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PROMOTION OF E MOBILITY

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**Partnership for Promotion and Popularization of Electrical Mobility through
Transformation and Modernization of WB HEIs Study Programs/PELMOB**

Call: ERASMUS-EDU-2022-CBHE-STRAND-2

Project Number: 101082860



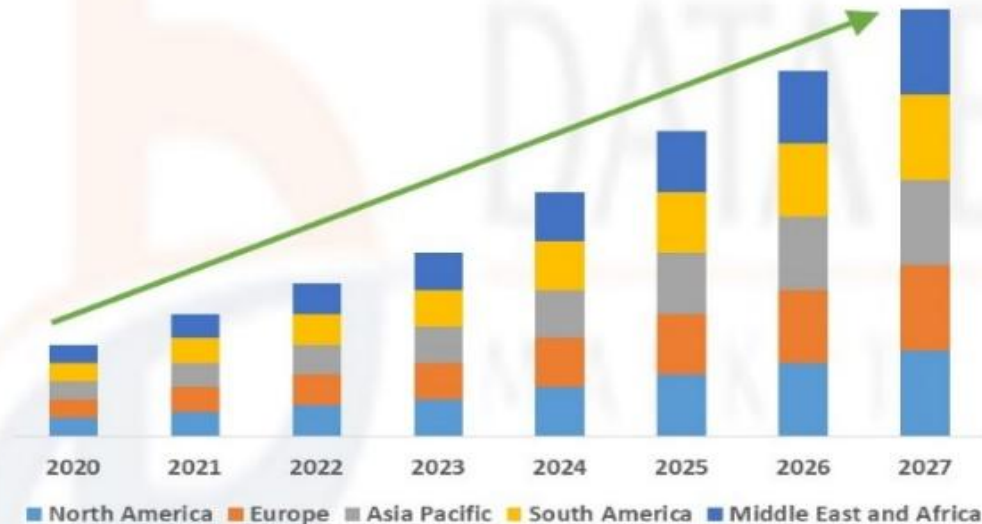
ELECTRIC SCOOTERS AND BICYCLES



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INCREASING TREND OF E-SCOOTER AND E-BICYCLE USE

Global E-Scooter/Moped and E-Motorcycle Market is Expected to Account for USD 458.86 Billion by 2028



Global E-Scooter/Moped and E-Motorcycle Market, By Regions, 2021 to 2028



DATA BRIDGE MARKET RESEARCH





PROMOTION OF EV AND SUSTAINABLE URBAN MOBILITY



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- ❑ **DEVELOPMENT OF ELECTRIC VEHICLES AND ACCOMPANYING INFRASTRUCTURE**
- ❑ **DEVELOPMENT AND INNOVATIONS IN THE FIELD OF EV**
- ❑ **PROMOTION OF ELECTRICALLY POWERED PUBLIC TRANSPORT**
- ❑ **INCENTIVES, SUBSIDIES, AND TAX RELIEFS FOR CAR MANUFACTURERS**
- ❑ **INCENTIVES FOR THE PURCHASE OF ELECTRIC VEHICLES**



INTELLIGENT
SPACE

PHYSICAL
OBJECTS
EQUIPPED
WITH ITS



DATA
EXCHANGE

TRAFFIC
MANAGEMENT
AND
SUSTAINABLE
MOBILITY

**A SMART CITY CAN BE DEFINED AS AN INTELLIGENT ENVIRONMENT
THAT UNITES INFORMATION-COMMUNICATION TECHNOLOGIES AND
CREATES AN INTERACTIVE SYSTEM!**

**INTEGRATED, HETEROGENEOUS AND INTELLIGENT FORM OF WIRELESS
COMMUNICATION**

- ❑ **SMART CITIES ARE FOCUSED ON REDUCING HARMFUL GAS EMISSIONS AND ENCOURAGE THE USE OF ELECTRIC VEHICLES.**
- ❑ **THE DEVELOPMENT OF APPLICATIONS FOR MONITORING THE AVAILABILITY OF CHARGING STATIONS, SMART TRAFFIC MANAGEMENT SYSTEMS, AND SUPPORT FOR THE SHARED USE OF ELECTRIC VEHICLES**
- ❑ **KEY ROLE OF INFORMATION-COMMUNICATION TECHNOLOGIES.**



