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BOOK OF PROCEEDINGS

INTERNATIONAL CONFERENCE

SUSTAINABLE MOBILITY

5-6 MARCH

2026

The INTEC International Conference brings together academics, researchers, policymakers and industry experts to discuss innovative approaches and collaborative solutions for a sustainable future in engineering and mobility. The conference will be hosted by POLIS University in Tirana, Albania, and co-organized by partners from across the EU as part of the Erasmus+ CBHE Project 101081873-ERASMUS-EDU-2022-CBHE-STRAND-2.

INTEC International Engineering Competence Centres to push sustainable mobility development in Albania and Montenegro
Project Reference: 101081873-ERASMUS-EDU-2022-CBHE-STRAND-2

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Project Partners:

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09

AUTOMOTIVE COOLING SYSTEMS SUSTAINABILITY: A FOCUS ON THE EXPANSION TANK

DOI: 10.37199/c41001009

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Abstract

This paper analyses the working of a modern automotive cooling system, describing its components and how they work together, as well as briefly presenting the several types used nowadays and their different applications. Specifically, it focuses on the role of the expansion tank, how it works and its importance to the whole circuit and respective sustainability. An automotive cooling system depends on the evaporation and condensation of coolant (a mixture of water and antifreeze liquid). These changes in physical state also represent variations in the internal pressure of the entire system, seen as it is a closed system. Therefore, a way to ensure the pressure is maintained at operational levels is essential. This is accomplished by the expansion tank. By keeping a reservoir of coolant and air, this tank allows the system to discharge or draw coolant back as necessary to maintain the desired internal pressure, this is possible because its free expansion and contraction that is allowed by the tank without causing damage to the entire system. This is achieved through a pressure-relief valve that connects the radiator to the tank. The expansion tank proves its importance during abrupt temperature variations caused by changes in engine load, such as warm up, cool down or rapid acceleration. To model this process, this paper uses mass balance equations and studies the thermal behavior inside the tank, such as thermal expansion and air compression. To obtain the data needed for these calculations, several sources were consulted Additionally, the role of the expansion tank in the sustainability of the cooling system is evaluated through component replacement costs. The subsequent results highlight the importance of the expansion tank in automotive cooling systems. These results also allow us to verify the importance of this component in the efficiency and sustainability of the cooling system, providing insight that can be used to develop more sustainable and efficient cooling systems in future vehicles.

Keywords*:* automotive cooling systems; expansion tank; pressure relief; sustainability; cost savings

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I. INTRODUCTION

This paper studies the role of the expansion tank in an automotive liquid cooling system. Modern internal combustion engines generate significant amounts of heat during operation, which must be effectively dissipated to ensure reliable performance and prevent mechanical damage. Automotive cooling systems are therefore essential components, designed to maintain engine temperature within a safe operating range under varying driving conditions and avoid damage done by the heat produced. (How an Engine Cooling System Works | How a Car Works, n.d.) Among the different cooling technologies available, namely air cooling, oil cooling and liquid cooling systems, the latter being the most widely adopted due to their efficiency and ability to provide stable thermal control. The difference between these technologies is the means used to absorb the heat from the engine. The air cooling is the simplest method, and it requires low maintenance, but is also the least effective. The oil cooling system uses the engine lubricating oil as the cooling medium and is mainly used in diesel engines. This system is more efficient, but it also represents a higher need for special maintenance. Liquid cooling is able to keep the engine temperature stable, even under heavy operational conditions, being highly efficient but also represents a higher need for maintenance such as coolant replacement and leak inspection. (CSULFinance - Solusi Segala Kebutuhan Financial Anda, n.d.)

