

CEiJA

ENGINEERING AND INNOVATION

Autonomous driving challenges

AUTOCITS 3rd Open Workshop (ICG)

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10.Oct.2017



ABOUT CEiiA

CEiiA is a Centre of Engineering and Product Development that designs, implements and operates innovative products and systems alongside its partners in the automotive, mobility, aeronautics, sea and space industries.

CEiiA offers complete solutions, covering all product development phases from concept to the production of small series, and operates intelligent systems.

+250

Engineers

+10

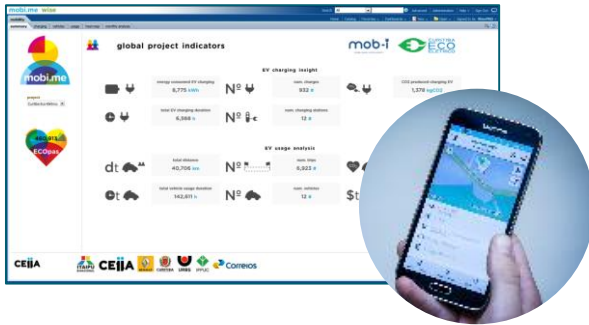
Years in complex projects

Largest R&D investment in Portugal

(nonprofit organisations - IPCTN 2016)

MOBILITY, ENERGY AND SMART CITIES

OVERVIEW



mobi.me systems and technologies ensure a comprehensive answer to the needs of users, cities and mobility operators



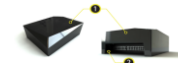
BE (connected urban car)



Smart EV charging solutions for public and private locations



Bikesharing systems



Connectivity devices

Devices as a Service – from vehicles to connectivity and smart infrastructure and advanced electric vehicle energy management solutions

THE MOBILITY CHALLENGE

GLOBAL TRENDS

GLOBAL CHALLENGES

Growing urbanization



Population concentration



Increase in number of vehicles and km traveled

High impacts



Emissions from transport



Mobility costs

Collapse of current paradigm



High dependence on private cars



Low coordination and interoperability between modes

Changes in behavior and policies



Restrictive policies to the private vehicle



Evolution of ownership for shared use

MOBILITY DRIVERS



Flexible and on-demand mobility



Connectivity



Electrification

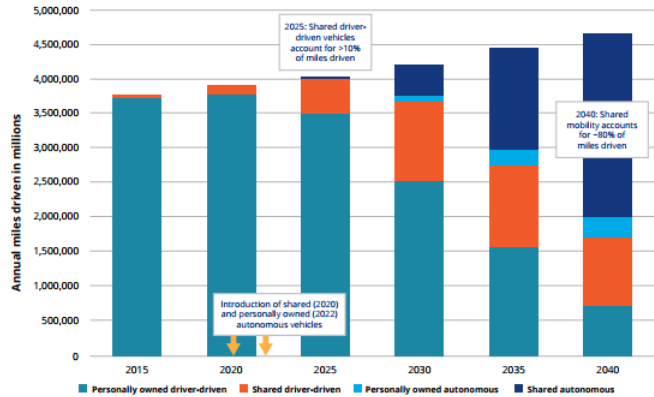


Autonomous driving

AUTONOMOUS DRIVING

RESHAPING URBAN MOBILITY

Figure 2. Forecast of total miles driven in the United States



Source: Deloitte analysis based on publicly available information. See appendix for data sources.

Graphic: Deloitte University Press | DUPress.com

Distance travelled based on electric autonomous vehicles through flexible and on-demand services (convergence of sharing + ridehailing)

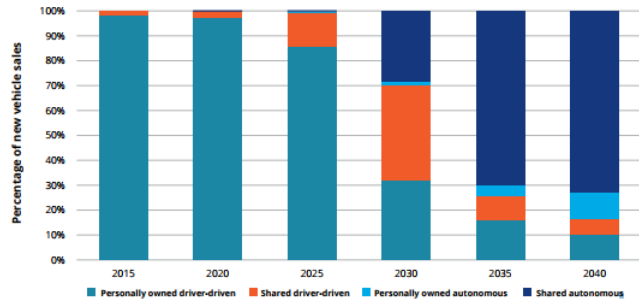
ap. 60%+ in 2040 (Deloitte (2016) | The future of mobility: What's next?)

