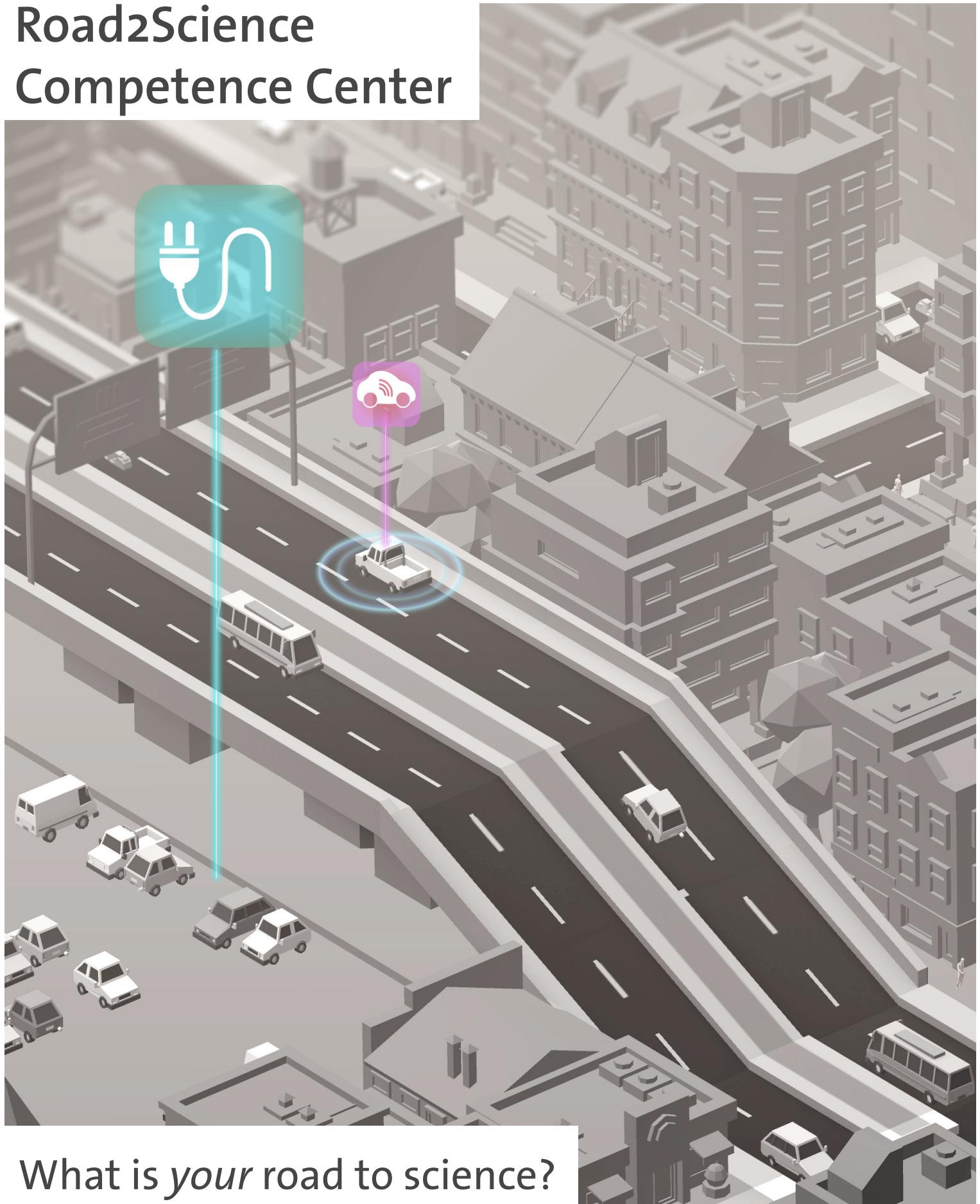


# Road2Science Competence Center



What is *your* road to science?

**ROAD2SCIENCE (R2S)** is a Competence Center at KTH Royal Institute of Technology. Together with our industry partners we aim to bridge the gaps between academia and industry in the field of transportation infrastructure.

