voor het Wegverkeer</p> <ul style="list-style-type: none">▪ Closed controller environment for Automotive engineering▪ Reliability of functionality of Cooperative Adaptive Cruise Control (CACC)	<p>Controlled open environment A270/N270 (TASS)</p> <ul style="list-style-type: none">▪ Eindhoven-Helmond 8KM track with 50 fixed cameras, 20 dome cameras, sensor fusion, application platforms▪ Real-life traffic test of connected, cooperative and driverless vehicles	<p>Equipped with WIFI-p, in car speed advice and intelligent traffic lights.</p> <p>Real life testing does not only prove that the prototype works technically, but effects can also be measured and adjusted in practice.</p>