aggressive scenarios predict as high as

95% in 2030 (Rethink (2017) | Rethinking Transportation 2020-2030)

Unit mobility costs to be reduced by a factor of 4 to 10

Figure 3. Forecast of new vehicle sales distribution in urban areas in the United States



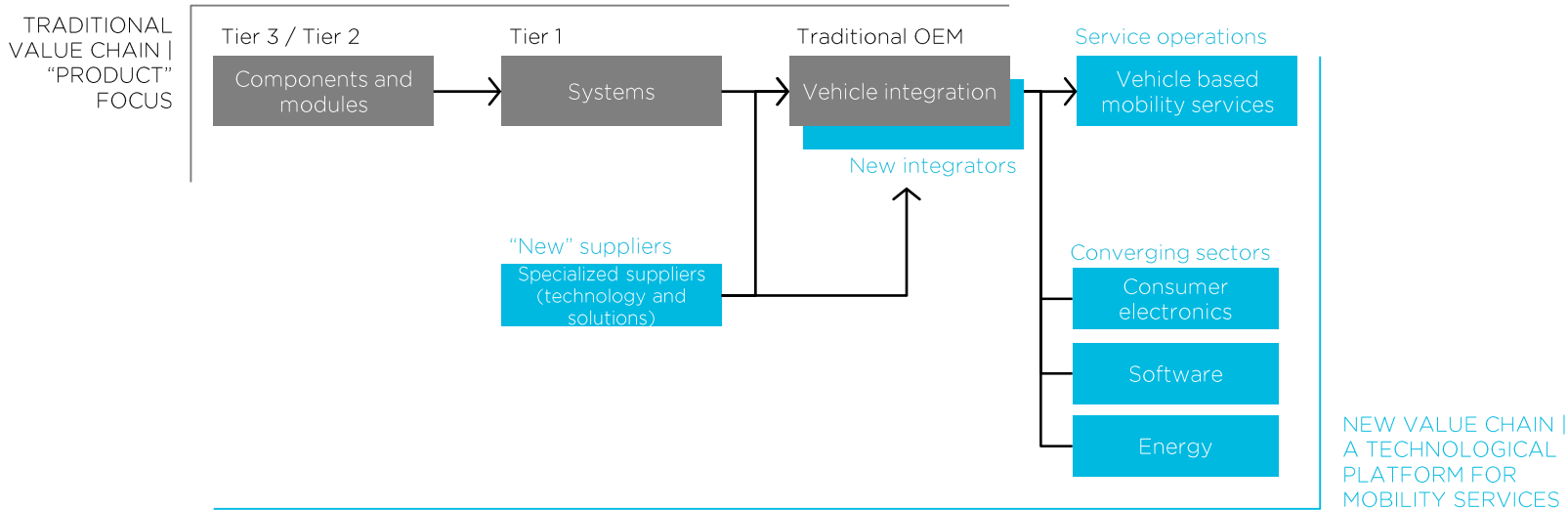
Source: Deloitte analysis based on publicly available information. See appendix for data sources.