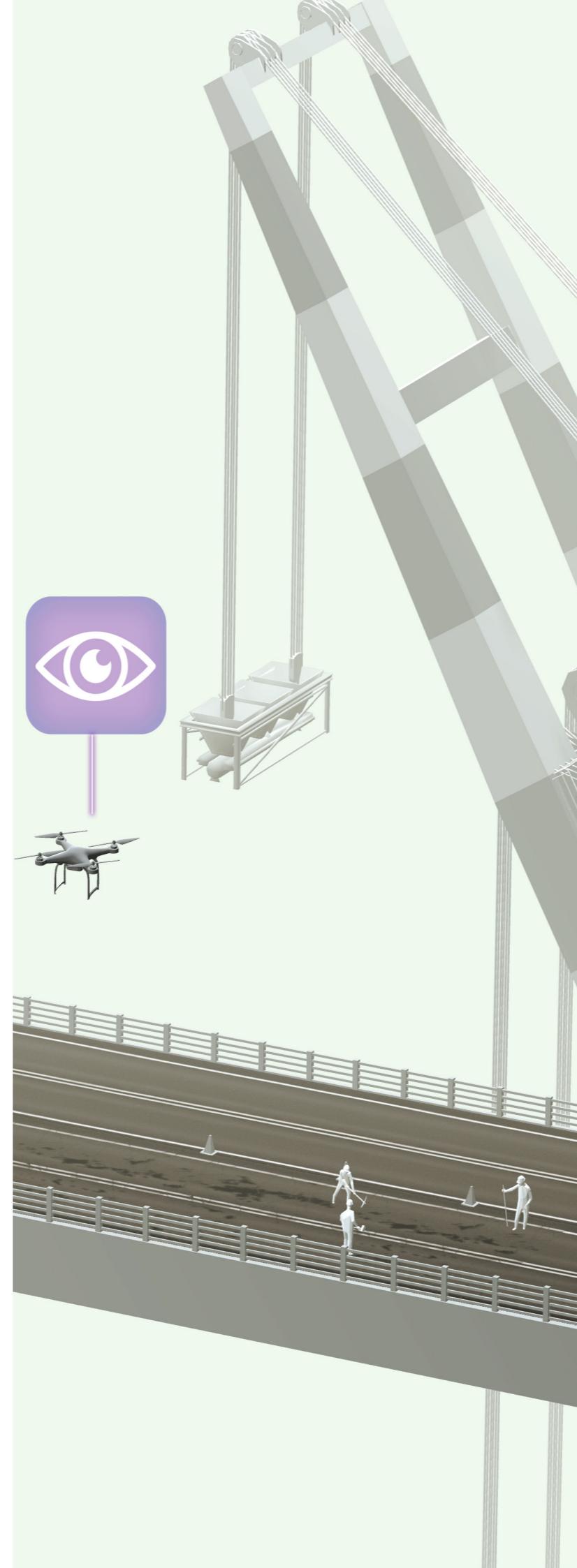
## VISION

Enhance the innovation capacity and economic, social and environmental sustainability of the road infrastructure sector.

## AIM

Initiate and support activities that systematically address closing the identified GAPS that are obstructive for innovation and sustainable growth in the sector.

Be a fertile productive environment that serves as an important nursery for students, researchers and industry stakeholders.



## GAPS

As a part of [R2S strategic plan](#) all our partners were asked to indicate where they feel currently the strongest gaps are in the sector as a whole and their own organization specifically which may inhibit their progress. These discussions are summarized into four main GAPS that, when overcome, would enhance the sector's sustainability and its innovation capability.

### GAP 1: The lack in ability to ensure a systems perspective

Overcoming GAP 1 would lead to:

- Enhanced efficiency through inter-coupled processes
- Enabled circular economy

### GAP 2: The lack of reducing risk averseness that countervails possible creativity

Overcoming GAP 2 would lead to:

- Increase of innovation mindset
- Space for 'high risk-high gain' projects

### GAP 3: The lack of long-term attractiveness of the infrastructure sector

Overcoming GAP 3 would lead to:

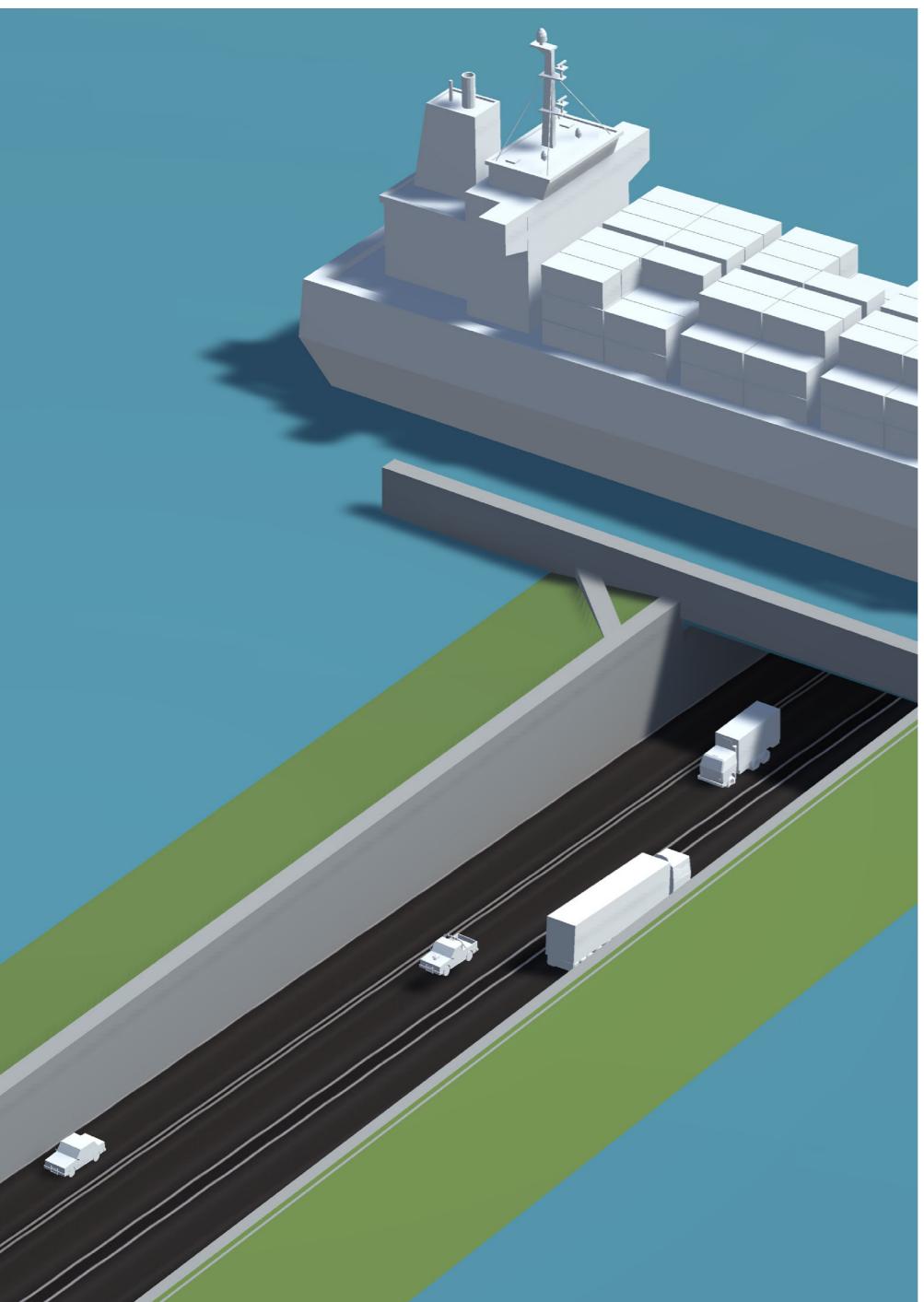
- A mixed workforce that can handle cross-disciplinary challenges
- Overall enhanced intellectual capacity