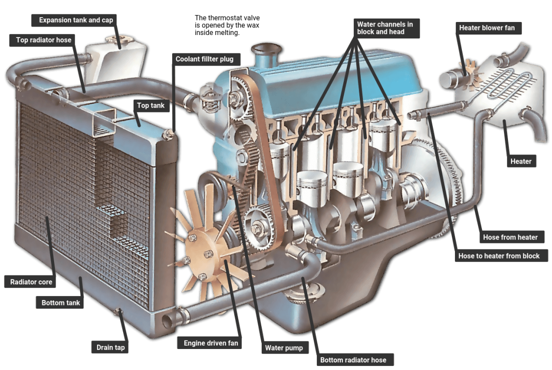

Figure 2. Components of an automotive cooling system.

In liquid cooling systems, engine cooling is achieved by circulating a coolant mixture, typically composed of water and antifreeze, through the engine block, where it absorbs the heat generated during operation. The heated coolant then flows to the radiator, where excess heat is released to the surrounding air. This description represents a simplified overview of the system operation, which in practice involves several components working together, as shown in Figure 1. The water pump ensures continuous coolant circulation through the engine and the radiator, while the cooling fan enhances heat dissipation. After cooling, the coolant returns to the pump and the cycle is repeated. As engine temperature increases, the coolant expands, leading to a rise in system

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pressure, which can pose a risk to the engine and associated components. To prevent excessive pressure buildup, an expansion tank is used. This component is connected to the radiator through a pressure relief valve that opens when a predefined pressure threshold is exceeded, allowing excess coolant to flow into the tank. When the pressure decreases, the coolant is drawn back into the system, ensuring stable operation (How an Engine Cooling System Works | How a Car Works, n.d.)

By regulating pressure and accommodating coolant volume changes, the expansion tank helps maintain the engine within its optimal operating conditions and protects critical components such as radiator hoses, the radiator and the water pump. This pressure control reduces the likelihood of failures, minimizes maintenance needs and extends component lifespan, contributing to the overall economic sustainability of the cooling system (The Importance of Expansion Tanks in Summer: Keep Your Industrial Vehicle in Optimal Conditions - Ryme Automotive | Leader in Spare Parts for Industrial Vehicles and LED Lighting, n.d.). In the absence of an expansion tank, increased pressure and thermal fluctuations could lead to hose rupture, coolant leakage, deformation of radiator joints and accelerated wear of water pump seals and bearings.

To successfully analyze the role of the expansion tank on the sustainability of the system, this paper is structured as follows. The methods section presents the system assumptions and equations as well as the data used. Subsequently, the results section uses the methodology previously presented, to calculate the coolant expansion, pressure variations cost of parts replacement. Finally, the main findings are analyzed and correlated to the importance of the expansion tank for the cooling system in the conclusions section.

II. METHODS

This chapter explains the methodology used to analyze the role of the expansion tank in the automotive cooling system. The methodology is based on a simplified theoretical model using representative input data and clearly stated assumptions. Although not intended for high-precision validation, this approach is suitable for a comparative analysis of pressure regulation and its implications for system durability and economic sustainability.

1. System description

The system analyzed is a closed automotive liquid cooling circuit. It consists, in its most basic form, of a pump, engine block, radiator, a cooling fan, expansion tank and rubber hoses that connect them all, through which coolant flows. By circulating through the engine block, driven by the pump,

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the coolant absorbs the excessive heat generated by the engine operating then, flowing through the radiator, with help from the fan, that heat is expelled to the surroundings.

The role of the expansion tank in this system is to compensate for the expansion and contraction of the coolant as its temperature varies, acting as a reservoir. The tank is partially filled with coolant as well as air and it is connected to the radiator through a pressure relief valve. When the pressure of the system exceeds a certain value, the valve opens and, when it goes below that value it closes.

2. Assumptions made

To study how an expansion tank works, several assumptions are required to simplify the analysis and maintain physical relevance. Those assumptions are as follows:

- The system is a closed system;
- The coolant is treated as incompressible fluid;
- Air inside expansion tank behaves as an ideal gas;
- Uniform temperature inside the tank;
- Thermophysical properties of the coolant are assumed to be constant.

