NTUA
Road Safety Observatory

www.nrso.ntua.gr

George Yannis
NTUA Professor

Together with:
all the great nrso team

Department of Transportation Planning and Engineering
National Technical University of Athens

Artificial Intelligence
for Road Safety and Mobility Workshop

8th UN Global Road Safety Week

Athens, 15 May 2025

DECADE OF ACTION FOR ROAD SAFETY 2021 - 2030

Streets for Life
#MakeCyclingSafe

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NTUA Road Safety Observatory

A Center of Research and Innovation Excellence

NTUA Road Safety Observatory

since 2004

- A Center of Research and Innovation Excellence on Road Safety, with global recognition [ranked: 4th in Europe and 45th worldwide (PubMed 2023), 2nd in Europe and 6th worldwide (AAP 2019)]
- within the Department of Transportation Planning and Engineering [ranked: 41th in Europe and 168th worldwide (ShanghaiRanking, 2023), scientific citations: 4th in Europe and 26th worldwide among all Transportation Departments, with the best performance among all NTUA and Greece Departments (EduRank's)
- of the School of Civil Engineering [ranked: 2nd in Europe and 5th worldwide (ShanghaiRanking, 2023)]
- of the National Technical University of Athens [the oldest (since 1837) and most prestigious educational technical institution of Greece]

NRSO - Mission

The Mission of the NTUA Road Safety Observatory (www.nrso.ntua.gr) is:

- to support the Greek and the International Road Safety Community with current key road safety knowledge and data
- gathered, analysed and organised within the research activities of the Department of Transportation Planning and Engineering of the School of Civil Engineering of the National Technical University of Athens
- as well as within co-operations with various national and international road safety organisations

NRSO - Vision

Science and innovation for safer roads everywhere and for all

The Vision of the NTUA Road Safety Observatory is:

- to contribute to the significant reduction of the number of road crashes and of the related casualties in Greece, in Europe and worldwide
- through the scientific support of evidence based decision making for the necessary road safety policies, programmes and measures

NRSO - a Dedicated Team of 40+ Scientists

NRSO - Dedicated Team

- Internationally recognized Professors
- 13 Senior Transportation Engineers (9 PostDoc)
- 15 Transportation Engineers - PhD Candidates
- 8 Transportation Engineers - Research Assistants
- 2 Information Systems Engineers
- 2 Administrative Assistants

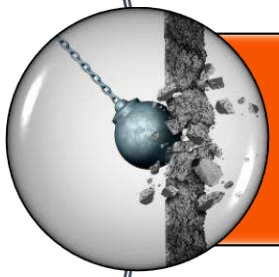
with high level scientific expertise in:

- **traffic safety**, mobility, transport and traffic planning and engineering
- **data science** and advanced statistical data analysis
- intelligent transportation systems and **automation**

NRSO - Fundamental Research Principles

Excellence

Advanced and innovative technology concepts



Impact

Research with significant impact to society and economy

Implementation

State-of-the-art organisation and management structures

NRSO - The Value of the Researcher

We are committed to the Value of the Researcher, which:

- starts with carrying out excellent research,
- is tested by publishing in high-level peer review journals and
- makes the difference when awarded project grants through highly competitive procedures

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NRSO - Research Performance

- More than 180 road safety research projects since early '90s:
  - 85 Greek
  - 95 International

- 105 of these research projects were assigned through highly competitive (national or international) procedures:
  - EU Horizon - 18 projects
    out of 60 proposals submitted

NRSO - Research Publications

- More than 900 road safety publications:
  - in scientific journals (more than 270)
  - in scientific conference proceedings (more than 590)
  - with more than 13.000 citations
  - i10-index: googlescholar: 221
  - h-index: google scholar: 57, scopus: 43

- More than 700 presentations in scientific conferences:
  - more than 500 international and 200 national
  - after invitation in more than 330 of them