### GAP 4: Frozen market dynamics that prevent new collaborations

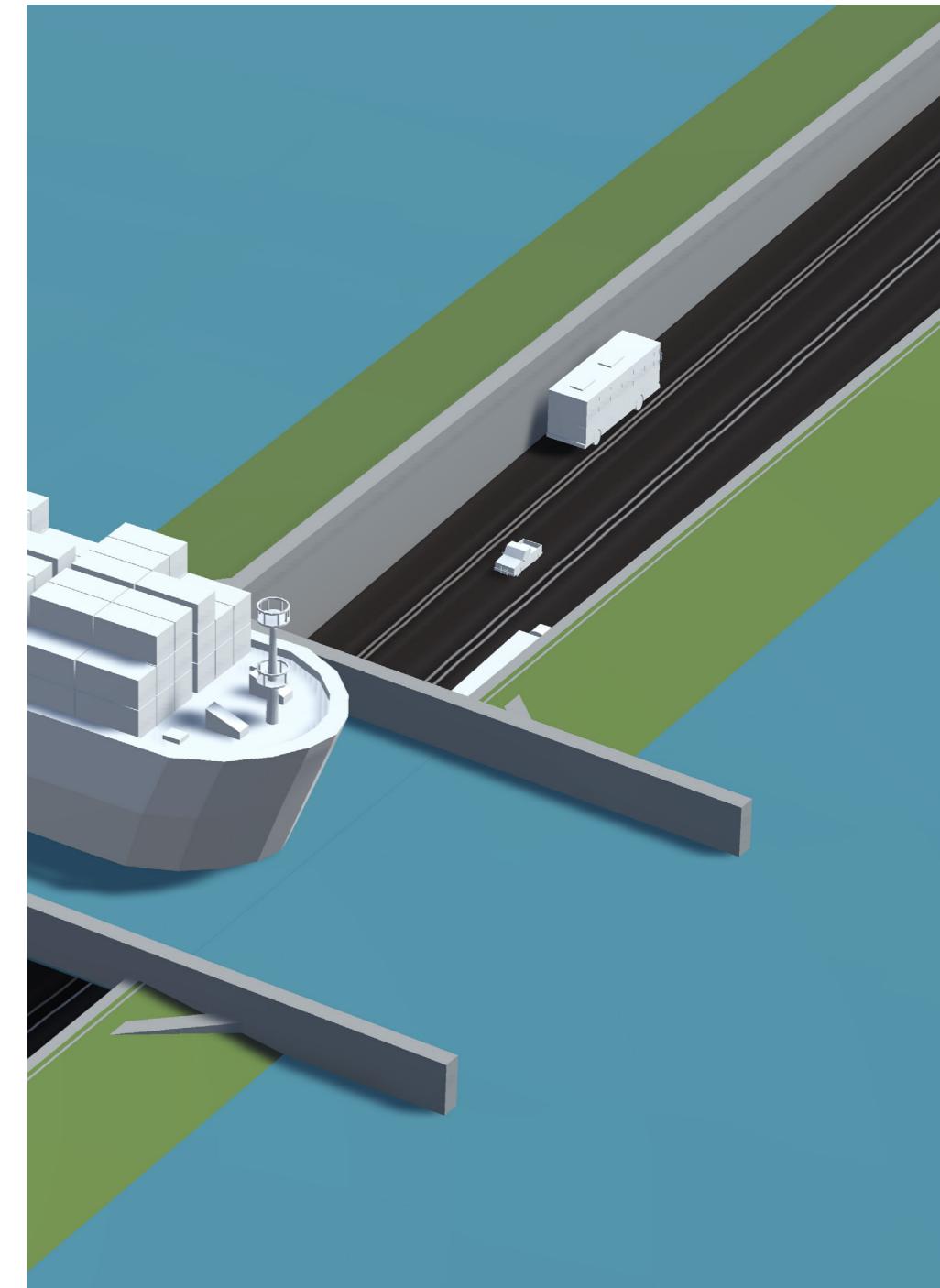
Overcoming GAP 4 would lead to:

- Healthier market dynamics
- Shorter invention to implementation timelines

# Road2Science Management Structure



- ADVISORY BOARD**  
Giving the Center's leadership constructive feedback on the strategic developments
- LEADERSHIP TEAM**  
Responsible for the overall development of the Center and its interaction with its stakeholders
- Impact Committee**  
Responsible for the building up of collaborative activities between the stakeholders to meet the Center's aims
- Internationalization Committee**  
Responsible for the building up of the Nordic Graduate School for Road Engineering



# Projects and Activities

## From Primary School to Higher Education - a pilot study on systematically connecting education to industry

Our pilot study focuses on shared resources, inspiring teachers and raising the bar on early talent nurturing from primary school to university.

### Background and objectives

The number of students that are interested in technical subjects has decreased significantly the last years. At the same time, the industry innovation requirements that are urgently needed to meet the sustainability goals have significantly increased.

Systemic changes are needed to enable the nurturing of a new generation. Connecting the programs of the various levels of education to each other as well as to industry and strategic partnerships, could keep a wider range of students engaged to technical subjects.

The pilot focuses on the Nynäshamn municipality, which is home to the Nynas AB refinery and the Norvik port being built by Stockholmshamnar AB. Together with the municipality, a local secondary school and two primary schools were selected.