3. Mathematical model

3.1 Data input

Before the equations used are presented, there are some values that need to be established. This study considers a mid-size passenger vehicle cooling system. Therefore, service manuals of similar cars, such as Golf 2 and Toyota Corolla, were consulted, as well as parts manufacturers and other literatures to obtain or assume the values used. From these literatures we can conclude that the coolant used is a 50/50 mixture of ethylene glycol and distilled water, as well as assume the operating temperature and initial volumes of air and coolant inside the tank. Thermodynamics tables were also consulted as to obtain properties value of the coolant as constant average values over the operating temperature range. All the values obtained or assumed are presented in the Table 1 below with respective sources.

Table 2. Input data and corresponding sources.

Name	Symbol	Value	Source
Cooling system capacity	V_{system}	6,3 L	(Coomber & Rogers, 1997)
Pressure relief valve	P_{max}	1,03 x10^5 Pa	(Randall, 2006)

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Initial pressure inside the tank	P_1	1,013 x 10^5 Pa	(Lewis, 2023)
Total volume of the tank	V_{tank}	1,5 L	Assumed
Initial volume of coolant inside the tank,	$V_{liq,1}$	0,75 L	Assumed
Initial volume of air inside the tank	$V_{air,1}$	0,75 L	Assumed
Initial Temperature	T_1	25 ºC / 298,15 K	Assumed
Operating Temperature	T_2	93 ºC / 366,15 K	(Randall, 2006)
Volumetric thermal expansion coefficient	β	4,0 x 10^{-4} K^{-1}	(*Temperature and Heat*, n.d.)

Costs of replacement of the radiator hoses, the radiator itself and the water pump were obtained by consulting different sources and are presented in the Table 2 below, the prices obtained are in USD ($).

Table 3. Cost of replacement and life span of the different components.

Part	Life span	Cost of replacement	Source
Radiator hoses	5-7 years	$500-$600	(*Exploring Radiator Hoses Replacement Cost: Material Properties, Standards, and Industrial Uses*, n.d.)
Radiator	8-15 years	$300-$900	(*What Is a Radiator on a Car: Function and Importance*, n.d.)
Water pump	60 000-100 000 km	$800-$1500	(*What Is a Water Pump in a Car and How It Works*, n.d.)

3.2 Equations needed

The temperature increase that happens when the engine is reaching its operating temperature results in a volumetric expansion of the coolant. That expansion is possible to calculate using the equation (1), where the temperature difference is calculated by the equation (2). (Volumetric (Cubic) Thermal Expansion, n.d.)

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$$\Delta V = V_{system} \cdot \beta \cdot \Delta T \quad (1)$$

$$\Delta T = T_2 - T_1 \quad (2)$$

The volumetric expansion means that a corresponding volume of coolant is going to be transferred to the tank. So, it is possible also to calculate the new volume of coolant in the tank, equation (3), as well as the new volume of air, equation (4), as this added coolant compresses the existing air.

$$V_{liq,2} = V_{liq,1} + \Delta V \quad (3)$$

$$V_{air,2} = V_{tank} - V_{liq,2} \quad (4)$$

As we assumed the temperature inside the tank to be constant and the air in it to behave as an ideal gas, we can use the ideal gas law to calculate the new pressure inside the tank, equation (5). (Luder, 1968)

$$P_1 \cdot V_{air,1} = P_2 \cdot V_{air,2} \Leftrightarrow P_2 = P_1 \cdot \frac{V_{air,1}}{V_{air,2}} \quad (5)$$

Finally, we can compare this new pressure to the one needed to open the valve, equation (6), and, that way assess if everything is working according to the expected.

$$P_{max} \leq P_2 \quad (6)$$

III. RESULTS

This chapter presents the results obtained using the methodology described previously. Those results are, in order, the coolant thermal expansion, the new volumes of coolant and air inside the tank and subsequently increased pressure, as well as an analysis of cost saving provided by the tank.

1. Working of an expansion tank

To obtain the desired values, the input data found in Table 1 is applied to the equations (1) -(6) and the subsequent results are presented in the Table 3 below.

Table 4. Calculated results using the methodology presented.