Graphic: Deloitte University Press | DUPress.com

Shared autonomous vehicles to account for majority of sales

AUTONOMOUS DRIVING

A DRIVING FORCE FOR A NEW INDUSTRIAL REALITY

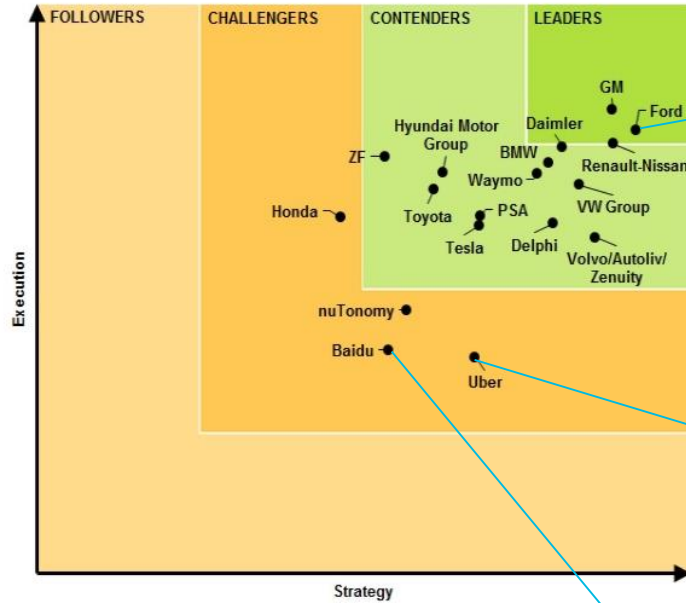


The industry evolves from an "industry pull" model to a "market push" / **service oriented model**, driven by operations in mobility environments

Electrification, full connectivity (integration of vehicle-infrastructure-systems-services-users) and **self driving functions** induce the emergence of new technological players

THE CASE OF AUTONOMOUS VEHICLES

NEW INDUSTRIAL REALITY



Fonte: Navigant Research (2017)

Technology | Science | Culture | Video | Reviews | Magazine

Ford invests \$1 billion in AI startup Argo to make self-driving cars

The money will be put into Argo AI over the next five years to help develop autonomous cars

Ford has shown just how committed it is to the future of self-driving cars by investing a staggering \$1 billion (\$800 million) in a new AI company.

CONVENTIONAL OEM (EX.)

UBER Newsroom

Pittsburgh, your Self-Driving Uber is arriving now

September 14, 2016
Posted by Anthony

A year and a half ago, Uber set up an Advanced Technologies Center (ATC) in Pittsburgh. Its mission: to make self-driving Ubers a reality. Today, we're excited to announce that the world's first Self-Driving Ubers are now on the road in the Steel City.

UBER'S SELF-DRIVING TRUCK MAKES ITS FIRST DELIVERY: 50,000 BEERS

WALT MARTIN is kneeling, legs folded behind him, butt resting on his heels. "I've got to practice my yoga," he says, clearly joking. Never mind that we're in the cab of an 18-wheeler cruising through Colorado at 55 mph and Martin was, until a moment ago, the guy at the wheel.

Maybe he was feeling cocky. After all, the truck, outfitted with \$30,000 worth of hardware and software from San Francisco startup Otto, had just hours before made the world's first autonomous truck delivery. You'd think so momentous an occasion would have involved something more glamorous than 50,000 cans of Budweiser; but there it is.

Forbes

Asia / #TestDrive
JUN 29, 2016 @ 02:11 AM 3,842 VIEWS

China's Internet Giant Baidu To Mass Produce Driverless Cars In 5 Years

Tycho De Feijter, CONTRIBUTOR

I write about the Chinese car market. FULL BIO

NEW ENTRANTS (EX.)

THE CASE OF AUTONOMOUS VEHICLES

OPPORTUNITY FOR INDUSTRY TECHNOLOGY, INDUSTRY AND SERVICES



intel Newsroom

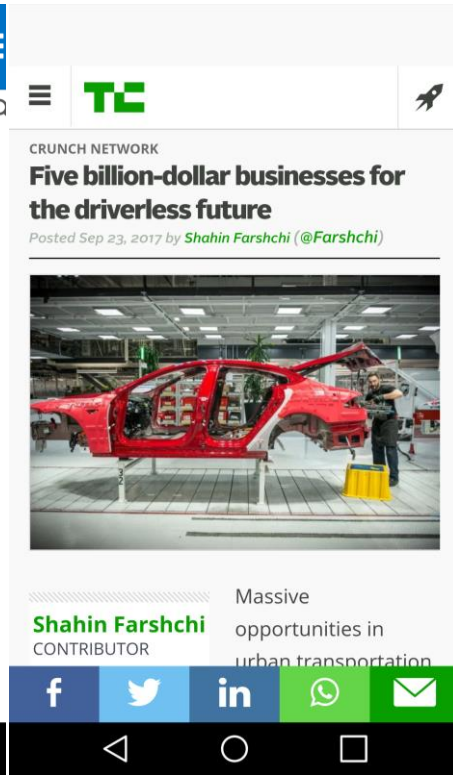
All News Search Newsroom...