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### Long term aims

- Increase the number of students who have an interest in our future transport infrastructure system
- Provide teachers with the conditions to lift the challenges of transport infrastructure in their courses and activities, increase students' interest in the subject and technical subjects, and aim for sustainable collaboration with actors
- Enable comprehensive conception of ideas, opportunities, needs and interests across schools, municipalities, academia and industry boundaries to create the next generation of innovation leaders in the transport infrastructure sector.

### Activities

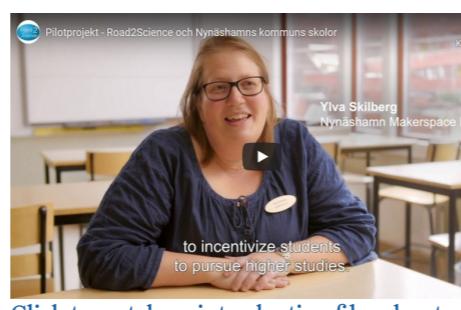
- Study visits at KTH and partner organisations
- Makerspace project assignments
- Workshops
- Guest-lectures
- Coaching, elevator pitch training
- Summer internship at KTH

The pilot is continuing during the spring of 2020 and will close before summer, after which an evaluation will be done.

### Organisations involved



Working group with representatives from participating schools in Nynäshamn



[Click to watch an introduction film about the project](#)

[Click here to download a case study about the project](#)

## Conference - How to Avoid the Gender Data Gap in a Digitized Transportation Infrastructure

Digitization of our transportation infrastructure is running at full speed today. Technology is an important tool for ensuring sustainable development and we who run this process have a responsibility to support new technologies that lead to an economically, environmentally and socially inclusive society.

The use of artificial intelligence, computer learning and apps are becoming normal in the design, construction, operation and maintenance phases of our infrastructure. For this reason, it is increasingly important that we make sure our technologies are inclusive and relevant for all its users. Data plays an important role in this. But as it turns out, data is not necessarily neutral and free of bias.

**The aim of the conference is to raise the awareness of decision-makers about the urgency to deal with gender data bias.**



[Click to watch a teaserfilm about the conference](#)

Transportation infrastructure is a specific focus area of the conference because it is such an essential part of the built environment. What we see happening is that smart infrastructure is more and more becoming the cement between societal building blocks: from supporting electrified autonomous vehicles that reduce the environmental impact, to providing accurate information about the quality to support emergency services into urban areas...and so much more.

We have to make sure that within our digitization efforts our data is inclusive and representative of the entire population.

### Background

On behalf of Road2Science competence center, Teknikkvinnor Sverige AB conducted a study on gender equality in the road engineering sector.

Data from the survey clearly shows that the proportion of women decreases higher up in the hierarchy.

[Click here to download the survey](#)

### In cooperation with:

Strategic Innovation Programmes



Research and Innovation Councils



KTH Centers and Platforms



# ELISA: Energy-effective Logistics and Infrastructure Systems Assessment for Cargo Ports

A paradigm shift is occurring in how cargo ports approach their role within the transport sector and society. To ensure a system that is optimized with respect to its overall energy usage, the ‘physical roads’- and ‘digital operating system’- infrastructures of ports must be further connected. Reduced terminal down-time, improved maintenance planning and flexibility will give large energy reductions: faster cargo handling, reduced ship-in-port times, more sustainable material use and enhanced collaboration between transportation modes and port terminals.

**THE PROJECT FOCUSES** on the case of the Stockholm Norvik Port, a new Swedish freight port to start its operations in 2020.

**THE PROJECT INVESTIGATES** the most promising smart roads and connects these with the supply chain infrastructure via a ‘virtual twin’ of the port. Systemic cargo port energy optimization will be done via user case scenarios with multiple stakeholders and a detailed energy optimization road map will be formed.



## AIMS

- Develop a holistic approach that enables:
  - doubling the lifetime of port infrastructures, as damage is minimized through strategic use of surfaces
  - reduction of the ship/truck/train-in-port time by 20%, as the port surfaces become more flexible in its functionalities
  - doubling the synchromodal opportunities in Sweden involving seaports, as maintenance forecasting is significantly improved.
- Provide a systemic way forward for freight transportation systems on how enhanced digitization, automation and sustainability of individual components and processes can lead to enhanced energy efficiency by 2030.