All available on-line at:
http://www.nrso.ntua.gr/geyannis/

NRSO - Road Safety PhDs

- Armira Kontaxi, 2025
  "The driver behavior telematics feedback mechanism"
- Eva Michelaraki, 2024
  "Improving driver safety tolerance zone through holistic analysis of road, vehicle and behavioural risk factors"
- Dimitrios Nikolaou, 2024
  "Machine learning-based road crash risk assessment fusing infrastructure, traffic and driver behaviour data"
- Apostolos Ziakopoulos, 2020
  "Spatial analysis of road safety and traffic behaviour using high resolution multi-parametric data"
- Dimitris Tselentis, 2018
  "Benchmarking Driving Efficiency using Data Science Techniques applied on Large-Scale Smartphone Data"
- Dimosthenis Pavlou, 2016
  "Traffic and safety behaviour of drivers with neurological diseases affecting cognitive functions"
- Akis Theofilatos, 2015
  "An advanced multi-faceted statistical analysis of accident probability and severity exploiting high resolution traffic and weather data"
- Panagiotis Papantoniou, 2015
  "Risk factors, driver behaviour and accident probability - The case of distracted driving"
- Eleonora Papadimitriou, 2010
  "Pedestrian behaviour and safety models in urban road networks"

NRSO - PhDs Under Preparation

- Stelios Peithis, 2024
  "Deep Learning and artificial intelligence applications for optimized traffic and mobility performance"
- Aristotelis Tsoutsanis, 2024
  "Data fusion of traffic, behaviour & infrastructure for holistic driver assistance"
- Simone Paradiso, 2024
  "AI for road safety monitoring and crash prediction from micro- to macro levels"
- Júlia Porto, 2024
  "Proactive risk mapping and infrastructure safety management"
- Aristotelis Styanidis, 2024
  "Road safety prediction on the basis of ethically sound physiological measurements"
- Nikos Karouzakis, 2023
  "Advanced macroscopic analysis models of international data regarding private equity investment strategy in infrastructure projects"
- Stella Roussou, 2023
  "Predictive evaluation of road safety in urban mobility using telematics data and traffic simulation models"
- Marios Sekadakis, 2021
  "Analysis of traffic safety and behaviour of autonomous vehicles during switching automation levels"
- Maria Oikonomou, 2021
  "Automated vehicles impact on traffic and the environment"
- Virginia Petraki, 2020
  "Big data and new urban sustainable mobility forms"
- Julia Roussou, 2019
  "Impact assessment of connected and automated transport systems"
- Alexandra Laiou, 2019
  "Measuring road safety culture"
- Foteini Orfanou, 2016
  "Modelling automated traffic using high resolution data"
- Katerina Folla, 2015
  "Advanced macroscopic models for the analysis of international road safety data"

NRSO - PhD & PostDoc Alumni Careers

Our PhD and PostDoc Alumni Engineers are pursuing excellent academic, engineering and consulting careers worldwide:

- Technical University of Munich (TUM)
- Technical University of Delft (TUD)
- Ecole Nationale des Ponts et Chaussées (ENPC)
- Ecole Polytechnique Fédérale de Lausanne (EPFL)
- Loughborough University (UL)
- National Technical University of Athens (NTUA)
- University of Patras (UPatras)
- University of West Attica (UniWA)
- Ernst & Young (EY)

National Technical University of Athens

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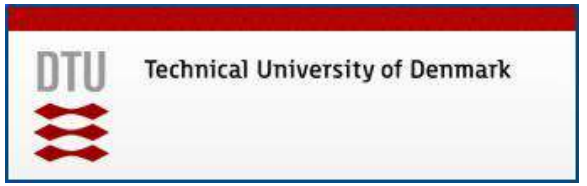
Cooperations and Partners

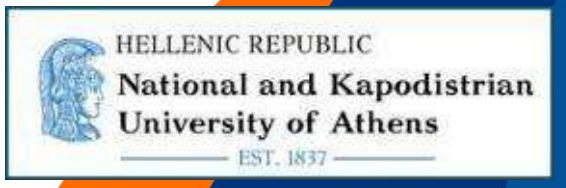
Our Cooperations - Greece

Our Cooperations - Europe

Our Cooperations - Worldwide

Partners - Universities





Partners - Research Institutes

NRSO Systems and Advocacy

The NRSO website (1/2)

An international reference website
- information system since 2004, with
state-of-the art road safety data and knowledge

www.nrso.ntua.gr

- more than 30.000 visits per month
- 152 electronic newsletters since 2007
- tens of social media posts annually (with 10K - 75K views each)
- network of more than 7.500 road safety experts in Greece (2.000+) and worldwide (5.500+)

The NRSO website (2/2)