INTEL PREDICTS AUTONOMOUS DRIVING WILL SPUR NEW 'PASSENGER ECONOMY' WORTH \$7 TRILLION

Study Estimates the Value of Goods and Services in the Early Years of the 'Passenger Economy' Will Be More Than Twice the Size of the 'Sharing Economy'

News Release


June 1, 2017



CRUNCH NETWORK

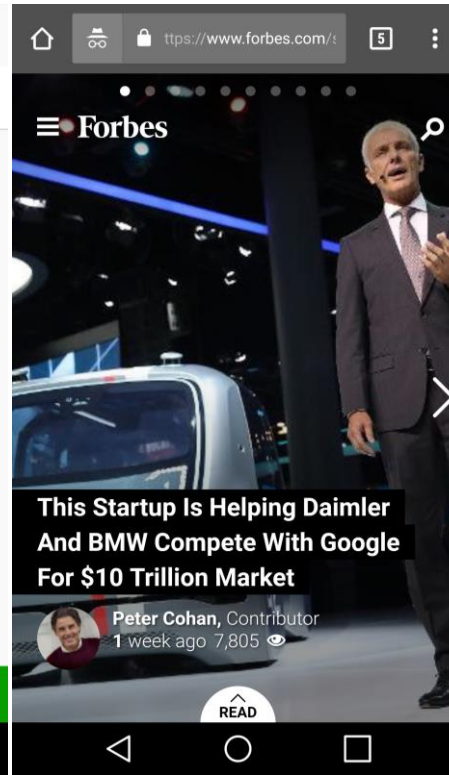
Five billion-dollar businesses for the driverless future

Posted Sep 23, 2017 by [Shahin Farshchi \(@Farshchi\)](#)



Shahin Farshchi CONTRIBUTOR

Massive opportunities in urban transportation



https://www.forbes.com/

This Startup Is Helping Daimler And BMW Compete With Google For \$10 Trillion Market

Peter Cohan, Contributor

1 week ago 7,805

READ

Autonomous driving generating a global market led by technology and service innovation

THE CASE OF AUTONOMOUS VEHICLES

SETTING THE CHALLENGE

SAE level	Name	Narrative Definition	Execution of Steering and Acceleration/Deceleration	Monitoring of Driving Environment	Fallback Performance of Dynamic Driving Task	System Capability (Driving Modes)
Human driver monitors the driving environment						
0	No Automation	the full-time performance by the <i>human driver</i> of all aspects of the <i>dynamic driving task</i> , even when enhanced by warning or intervention systems	Human driver	Human driver	Human driver	n/a
1	Driver Assistance	the <i>driving mode</i> -specific execution by a driver assistance system of either steering or acceleration/deceleration using information about the <i>driving environment</i> and with the expectation that the <i>human driver</i> perform all remaining aspects of the <i>dynamic driving task</i>	Human driver and system	Human driver	Human driver	Some driving modes
2	Partial Automation	the <i>driving mode</i> -specific execution by one or more driver assistance systems of both steering and acceleration/deceleration using information about the <i>driving environment</i> and with the expectation that the <i>human driver</i> perform all remaining aspects of the <i>dynamic driving task</i>	System	Human driver	Human driver	Some driving modes
Automated driving system ("system") monitors the driving environment						
3	Conditional Automation	the <i>driving mode</i> -specific performance by an <i>automated driving system</i> of all aspects of the <i>dynamic driving task</i> with the expectation that the <i>human driver</i> will respond appropriately to a <i>request to intervene</i>	System	System	Human driver	Some driving modes
4	High Automation	the <i>driving mode</i> -specific performance by an automated driving system of all aspects of the <i>dynamic driving task</i> , even if a <i>human driver</i> does not respond appropriately to a <i>request to intervene</i>	System	System	System	Some driving modes
5	Full Automation	the full-time performance by an <i>automated driving system</i> of all aspects of the <i>dynamic driving task</i> under all roadway and environmental conditions that can be managed by a <i>human driver</i>	System	System	System	All driving modes

Level 2-3 solutions reaching the market in short-term

Level 4-5 to reach markets 5 to 10 years away

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WHERE WE'RE AT

INTERNATIONAL STATUS (EXS.)