## TEAM

The project team consists of three main entities: the research development groups, led by two different groups at KTH Royal Institute of Technology, the operational reference group, based on important stakeholders at the Stockholm Norvik Port and the stakeholder reference groups, utilized in the energy scenario and road-map developments.

The project involves many aspects: technical developments to enable the added functionalities of the smart pavements in a sustainable way, handling of large quantities of data from various sources, building a virtual platform that enables complex interactions between the infrastructure and the supply chain and taking into account the interests of multiple actors involved in the port’s operations. As such, the project team has a multi-disciplinary composition.

# Campus 2030 : Enabling systemic solutions for smart roads

With the advent of smart transportation, infrastructure can no longer be seen as a static part of the solution, in which possible ‘smart’ IT components are merely placed within the body/surface of the road. Nor can ‘the road’ and its associated industry longer be operating as a separate part of the transport equation, as more integrated road solutions are needed. This change towards more complex solutions and partnerships has to be managed. For this reason, in the heart of the KTH campus, Campus2030 will enable innovative partnerships towards sustainable systemic solutions of smart roads.

## DIGITAL TWIN

The project, building upon existing tools and expertise, launches a Digital Twin of KTH’s road infrastructure that includes an augmented reality (AR) experience on campus to stimulate interaction with an open smart road digital platform developed in the project.

Campus2030 aims to become a fertile environment that serves as an important nursery of ideas for students, researchers and industry stakeholders to test out new smart transportation ideas. When on Campus2030, visitors will be invited to interact with the Digital Twin via focused transportation case-studies that are activated with the scanning of Campus2030 ‘markers’ via smartphones.