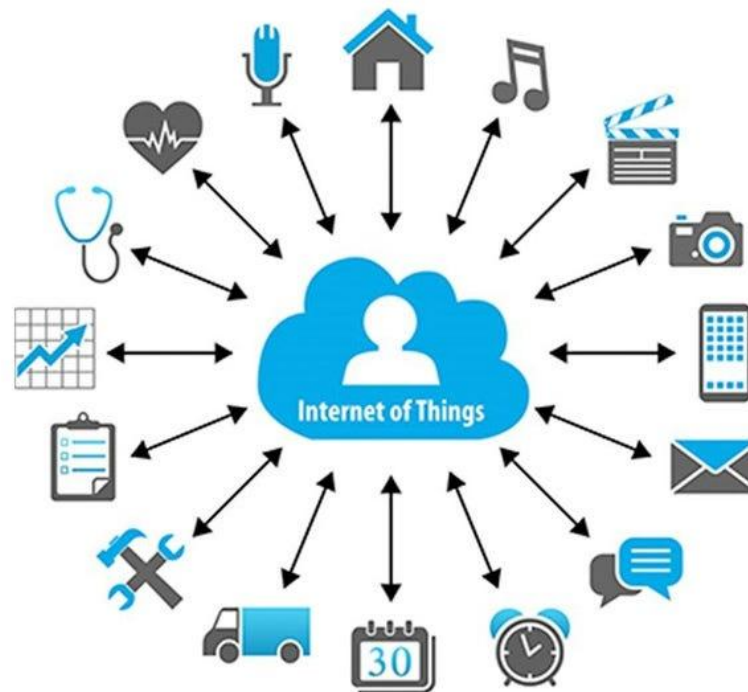
- ❑ **BARCELONA - AN EXAMPLE OF GOOD PRACTICE - SMART CITY**
- ❑ **SMART STREET LIGHTS THAT ADJUST THE LEVEL OF ILLUMINATION ON THE STREET BASED ON ACTIVITY;**
- ❑ **PARKING SENSORS THAT NOTIFY DRIVERS ABOUT AVAILABLE PARKING SPOTS THROUGH A MOBILE APPLICATION;**
- ❑ **WASTE SENSORS AND AUTOMATED WASTE COLLECTION.**



- ❑ INTERNET OF THINGS – IoT
- ❑ SENSORS USED FOR TRAFFIC MONITORING
- ❑ ADAPTIVE TRAFFIC LIGHTS
- ❑ ANALYTICS AND ADVANCED MANAGEMENT SYSTEMS
- ❑ DIGITAL CONNECTIVITY THROUGH APPLICATIONS AND PLATFORMS



"IOT = NETWORK OF PHYSICAL DEVICES THAT HAVE EMBEDDED SENSORS, SOFTWARE, AND NETWORK CONNECTION WHICH ENABLES THEM TO COLLECT AND SHARE DATA.