Name	Symbol	Value	Unit
Temperature variation	ΔT	68	K
Coolant volume expansion	ΔV	0,171	L

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New volume of coolant inside the tank	$V_{liq,2}$	0,921	L
New volume of air inside the tank	$V_{air,2}$	0,579	L
New pressure inside the tank	P_2	1,312 x 10^5	Pa

2. Costs saved by the existence of the expansion tank

Considering the lower end of each lifespan range and an average yearly mileage of 10 800 km, it can be observed that, in the first 10 years of life of a car, it would likely be necessary to replace the radiator hoses, as well as the water pump and, if poorly maintained, the radiator itself. That entails a cost of $1600 in total. (Change in Distance Travelled by Car | ODYSSEE-MURE, n.d.)

If the expansion tank did not exist, it is possible to estimate a decrease in the life span of each of these components. For the hoses, because of thermal aging, that causes cracking and loss of elasticity, it is possible to estimate a new life span of 4-5 years. For the radiator, because of the higher strain in the welded junctions, a new life span would be established at 8-10 years. Finally, in the water pump, the risk of cavitation and rupture of seals would put the new life span at 55 000- 70 000 km. This way, in the first 10 years of a car's life, the hoses would need to be replaced 2 times, as well as the water pump, while the radiator would still be just one time. Therefore, the new cost of replacement in 10 years would be $2900, an increase of $1300 or 181,25%.

IV. DISCUSSION AND CONCLUSION

The results obtained in this study show that the thermal expansion of the coolant, caused by the engine reaching its operating temperature, leads to an increase in system pressure that slightly exceeds the pressure relief valve threshold. This is the behavior that is expected and desired, confirming the correct dimensioning of the tank. When the calculated pressure is reached, the valve opens and allows excess coolant to flow into the expansion tank, preventing further pressure increase and keeping the system within safe operating limits. This pressure variations regulation reduces mechanical and thermal stress on key components of the cooling system, such as radiator hoses, the radiator and the water pump. This represents an improved durability of the system. The cost analysis supports this conclusion, showing that the presence of an expansion tank significantly reduces component replacement frequency, resulting in lower maintenance costs and reduced material consumption over the vehicle's lifetime.

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This paper presents some limitations, as it is based on simplified assumptions, including uniform temperature inside the expansion tank, constant coolant properties and quasi-static operating conditions. Additionally, it does not account for transient behavior, extreme ambient temperatures or long-term aging effects of materials. Future work should focus on dynamic and transient modeling of the cooling system, considering variable operating conditions and real driving cycles. For that, different vehicle classes and cooling system designs should be considered. This could lead to new automotive cooling systems, more efficient and sustainable.

In conclusion, this study confirms that the expansion tank is a fundamental component in automotive cooling systems, playing a key role in pressure control, component protection and overall system and economic sustainability.

REFERENCES

Change in distance travelled by car | ODYSSEE-MURE. (n.d.). Retrieved January 8, 2026, from https://www.odyssee-mure.eu/publications/efficiency-by-sector/transport/distance-travelled-by-car.html

Coomber, I. M. ., & Rogers, Christopher. (1997). *VW Golf & Jetta service and repair manual.* Haynes.

CSULFinance - Solusi Segala Kebutuhan Financial Anda. (n.d.). Retrieved December 31, 2025, from https://www.csulfinance.com/en/get-to-know-more-types-of-cooling-systems-in-motor-vehicles-you-need-to-know

Exploring Radiator Hoses Replacement Cost: Material Properties, Standards, and Industrial Uses. (n.d.). Retrieved January 10, 2026, from https://www.alibaba.com/product-insights/radiator-hoses-replacement-cost.html?utm_source=chatgpt.com

How an engine cooling system works | How a Car Works. (n.d.). Retrieved December 31, 2025, from https://www.howacarworks.com/basics/how-an-engine-cooling-system-works

Lewis, M. (2023). Physical concepts. *Food Process Engineering Principles and Data,* 37–46. https://doi.org/10.1016/B978-0-12-821182-3.00030-3

Luder, W. F. (1968). Ideal gas definition [2]. *Journal of Chemical Education, 45*(5), 351. https://doi.org/10.1021/ED045P351.1

Randall, Martynn. (2006). *Toyota Corolla : owners workshop manual.* Haynes Publishing.