A dynamic website with a wealth of information:

www.nrso.ntua.gr

- since 2004 with more than 2.550 items
- all important road safety News in Greece, in Europe and globally
- new Reports covering all modern road safety issues
- latest available road safety Data for Greece, the EU and the world
- exhaustive list of road safety Conferences in Greece and globally
- links to dozens road safety Resources globally

NRSO Data and Knowledge Systems

Databases

- SANTRA - Greek Road Accident Database with disaggregated data (1985 - 2019, 1,3 million recordings)
- CARE - European Road Accident Database with disaggregated data (1991 - 2020, 40 million recordings)
- IRTAD - International Road Accident Database with aggregated data
- Databases of International Organisations (WHO, IRF, ERF, UITP)
- Databases with Aggregated Data (Vehicle fleet, veh-km, driver behavior, etc.)

Knowledge Systems

- Online Road Safety Library > 7.100 key Reports
- International Bibliography database (scopus, science direct)
- Analysis tools (traffic, simulation, statistics)

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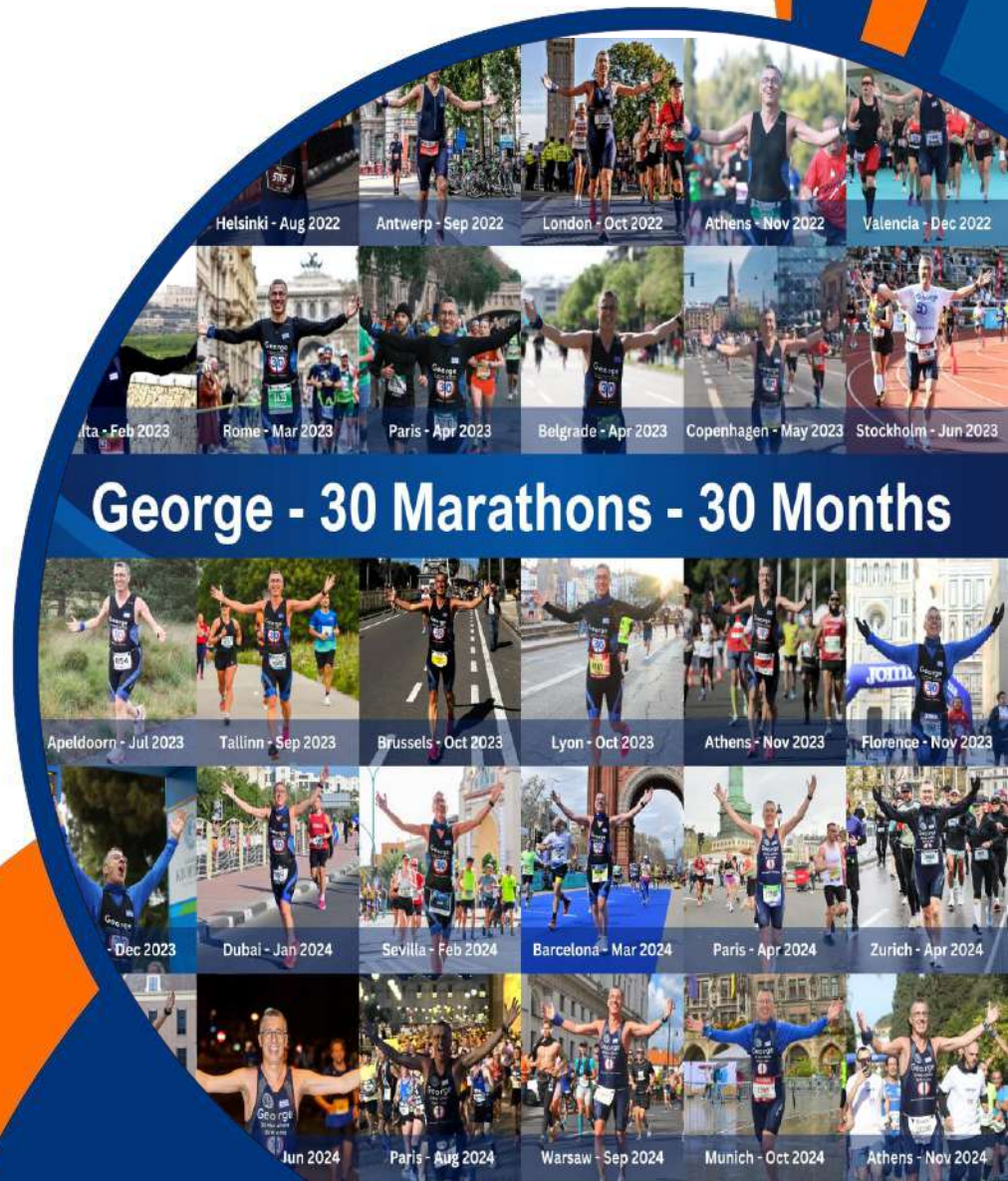
NRSO Research Infrastructure