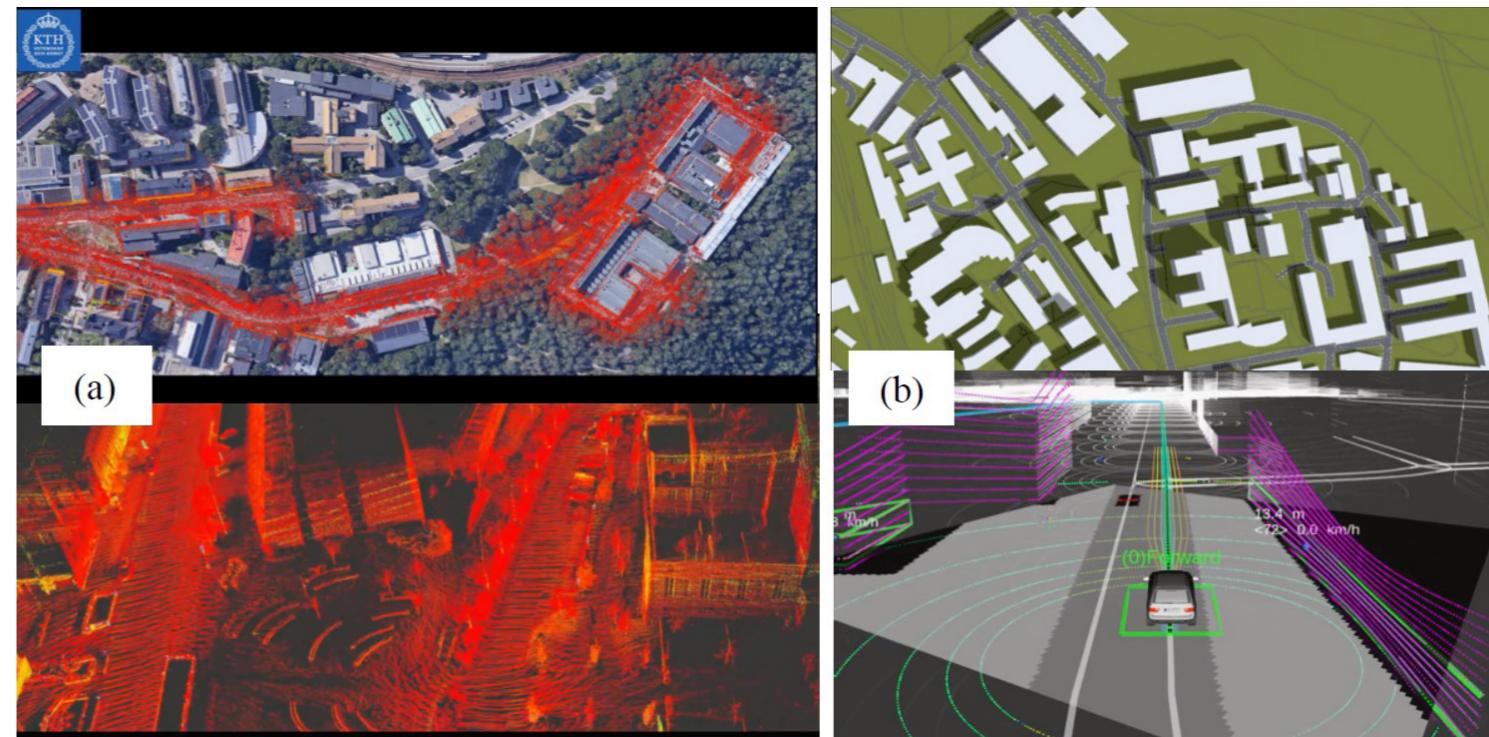


Figure 1: (a) 3D pointcloud mapping from Lidar (b) AD-EYE software platform

Together with its industry and KTH partners, Campus2030 provides an environment that serves as an important nursery for students, authorities, researchers and industry stakeholders to systematically optimize smart transportation ideas, making use of the full cross-disciplinary range of expertise available.

# InfraSweden2030 and GIMI Agenda

During the first years of its operation Road2Science initiated and played an essential part in the establishment and development of the Strategic Innovation Program InfraSweden2030 and the GIMI Agenda, two highly successful and still active programs.



## Challenges and opportunities for transport infrastructure

Sweden's development and prosperity depends heavily on efficient transport and requires a reliable, safe and sustainable transport infrastructure.

Our country's topographic and demographic conditions, with sparsely populated areas and rapidly growing cities, mean that our transport infrastructure is both complex and socially critical in several respects. The stable and long-term financing of our infrastructure is not enough; we also need innovation that results in increased sustainability, increased productivity and more efficient use of transport infrastructure.

### The vision of InfraSweden2030

In 2030, Sweden has a competitive transport infrastructure sector for climate-neutral transport that addresses society's economic and social challenges.

#### Main objectives:

- Develop innovation for transport infrastructure.
- The programme shall promote research and development of competitive products and services that shall be in demand nationally and internationall
- Create an open, dynamic and attractive environment.

[Read more about InfraSweden2030](#)

## GIMI Agenda

The GIMI Agenda (Green Infrastructure Material Innovations) has been developed for a National Swedish Strategic Research and Innovation Environment. Road2Science has coordinated the development of the GIMI Agenda in collaboration with all its stakeholders. It is a roadmap taking us from 2013 to 2030 and describes the research, education, transfer to industry and innovation steps in detail.

Stakeholders in the infrastructure sector will collaborate in a GIMI environment with a shared vision: Scientists to drive the knowledge, industry to apply the new technology, standard setting bodies to provide the supporting standards and policies and a strong (inter)national network to allow for dissemination, communication and cross-disciplinary interactions.

GIMI is about establishing a paradigm shift in Sweden's infrastructure sector.



[Click here to read more and download the GIMI roadmap](#)

# Nordic Research School of Transportation Infrastructure

Road2Science, together with the transportation infrastructure engineering groups of five Nordic Universities (KTH, DTU, NTNU, Aalto, and Tampere University) and the Swedish National Road and Transportation Research Institute (VTI) established a common Nordic Research School for Transportation Infrastructure (NordSTI).

## Objectives

- stimulate existing Nordic educational programs with new content and offerings;
- promote cross-disciplinary research projects;
- raise gender-equal interest in the domain;
- facilitate networking possibilities among stakeholders;
- offer shared courses on various levels;
- produce white papers on related topics;
- arrange focused events.

This initiative has an overall goal of addressing forthcoming Nordic challenges within the transportation infrastructure arena, e.g., increased demands for uninterrupted service, readiness to climate change effects, resiliency to natural or man-made disruptions, material reuse and circular economy, and shortening of invention-to-implementation times.

NordSTI strives to help shape new cadres of gender-balanced transportation infrastructure professionals; these will not only possess specific technical knowledge, they will also exhibit openness to cross-disciplinary solutions.