The Importance of Expansion Tanks in Summer: Keep Your Industrial Vehicle in Optimal Conditions - Ryme Automotive | Leader in Spare Parts for Industrial Vehicles and LED Lighting. (n.d.).

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Retrieved January 8, 2026, from https://www.rymeautomotive.com/en/The-importance-of-expansion-tanks-in-the-summer%3A-keep-your-industrial-vehicle-in-optimal-conditions/

Volumetric (Cubic) Thermal Expansion. (n.d.). Retrieved January 7, 2026, from https://www.engineeringtoolbox.com/volumetric-temperature-expansion-d_315.html

What Is a Radiator on a Car: Function and Importance. (n.d.). Retrieved January 10, 2026, from https://carinterior.alibaba.com/question/what-is-a-radiator-on-a-car

What Is a Water Pump in a Car and How It Works. (n.d.). Retrieved January 10, 2026, from https://carinterior.alibaba.com/question/what-is-water-pump-car

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International conference on sustainable mobility

Agenda

Project title: International Engineering Competence Centres to push Sustainable Mobility Development in Albania and Montenegro
Acronym: INTEC

Work package	
WP11	**International conference**
TASK	
11.4	Coummunity Building Events

Dates	05.03.-06.03.2026
City	Tirana
Meeting venue	POLIS University Entrance Hall
Address	Rr. Bylis 12, Kodi Postar 1051, Kutia Postare 2995, Tirana, Albania

05.03.2026	
Entrance Hall, POLIS University	
8:30 – 9:00	**Registration**
9:00 – 9:30	**Opening Performance**
Welcome session – Auditorium A5 (Ground floor)	
9:30 – 10:00	**Opening Remarks** **Dr. Elona Karafili** (Vice Rector, POLIS University) **Dr. Flora Krasniqi** (Head of Office of Projects and Internationalization, POLIS University) **DI Daniela Wenzl** (INTEC Project Coordinator)
Auditorium A5 (Ground floor)	
10:00 –11:00	**Keynote speakers** **DI Horst Pflügl AVL** Collaborative Research for sustainable Mobility **DPSHTRR Representative** – (General Directorate of Road Transport Services in Albania)
11:15 – 11:30	**Coffee break (Moving into parallel sessions)**

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11:30	SESSION 1: POLITICAL AND REGULATORY FRAMEWORK AULA B1	SESSION 2: TECHNOLOGICAL INNOVATION AULA B4
11:30 – 11:45	**Opening Session:** Prof. Emeritus dr Nataša Gospić (FSKL)	**Opening Session:** Associate Prof. Ivan Tolj (US)
11:45 – 12:00	**Integrating Event Data Recorder (EDR) Technology into Sustainable Road Safety Frameworks within the European Green Deal** Eriselda Alimeti, Parid Milo, Mentor Çejku, Anis Sulejmani, Odhisea Koça	**Empirical Comparative Study of Structural CFRP Sandwich Structure Inserts for Out-of-Plane loads** Imre Kovács
12:00 – 12:15	**Infrastructure Readiness for Sustainable Mobility: EU Frameworks and the Case of Albania** Ervin Kalemaj, Parid Milo, Mentor Çejku, Anis Sulejmani, Odhisea Koça	**The Role of Intermodal Transportation for the Sustainable Mobility** Márton Kovács
12:15 – 12:30	**Review of the Evolution of International Ship Energy Efficiency Regulations and the Albanian context** Dr. Blenard Xhaferaj, Doklejda Hodaj	**Impact of Heat Pump Systems on Winter Energy Use and Driving Range in Battery Electric Vehicles** Luis Henrique Pereira Martins
12:30 – 12:45	**Renewable Energy Procurement (CPPA) and Transport Electrification: European Perspectives and Albanian Challenge** Antonio Ndoci, Anis Sulejmani, Odhisea Koça, Mentor Çejku, Parid Milo	**Liquid Cooling Systems for Electric Vehicle Batteries: Improving Safety, Performance and Sustainability** João Miguel de Almeida Ribeiro Silva
12:45 – 13:00	**The Current Status of Autonomous Vehicle**	**Analysis of Battery Charging and Discharging Behavior for Electric Vehicle Applications** Leona Markic, Luka Filipović