- Driving Simulator (Foerst ¼ cab, moving base) for driver behavior experiments
- Unmanned Aerial Vehicles (Drones) for traffic monitoring
- Smartphone Telematics application (powered by OSeven) for driver behaviour monitoring
- On-Board Diagnostics Devices (OBD) for driver behavior monitoring
- Cameras and other devices for traffic counts, speed monitoring, position monitoring (GPS)

Advocacy – 30 Marathons Campaign

- A global campaign of running 30 Marathons in 30 months in order to actively promote the adoption of city-wide 30 km/h speed limit in as many cities as possible worldwide

- This campaign was concluded in November 2024 in Athens (all Marathons in under 4 hours) with a particularly significant global impact



Campaign Social Impact

An Integrated Communication Policy with Strong Global Impact

- **26 cities** with Marathon finish
- **10 International Organisations** Allie

- **500.000+ pageviews** per year
- **100.000+ global audience** at social media
- **200 republished posts** from scientific organisations and institutions (with 80.000+ post impressions)
- **40 social media** posts

- **25 interviews** in the electronic media
- **32 newspaper/magazine** articles
- **3 papers** in scientific journals
- **20 presentations** in conferences/webinars

Road Safety Research Areas

The Road Safety Research Areas

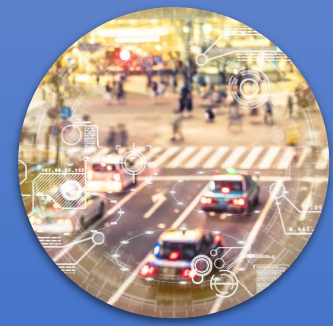
Artificial Intelligence and Driver Behaviour