## Specific aims

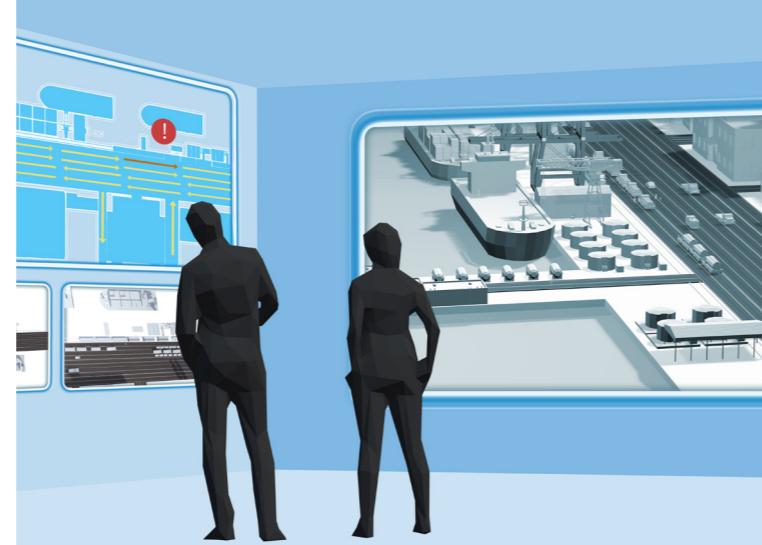
- a doubling of the cross-disciplinary collaboration projects aimed towards systemic application of digitized transportation infrastructure to diminish climate change that include two or more of the Nordic countries;
- an increase of content and course offerings in the existing Nordic educational programs by at least 30%, focused on aspects of digitization of infrastructure;
- a raised awareness of 100% amongst the Nordic infrastructure stakeholders of the existence and possible risks of the gender data gap



Road2Science arranged two workshops for NordSTI's Swedish node in 2019

## Road2Science Mentorprogram

Our mentorprogram targets B.Sc and M.Sc. students with an interest in developing the infrastructure of the built environment. Mentors in this program have several years of relevant experience, including leadership responsibilities and represent a broad range of career paths and experiences, including general management roles and expert roles, as well as academic backgrounds in structural design, project planning, material science, computational modelling and logistics. The infrastructure sector, construction engineering and material supply sector as well as non-profit and government organisations are included.



### Aim:

- To ensure a steady influx of talented engineers for a sustainable and creative transportation infrastructure sector.
- To offer strong career support to our B.Sc. and MSc students by involving our network.
- To give our students a strong start to their careers.
- To strengthen the position of Road2Science as a dynamic Competence Center that attracts and cultivates new talents.

[Click here to watch an introduction film about the program](#)

## Lunch Seminars

Road2Science regularly arranges lunch seminars and invites inspiring speakers from the infrastructure sector as well as from academy.

The aim of the seminars is to show students different carrier paths and that the road that leads to achieve their goals is not always straight.

The events series became really popular among students and each seminar has been fully booked with around hundred participants each.

[Click here to read more and watch teaserfilms about our speakers](#)



## Welcome day for new students at KTH

Every August arranges Road2Science in cooperation with the student union at KTH Architecture and the Built Environment a reception for newly admitted students.

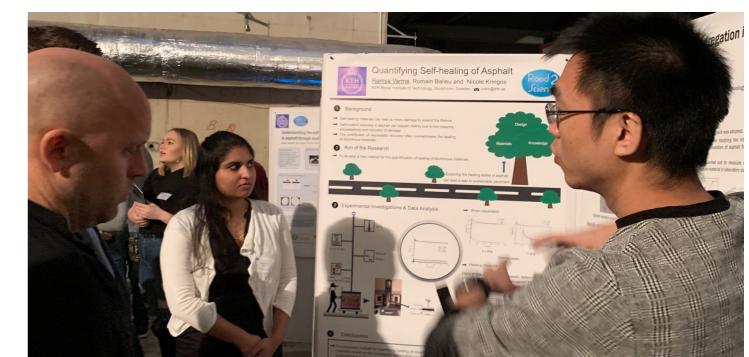
The program usually attracts a great number of students who, during a day full of activities, get to learn more about Road2Science, meet and network with our industry partners, listen to inspiring presentations and participate in games and competitions.

Some of our most popular activities from the past years were:

- Lecture of Google's Geospatial Technologist Ed Parsons, designer of Google Maps
- "Mix your own asphalt" in a lab
- Planning of a city and road network - "The City Game"
- VTI's traffic simulator
- Compacting asphalt in a simulator (Dynapac)



Open House 2019 was held in R1, the first nuclear reactor of Sweden



PhD poster presentation and competition