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	Technology Adoption in the Balkan Region Darjana Lopičić, Oliver Popović, Miloš Ilić, Bojan Kocić	
13:00 – 14:00	**Lunch**	
14:00 – 14:15	**Reviewing the European Green Deal in Energy, Mobility and Industry** Veselinka Calasan, Ivana Ognjanovic	**Automotive Cooling Systems Sustainability: A Focus on the Expansion Tank** Ana Inês Barbeiro Casimiro
14:15 – 14:30	**The European Green Deal and its National Implementation: From Strategy to Practice** Blerina Bektashi, Andi Bektashi	**Design and Development of a Constant-Volume Combustion Chamber for Optical Investigation of Hydrogen and Water Injection Under Engine-like Conditions** Julius Hollerith, Prof. Dr. Bhavin Kapadia
14:30 – 14:45	**From Prediction to Regulation: Evidence Production Approaches in Autonomous Mobility Research and Their Policy Implications** Sadmira Malaj	**Emission Reduction of Marine Propulsion Systems in SECA Zones Through the Integration of Hydrogen Technologies** Motalleb Miri, Ivan Radaš, Marija Mandić, Ivan Tolj
14:45 – 15:00	**Questions and Discussion**	**A Comprehensive Analysis of Ventilation System for Enhanced Energy Efficiency in Marine Propulsion Applications** Sara Blašković, Gojmir Radica, Jakov Šimunović

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15:00 - 15:15		**Design and Topology Optimization of a Lightweight Chain Sprocket for Electric Motorcycle Applications** Teo Čolović, Ivo Marinić-Kragić
15:15 - 15:30	**SESSION 3: ECONOMIC AND BUSINESS PRESPECTIVES + CASE STUDIES AND GOOD PRACTICES** Aula B1	**Questions and Discussion**
	Opening Session: Dr. Anis Sulejmani (PUT)	
15:30 - 15:45	**Managing Renewable Energy Resources as a Foundation for Sustainable Mobility Transitions** Deivi Sinanaliaj, Martin Bektashi	
15:45 - 16:00	**Feasibility of Electric Bus deployment in Montenegro: A Case Study of Budva (Erasmus+ INTEC / IECC Context)** Anastasija Mrkajic, Vinko Nikic.	
16:00 -16:15	**Children Paths as an Urban Regeneration Strategy: Naim Frasheri Study Case** Dejvi Dauti	
16:15 - 16:45	**Questions and Discussion**	

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International conference on sustainable mobility

Agenda

Project title: International Engineering Competence Centres to push Sustainable Mobility Development in Albania and Montenegro
Acronym: INTEC

Work package	
WP11	International conference
TASK	
11.4	Coummunity Building Events

Dates	05.03.-06.03.2026
City	Tirana
Meeting venue	POLIS University Entrance Hall
Address	Rr. Bylis 12, Kodi Postar 1051, Kutia Postare 2995, Tirana, Albania