Road Safety Data Intelligence

Connected and Automated Mobility

Safe Road Infrastructure

Road Safety Policy

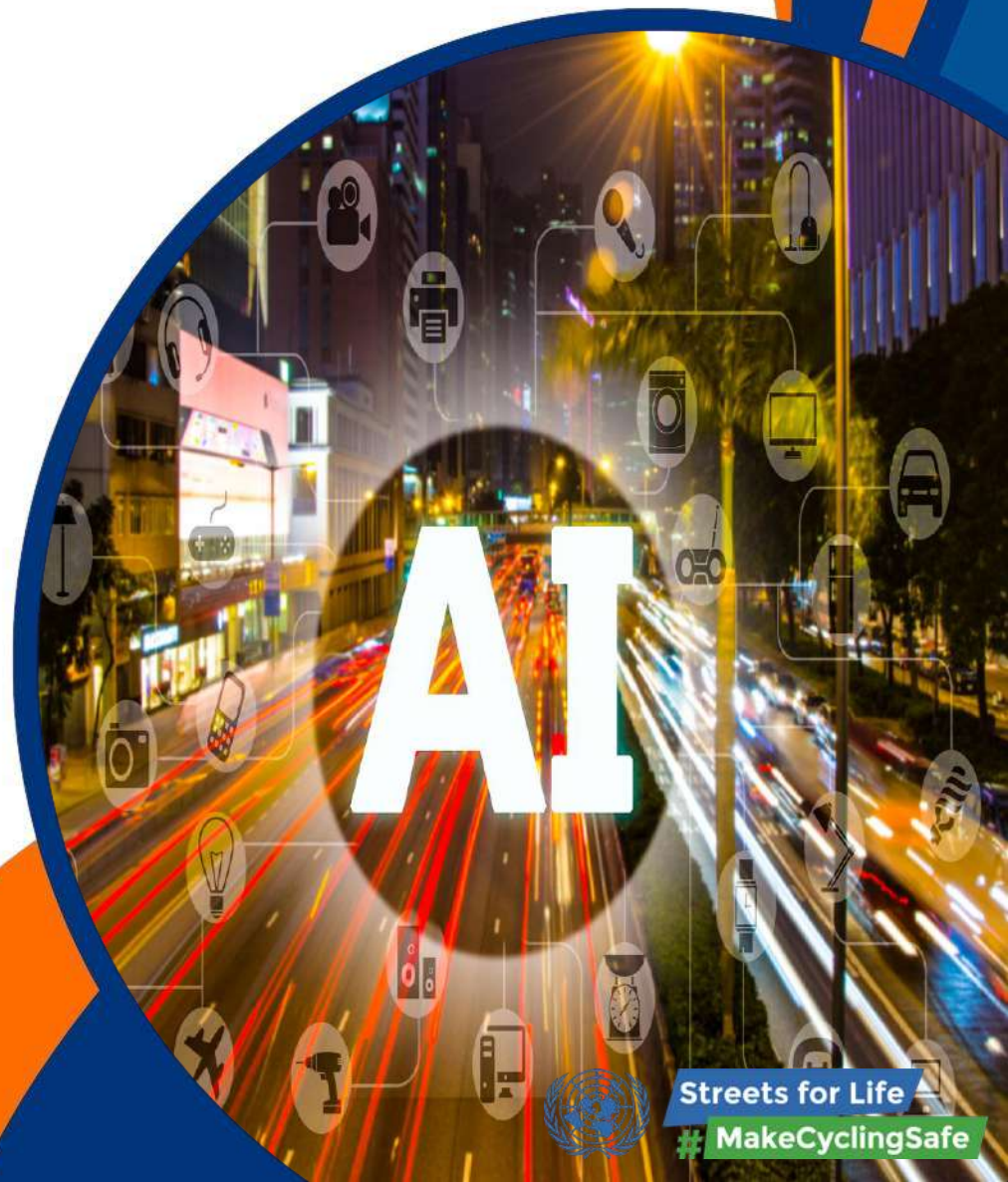


Smart Mobility

Artificial Intelligence and Driver Behaviour

- Ivory - AI for Vision Zero in Road Safety
- Phoebe - Predictive Approaches for Safer Urban Environments
- SmartMaps - Smart city mapping for safer and eco driver behaviour
- OptiMo - Optimising driver behaviour for safe, green and energy efficient mobility
- Peve - Unsafe traffic events

Only a thorough understanding of road user behaviour and perceived risk can lead to targeted safety measures



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Road Safety Data Intelligence

- Ersonext - Support to the European Road Safety Observatory
- Trendline - Support of technical activities for the development and collection of Road Safety KPIs
- Napcore - National Access Point Coordination Organisation for Europe
- Improva - Injury Mitigation to Promote Vision-Zero Achievement
- ESRA3 - E-Survey of Road users' Attitudes

Optimize policy decisions and road user choices based on advanced analyses of reliable crash, exposure and KPI data

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Connected and Automated Mobility

- CulturalRoad - Cultural, regional and societal factors to overcome barriers to connected, cooperative and automated mobility
- Show - Shared Automation Operating Models for Worldwide Adoption
- Hadrian - Holistic Approach for Driver Role Integration into Automation

Automation can boost safety
but safety issues during transition phases
require targeted multi-disciplinary research

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Safe Road Infrastructure

- EGRIS3 - Road Infrastructure Safety
- NTUA Campus Road Network Upgrade

Under the safe system approach
a road environment without surprises and forgiving
can prevent and accommodate road user errors

Road Safety Policy

- Trust - Traffic safety culture - A transition towards shared responsibility for safe and sustainable mobility
- 30m30 - Effectiveness of city-wide 30 km/h speed limits
- Piarc - Global Road Safety Knowledge Exchange
- SShCentre - Financial incentives and benefits for vehicle insurance policies using telematics
- New Attica Transportation Strategic Plan

Effective road safety policy
demands a holistic, evidence-based approach
towards shared safety goals for all road users