Have approved an Autonomous Vehicle Policy at the federal level, which includes best practices for developing and testing vehicles. Some states have also passed legislation in this regard, including California, Florida, or Nevada



Code of Practice contains recommendations for self-contained vehicle testing. UK is in the process of studying and consulting for the approval of legislation for autonomous and non-driver vehicles, including, in particular, amendments to the Road Code, Construction and Use Regulations and insurance legislation.



Recently published a bill for self-employed vehicles.

- Vehicles must be able to be disabled by the driver at any time
- Drivers should be able to transfer control of driving to the system, but should remain ready to resume control
- Vehicles shall be equipped with black boxes



Allows the testing of autonomous vehicles of levels 3 to 5 under its Instruction 15 / V-113 on the carrying out of research tests or tests with autonomous vehicles on routes open to traffic in general. There should always be a driver to take control of the vehicle, albeit remotely.

emphasis is on vehicle testing

ANTICIPATING CHANGE

THE PORTUGUESE CASE

GLOBAL CHALLENGES

1. Reshaping of automotive and mobility challenges traditional industries
2. Change pushes towards deep integration of converging sectors (automotive, energy, ICT, mobility services)
3. Services will lead transformation
4. Interoperability and tech integration via deeper V2X (V2V, V2I, ...) is key

GLOBAL OPPORTUNITIES

Anticipate a new cycle in the industry through:

- Technology development and innovation
- Attraction of relevant investments and inducing new Portuguese based leaders
- Fostering new emerging services / startups in emerging fields
- Setting favorable environments for real-life testing of advanced tech based services

ambition: set Portugal as a leader in autonomous driving economy

ANTICIPATING CHANGE: A STRUCTURED APPROACH

FREE TECHNOLOGY ZONES | ZONAS LIVRES TECNOLÓGICAS (ZLT)

APPROACH



An approach from the current logic of the automotive industry



Focus on the vehicle

Existing approaches tend to focus on the vehicle, following the leading role of traditional manufacturers. This is common to countries of origin of such manufacturers or with strong presence of the automotive industry



A differentiating approach



Focus on vehicle integration?
With the user and the city

1. Framework for testing integrated solutions
 - Led by different partners
 - Approach according to vehicle-infrastructure-systems-users integration
2. Leadership in interoperability
 - Technological and functional
 - Territorial: link between cities and cross-border
3. Bet on the connection with cities and users (real environments of use)
4. Induction of new business based on technology and services

CEiA AND AUTONOMOUS VEHICLES



INTELLIGENT
SYSTEMS AND
CONNECTIVITY



AUTONOMOUS
URBAN VEHICLES



LEGISLATION AND
REGULATION



CEiiA's [platform for smart mobility](#) connects users with all types of mobility devices in real-time, allowing the management and operation of shared and on-demand mobility services, infrastructure and public transportation under the perspective of user-centric “mobility as a service”, mobi.me®’s roadmap comprises integration of electric fully autonomous vehicles’ based services

[mobi.me® for users](#)

Plan and choose mobility and energy services from any operator, based on cost, time and impacts

[mobi.me® for cities](#)

MaaS environments

[mobi.me® for mobility operators](#)