06.03.2026		
First Floor Hall, POLIS University		
8:30 – 9:00	Registration	
9:00– 9:15	SESSION 4: SOCIAL AND ENVIRONMENTAL IMPACT AULA B1	SESSION 5: FUTURE SCENARIOS AULA B4
9:00 – 9:15	Opening Session: Prof. Dr. Bhavin Kapadia (FHF)	Opening Session: MA Adrian Millward-Sadler (FHJ)
9:15 – 9:30	**Comparison of Lifecycle Emissions of a SUV with Fuel Cell and Battery Electric Powertrains** - Bhavin Kapadia, Alper Sayin, Sandra Eisenträger	**GENAI Literacy as a Transversal Skill for Emerging Professionals: Implications for Sustainability-Critical Knowledge Work –** Adrian Millward-Sadler
9:30 – 9:45	**Smart Mobility Technologies and their Impact on Urban Sustainability: Insights from**	**Effects of Technical Traffic Calming Measures –** Filip Perović

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	European and Western Balkan Cities – Alma Gjonaj, Vjola Ziu	
9:45 – 10:00	**The Disappearing Squares: Social and Environmental Impacts of Urban Mobility Planning in Durres –** Arjola Sava	**Cybersecurity Vulnerabilities in Electric Vehicle Operating Systems: A Global Awareness Analysis -** Aleksa Radević
10:00 – 10:15	**The City that Demands Continuous Movement: The Disappearance of the Right not to Move within the Framework of Sustainable Mobility –** Avrili Meshi	**Development of a risk assessment model for the transport of hazardous materials using ALOHA and GIS software tools –** Marko Radetić
10:15 – 10:30	**Between Rhetoric and Reality: Discursive Framings, Greenwashing and Outcomes in Sustainable Mobility –** Kejsi Veselagu	**Mapping Distance and Time Leveraging Isochrone Intelligence in Emerging Cities -** Andia Vllamasi, Erjon Cobani
10:30 – 10:45	**Reimagining the City Through Green Mobility Strategies: The Case of Tirana -** Vjola Ziu, Alma Gjonaj	**Can AI develop its Own "Taste" Automotive Design? -** Gregor Andoni, Kristjana Meço
	Coffee Break	
11:00 – 11:15	**Linking Morphology, Perceived Safety, and Sustainable Mobility in Post-Socialist Urban Contexts-** Sindi Doce	**Optimizing Public Transport Corridors Using AI-Based Scenario Modelling: A case Study on Tirana's Ring Road -** Erjon Çobani, Julian Beqiri, Merita Guri
11:15 – 11:30	**Towards Sustainable Transport: A Comparative Analysis of Electric Vehicle Adoption in Montenegro and Albania -** Radmila Milić	**Threat Landscape and Multi-Layered Protection Mechanisms for Autonomous and Electric Vehicle Systems -** Marko Asanovic, Oliver Popović, Zoran Avramović, Nataša Gospić

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11:30 – 11:45	Questions and Discussion	**Cybersecurity Challenges in Modern Vehicular Communication Networks** - Aleksandar Grgurević, Nataša Gospić, Oliver Popović
11:45 – 12:00		**Green Transition in Albania: Challenges and Future Actions** - Erik Kushta, Andi Hyka, Enea Nasto
12:00 – 12:15	SESSION 6: CONTROVERSIES AND CHALLENGES Aula B1 **Opening Session:** Prof. Kristofor Lapa (UV)	**Use of AI in the Process of Green Transformation and Impact on Public Health** - Esmeralda Hamiti, Federika Alliaj, Kristi Metushi
12:15-12:30	**The Adoption of Electric Vehicles in Albania: A Comparative Study with Other Western Balkan Countries** - Doklejda Hodaj, Andrea Lapa	**Development of an Automatic Traffic Sign Detection System Using YOLOv8** - Valentina Vojinović, Luka Filipović
12:30-12:45	**Application of Quality Tools in the Analysis of Factors Influencing the Development of Electromobility in Montenegro** - Jelena Šaković Jovanović, Draško Jovanović, Mirjana Grdinić Rakonjac, Marko Lučić, Miloš Perović, Aleksandar Vujović, Gordana Radulović	**The Historical Development of Artificial Intelligence and Its Influence on the job market in Automotive Engineering** - David Josef Pilgram
12:45 – 13:45	Questions and Discussion	Questions and Discussion
13:45	**Lunch**	

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