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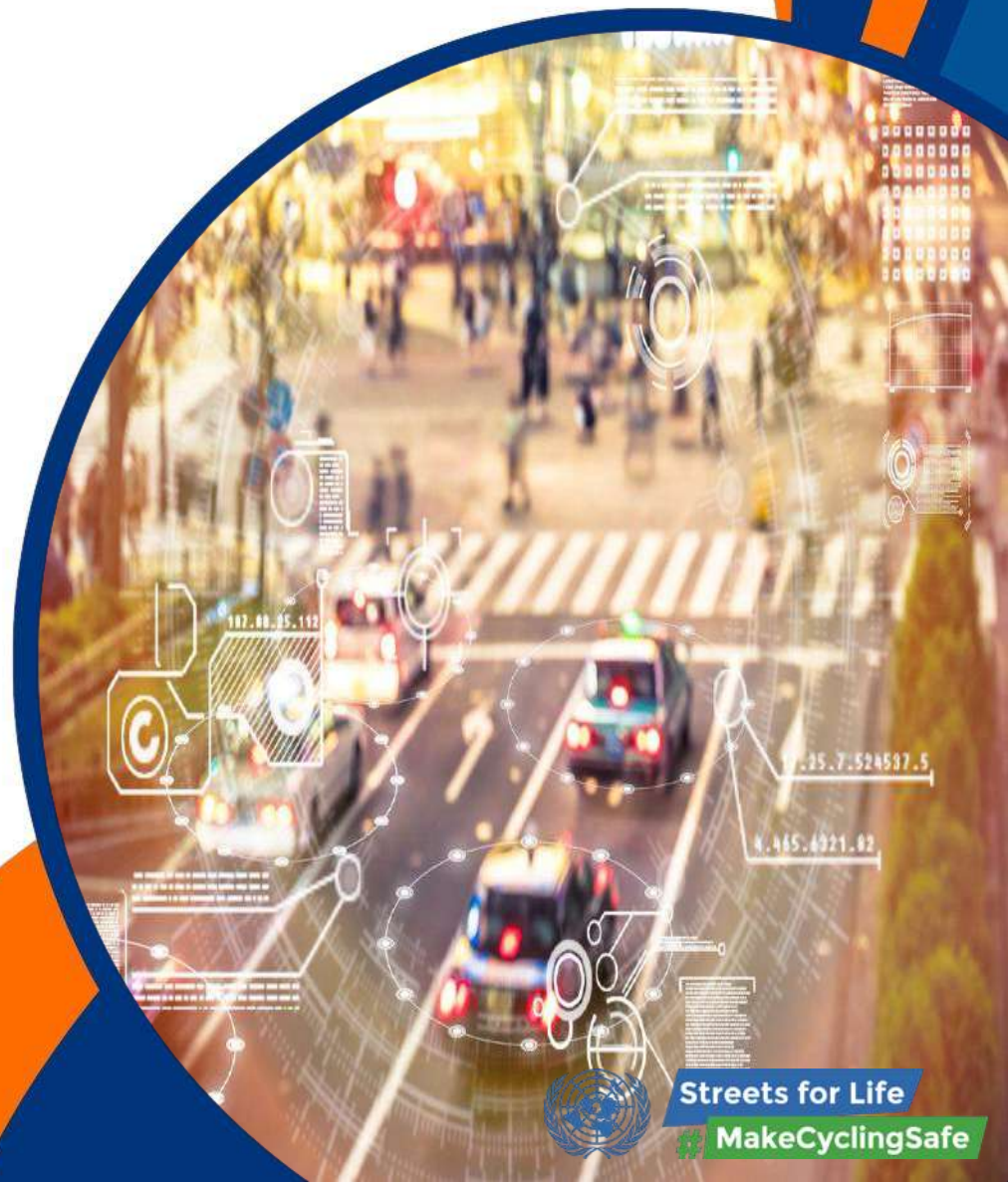
Smart Mobility

- MetaCCaze - Smart and shared Zero Emission mobility for passengers and freight
- GreCo - Green Cultural Oases
- Athens Metropolitan Transport System
- Ride Sharing Solutions
- Smart Payments in Public Transport