THE ROLE OF THE INTERNET OF SMART THINGS (IOT) FOR EM



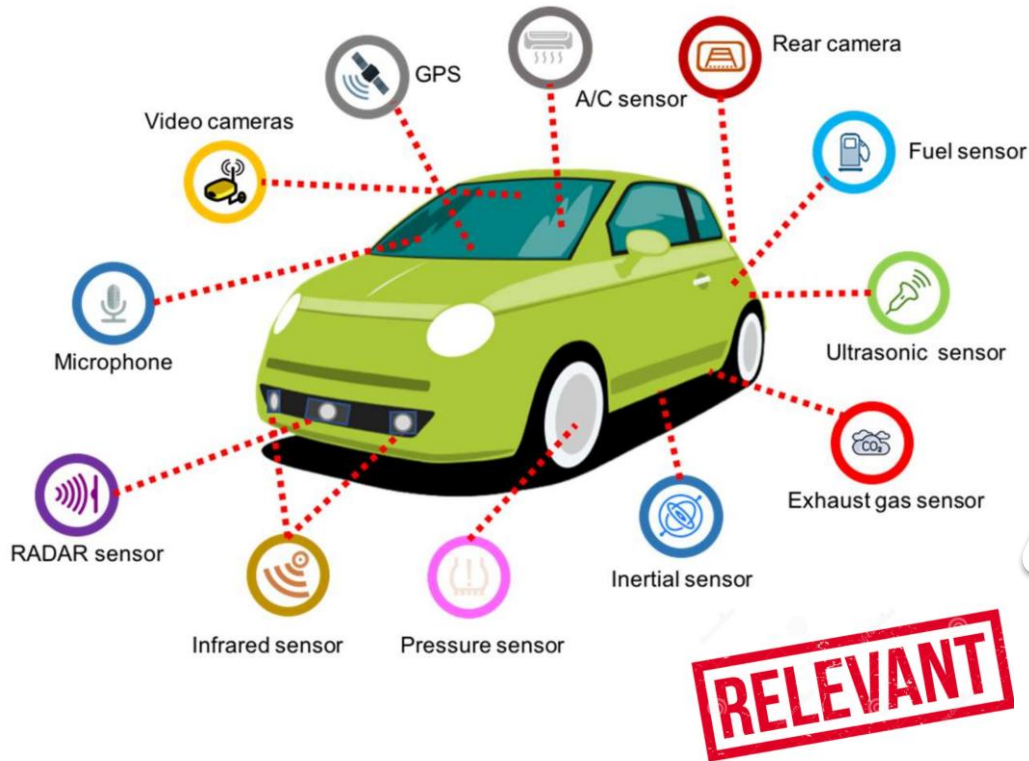
**SENSOR LAYER
(PHYSICAL LAYER)**

**LAYER OF NETWORK DEVICES
(NETWORK LAYER),)**

**DATA PROCESSING
LAYER (AI LAYER)**

**APPLICATION LAYER
(INTERFACE LAYER).**

THE ROLE OF THE INTERNET OF SMART THINGS (IOT) FOR EM



**INTERPRETATION OF
INFORMATION IN
REAL TIME**



**DATA COLLECTION
SUPPORT**



**SUPPORT IN THE
DECISION-MAKING
PROCESS FOR DRIVERS**



COLLECT LATE AND PRECISE REAL DATA:

- VIDEO ANALYTICS;
- ROADWAY SENSORS;
- TOLL COLLECTION DEVICES;
- MOBILE PHONES;
- CONNECTED VEHICLES.

INTERPRET DATA

WHAT IS THE BIGGEST TRAFFIC CHALLENGE IN SMART CITIES?