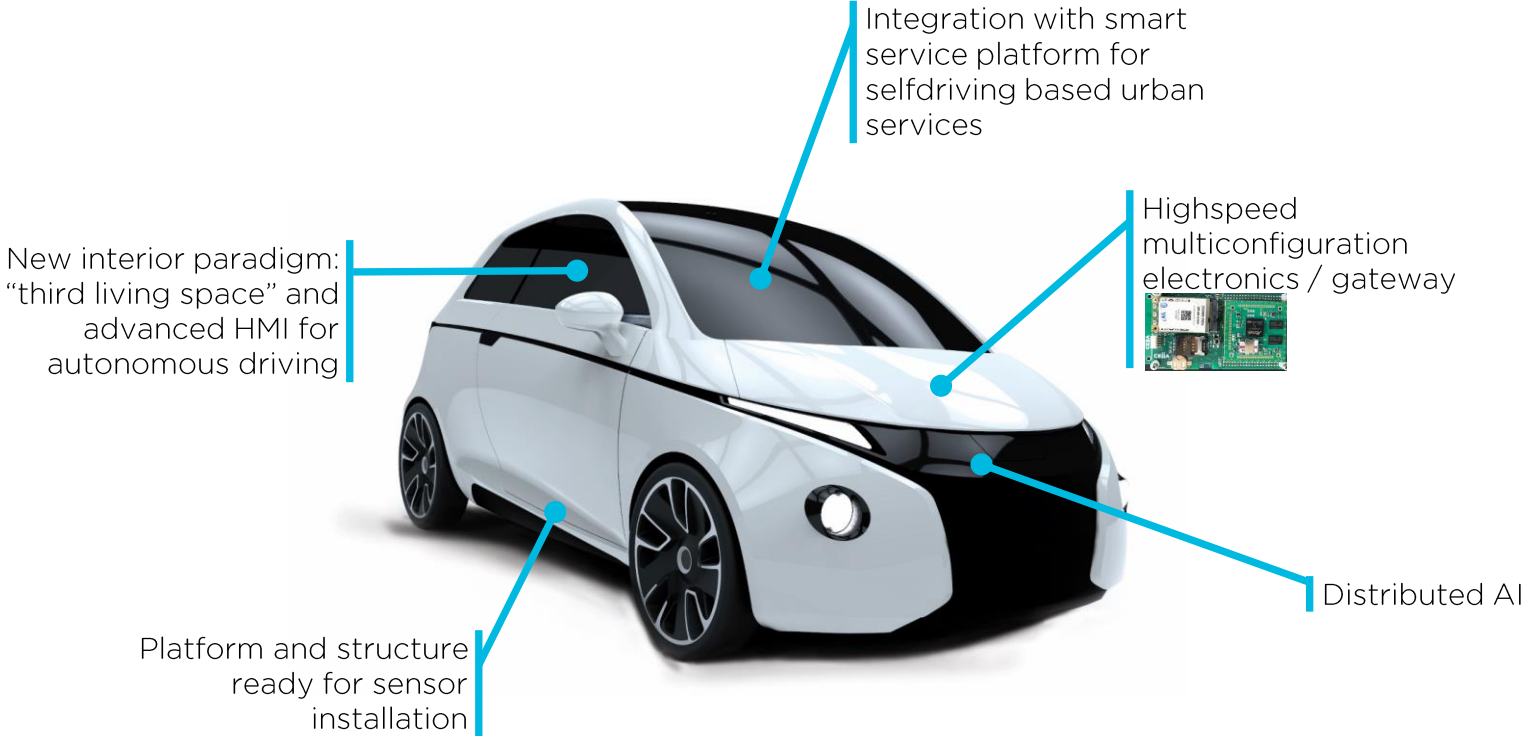
Flexible and scalable solutions for innovative mobility service operations



United Nations
Global Compact



CEiA | AUTONOMOUS CAR





DRAFT DEFINITION

Physical spaces that gather and replicate the real conditions of city ecosystems for the purpose of development of activities of research, demonstration and testing of technologies with different states of maturity in full security, privacy and confidentiality

ZLT CHALLENGES

TECHNICAL

- Technology
- Standards
- Security
- Homologation

SAFETY

- Responsibility / traceability
- Behavior / ethical

SYSTEMIC

- Testing in real-life environment
- V2X... X2X interoperability

SERVICES

- Insurance

CLUSTER

- Industry
- New services
- New businesses / startups
- R&D

FREE TECHNOLOGY ZONES

TECHNOLOGY AND SERVICE CHALLENGES (EXS.)


Embedded intelligence

- Advanced sensing
- Augmented reality
- Machine learning / AI
- High resolution navigation


Integration with transportation systems


Integration with infrastructure


Integration with users


Integration with systems and communications


Integration with energy systems

Technology driven

- Flexible/on-demand mobility
- Public transportation

- Smart road infrastructure / road signs
- Traffic management
- Blockchain

- Third living space / “office on wheels”
- Infotainment

- Vehicle-to-everything
- 5G
- DSRC
- Machine learning / AI
- Blockchain

- Autonomous EV charging
- Wireless EV charging

Service driven

- Integrated service management / MaaS

- New vehicle based services

- Advanced services (sharing, logistics, ...)