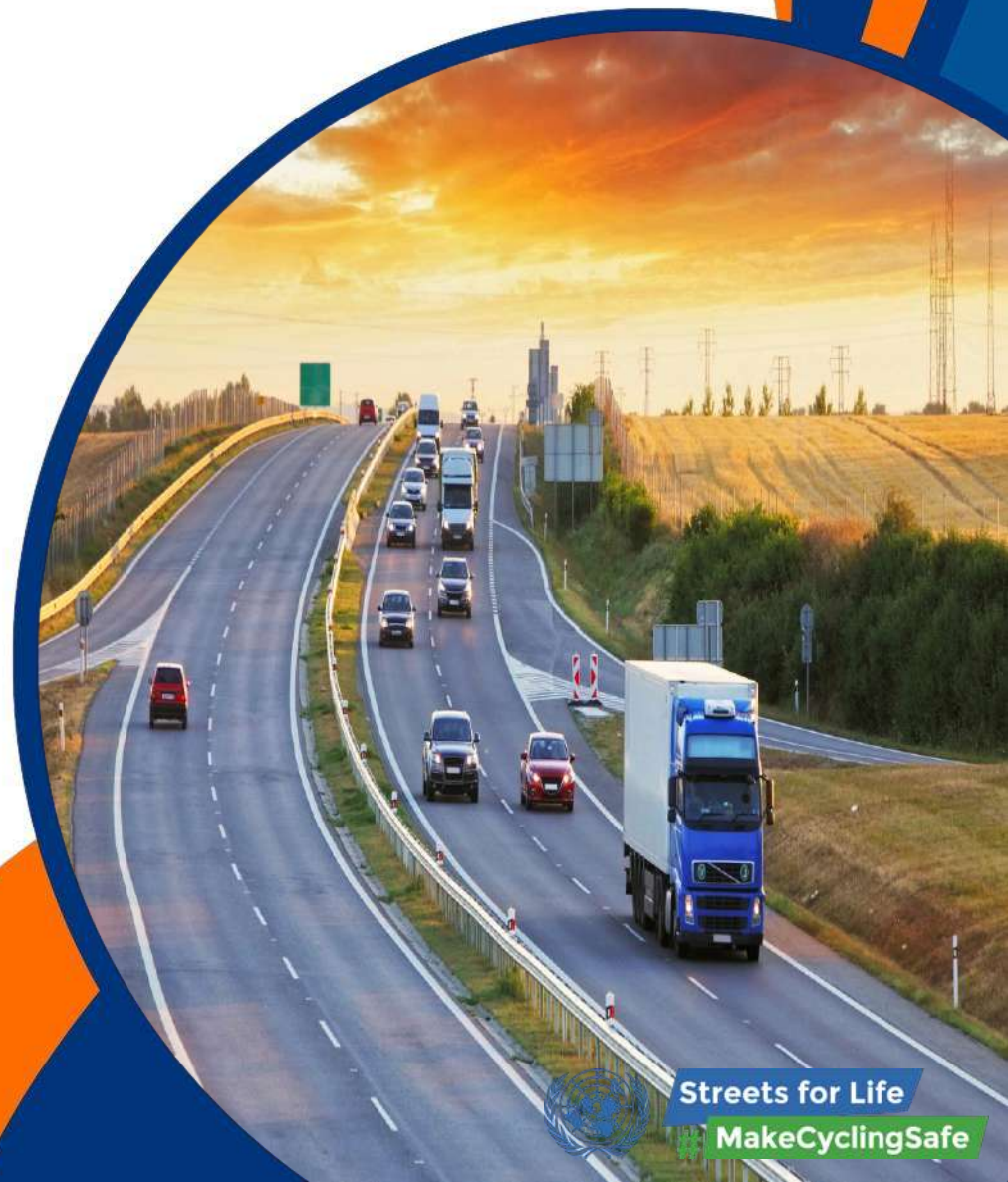
Integration of safety needs into sustainable urban mobility plans is the key for high acceptance and great safety benefits



Road Safety Research Perspectives

Key Road Safety Considerations

- Speed is highly misunderstood by all
- Vulnerable road users are not accommodated
- We spend too much without effectiveness monitoring
- Unrealistic expectations of technology (especially of automated vehicles)
- Too much data, too little usage
- Need for more road safety science and budgets