SENSORS

NETWORK SYSTEMS

CENTRAL PROCESSING UNIT

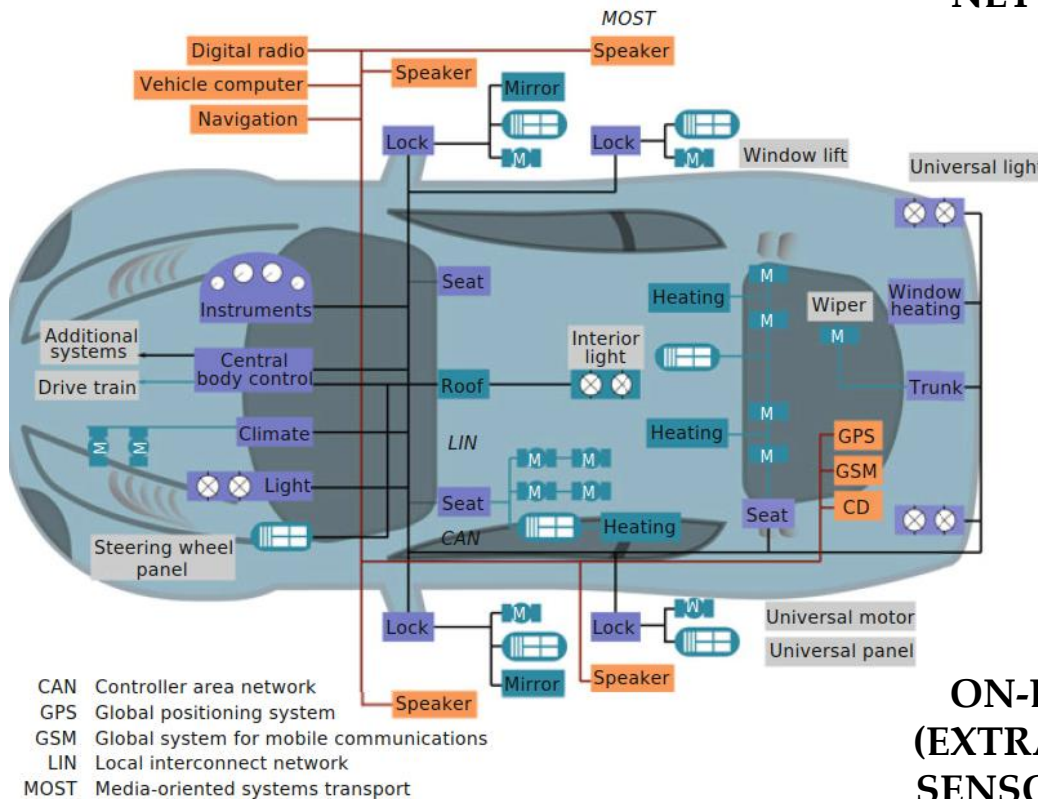
COMMUNICATION APPLICATION

WIRELESS COMMUNICATION

Global Positioning System (GPS)

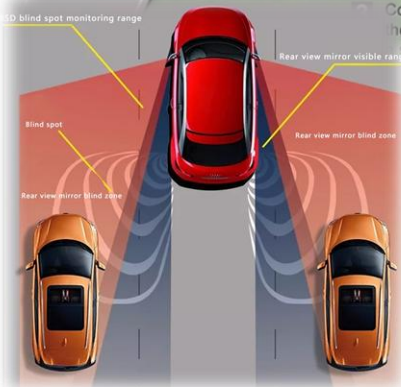
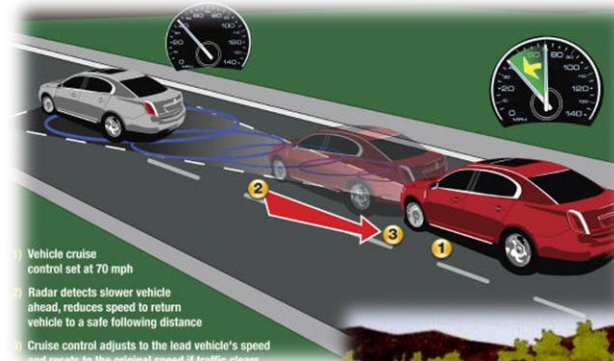
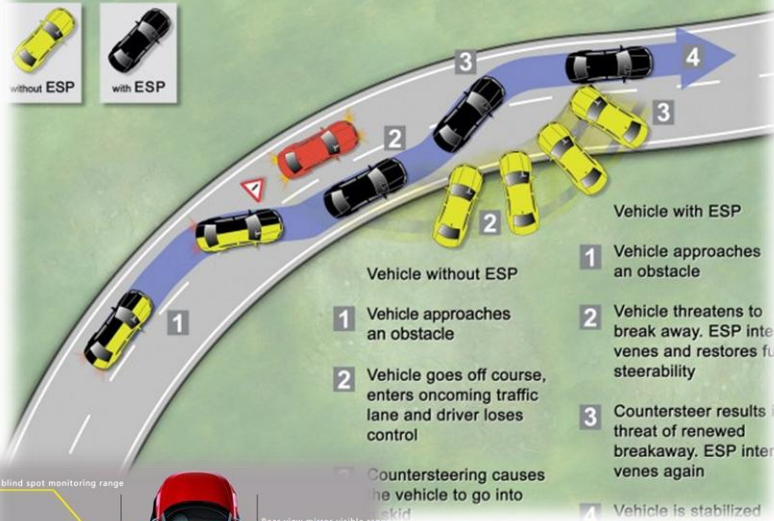
CONTROLLER AREA NETWORK (CAN)