- Intelligent energy management

FREE TECHNOLOGY ZONES

POSSIBLE LOCATIONS

The concept of Free Technology Zones shall focus on the preparation of areas with differentiated character aiming at the testing and demonstration of autonomous driving solutions, under an integrated approach at vehicle operations, infrastructure, communication environments and backend systems

Matosinhos: high-density urban area

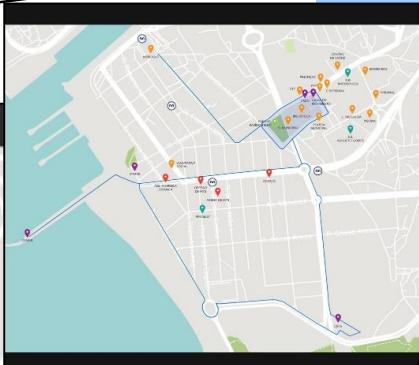
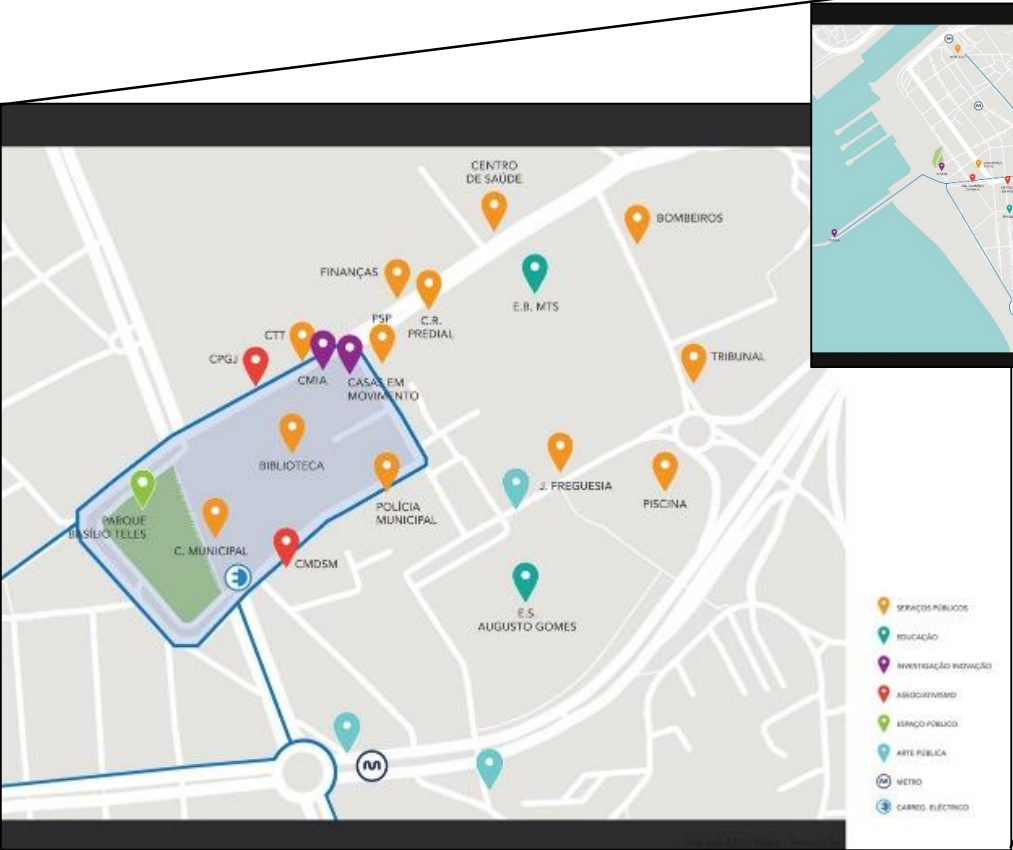
Porto: high-density urban area

Cascais: low-density urban residential area



FREE TECHNOLOGY ZONES

MATOSINHOS LIVING LAB



One of 12 living labs approved by Min Environment



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**Please visit CEiIA web channels
for more information**