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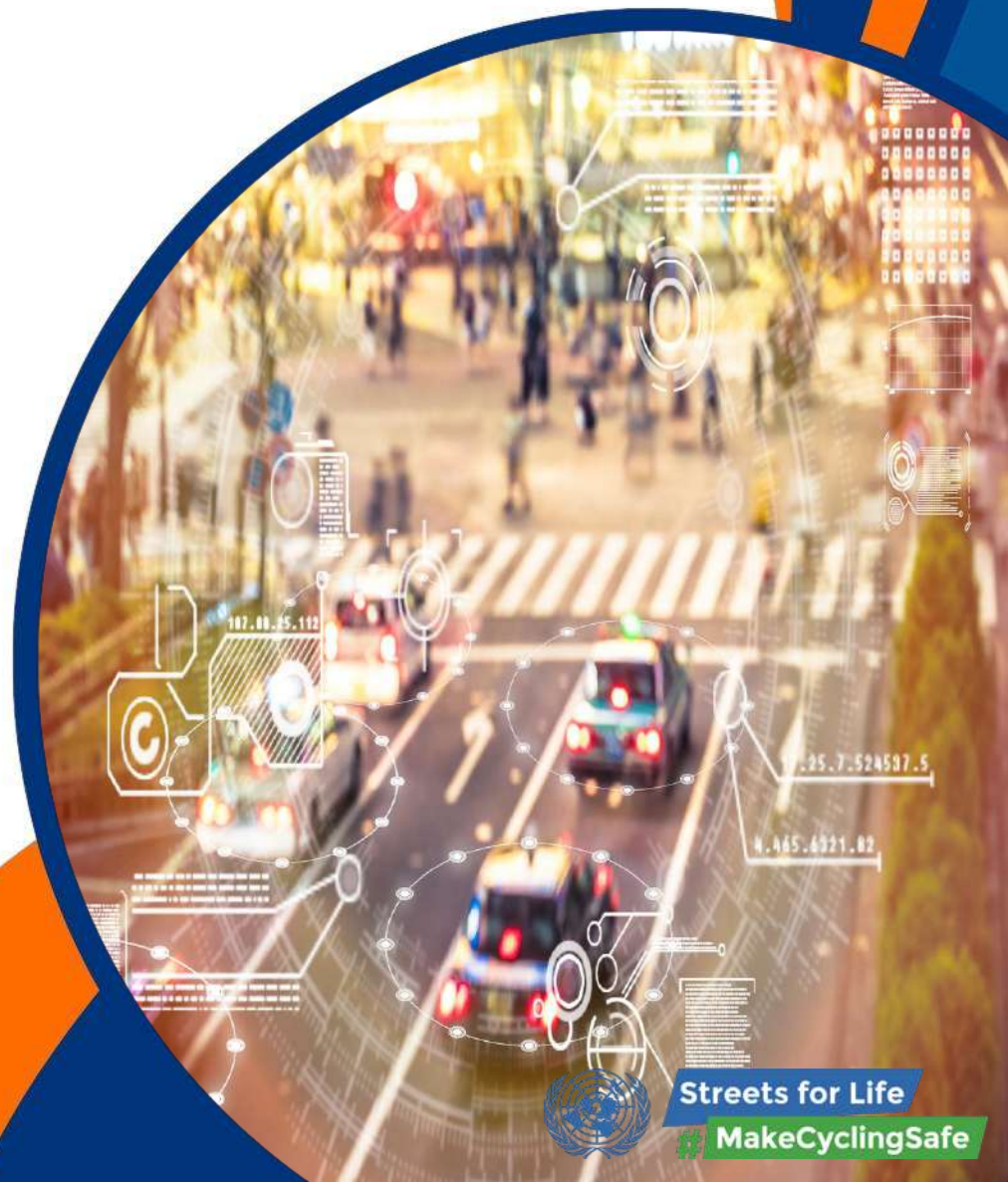
Road Safety Policy Perspectives

- Focus on the key road crash risk factors:
  - **Speed, Speed and Speed**
  - Drink and Drive
  - Distracted Driving
  - Not use of seat belt and helmet
- Adapt urban mobility management to accommodate and balance current and future mobility and safety needs of the vulnerable road users (pedestrians, cyclists, motorcyclists): **Reduce Speed everywhere – city-wide 30km/h**
- Develop strong road safety culture of the Authorities and all Stakeholders (Safe System Approach) and the whole population



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Road Safety Technology Perspectives (1/2)

- **Technology** can be the catalyst for road safety, through:
  - Public private partnerships
  - Clear problem analyses (well defined objectives)
  - Systematic effectiveness monitoring

- **Great** need for:
  - more data and knowledge
  - better exploitation of current and future data
  - broader geographical coverage

- **Data** focus on:
  - more accurate road crash data
  - exposure data and performance indicators
  - measures and policies effectiveness evaluation

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Road Safety Technology Perspectives (2/2)

- Digitalization and Artificial Intelligence open great new data possibilities for:
  - road user support and guidance
  - evidence based public and private road safety decision making at all levels
- New great potential for seamless data driven performance from safety problems identification to selection and implementation of optimal solutions
- Exploitation of the high safety potential of vehicle and traffic automation, with focused research on the transition phase and the vulnerable road users

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