**ON-BOARD DIAGNOSTICS (OBD)
(EXTRACTING INFORMATION FROM
SENSORS - IN VEHICLES FROM 1996.)**



ARCHITECTURE OF A MODERN VEHICLE

Critical manoeuvre with / without ESP



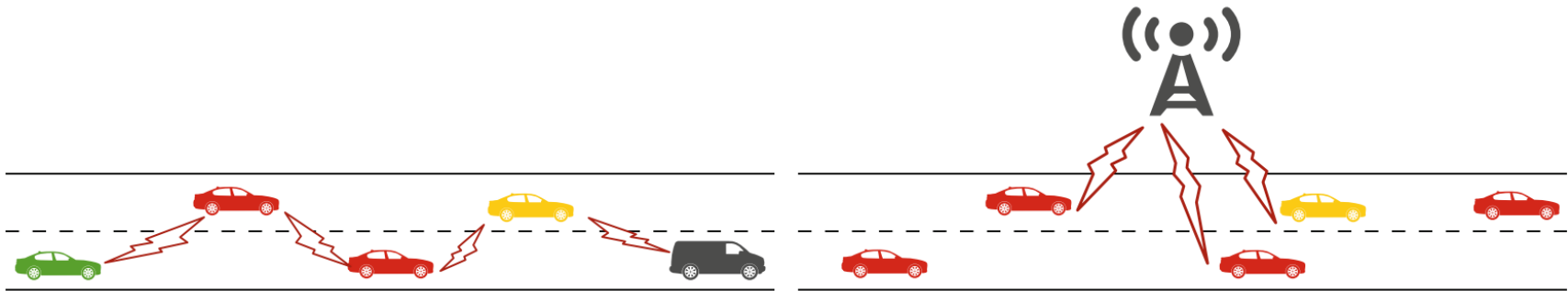
ACCEPT



SOCIETY OF AUTOMOTIVE ENGINEERS (SAE) AUTOMATION LEVELS

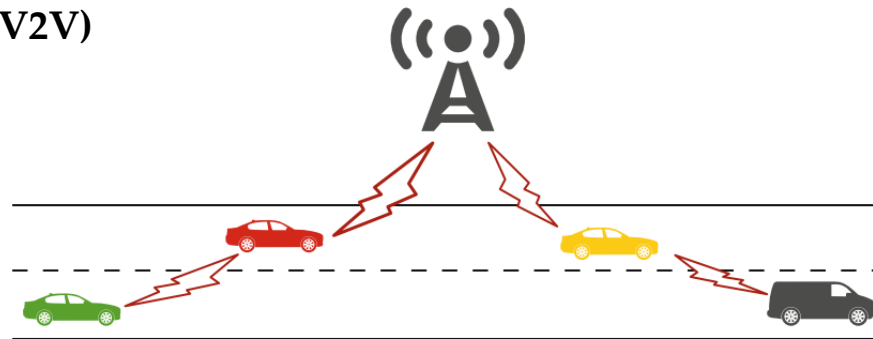
Full Automation

<p>0 No Autonomy</p>	<p>1 Driver Assistance</p>	<p>2 Partial Autonomy</p>	<p>3 Conditional Automation</p>	<p>4 High Automation</p>	<p>5 Full Automation</p>
<p>Zero autonomy; the driver performs all driving tasks.</p>	<p>Vehicle is controlled by the driver, but some driving assist features may be included in the vehicle design.</p>	<p>Vehicle has combined automated functions, like acceleration and steering but the driver must remain engaged with the driving task and monitor the environment at all times.</p>	<p>Driver is a necessity but is not required to monitor the environment. The driver must be ready to take control of the vehicle at all times with notice.</p>	<p>The vehicle is capable of performing all driving functions under certain conditions. The driver may have the option to control the vehicle.</p>	<p>The vehicle is capable of performing all driving functions under all conditions. The driver may have the option to control the vehicle.</p>



VEHICLE – VEHICLE
(V2V)

VEHICLE – INFRASTRUCTURE
(V2I)



HYBRIDE ARCHITECTURE

VANET ARCHITECTURE

SELF-ORGANIZATION

MOBILITY
(SPEED OF NODES
MOVEMENT - VEHICLES
- TRAJECTORIES)

TRANSMISSION SPEED
(CONNECTION
PROBLEM)

TOPOLOGY AND
ENERGY

RANGE

NETWORK
FRAGMENTATION

**VANET DIFFERS FROM THE TRADITIONAL
WIRELESS NETWORK!**

NETWORK FEATURES IN VEHICLES

EU → Legal Framework → National and Local Decision Makers



What systemic changes should decision-makers bring about?



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THANK YOU FOR ATTENTION