**INTRODUCTION**

As the ecological transition agency, ADEME’s mission is to accelerate the transition to a more sober and supportive, job-generating, humane and harmonious society. To this end, they support innovation, from research to the application and sharing of solutions. Such that they generalise good practices and advance knowledge.

Thanks to a global vision, ADEME develop strategic orientations in their areas of competence, monitor their implementation and evaluate their effectiveness. In metropolitan France and overseas, their employees raise awareness and support citizens, local authorities and economic stakeholders with a view to changing lifestyles, which is now essential. [1]

For more than 25 years now, it has been reported that neglecting variations in travel times in cities due, for example, to congestion during peak hours in the early morning and late afternoon, can lead to inefficient or even sometimes infeasible delivery routes. [3]

Vehicle routing has been a core logistic problem since it was introduced by Dantzig and Ramser. Over the last 60 years, numerous papers have dealt with a large number of variants of this basic problem. While early vehicle routing papers considered problems in which all inputs are static, it is now commonly accepted that, especially in urban areas, travel times do vary during a typical planning horizon, e.g., a day. This has led to a significant body of literature on time-dependent routing problems. Recently, some authors have pointed out the fact that to reflect reality, time-dependent problems should not be defined with respect to the graph of customers, but rather with respect to the underlying road network. [4]

Routing problems have been largely studied due to its interest in different applications in logistics and supply chain management. Not surprisingly, transportation is an important component of supply chain competitiveness since it plays a major role in the inbound, inter-facility, and outbound logistics. Transportation costs represent approximately 40 to 50 percent of total logistics costs and 4 to 10 percent of the product selling price for many companies. As such, transportation decisions directly affect the total logistic costs. The passage of the transportation deregulation acts in the 1980’s in the U SA and in the 1990’s in the EU drastically changed the business climate, within which the transportation managers operate. Within the EU, the competition is becoming intense between transporters since they often operate at transnational levels and must provide higher levels of service with lower costs to meet the various needs of customers. In this context, assigning, scheduling and routing the fleet of a transportation company is a crucial management issue. [5]

Certainly! Here’s a more structured and logically flowing version of your introduction. I’ve reorganized the content to ensure a smooth progression from the background to the problem at hand, while also incorporating the Sustainable Development Goals (SDG).

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## \*\*Introduction\*\*

### \*\*1. Background: The Role of ADEME\*\*

The \*\*Agence de la Transition Écologique (ADEME)\*\* plays a pivotal role in accelerating the transition towards a more sustainable and inclusive society. Its mission is to support innovations aimed at promoting energy efficiency, reducing environmental impact, and fostering sustainable development across multiple sectors. ADEME's approach spans from research to implementation, focusing on sharing solutions that encourage the widespread adoption of best practices.

With a strategic vision, ADEME oversees the implementation of its initiatives, evaluates their effectiveness, and provides support to citizens, local authorities, and businesses to facilitate crucial changes in daily life, particularly with regard to reducing environmental impact in urban and rural contexts.

### \*\*2. Problem Overview: Inefficient Routing in Urban Logistics\*\*

One of the long-standing challenges in logistics is optimizing delivery routes, especially in urban areas where varying traffic conditions lead to fluctuating travel times. For over 25 years, research has shown that failing to account for variations—such as congestion during peak hours—can lead to inefficient or, in some cases, infeasible delivery routes.

This issue is particularly relevant in the context of growing urbanization and the increasing demand for last-mile delivery services. Cities experience traffic congestion at different times of the day, which must be considered when planning delivery routes for maximum efficiency.

### \*\*3. The Evolution of Vehicle Routing Problems\*\*

The \*\*Vehicle Routing Problem (VRP)\*\*, introduced by \*\*Dantzig and Ramser\*\*, has been a cornerstone of logistics research for decades. Traditionally, VRP studies assumed static conditions for travel times, but in recent years, it has become widely accepted that travel times, especially in urban environments, are highly dynamic. This realization has given rise to \*\*time-dependent routing problems\*\*.

Recent studies suggest that to better reflect real-world conditions, time-dependent routing should not only focus on the graph of customer locations but also consider the underlying road network. This shift allows for more accurate modeling of traffic flows, which fluctuate based on time-of-day and other factors.

### \*\*4. Importance of Routing in Logistics and Supply Chains\*\*

Routing and transportation are integral components of supply chain management, directly influencing a company’s operational efficiency. Transportation costs typically represent 40% to 50% of total logistics costs and can account for 4% to 10% of the product’s selling price. As such, optimizing delivery routes is critical for reducing these costs.

The deregulation of the transportation industry in the \*\*1980s (USA)\*\* and \*\*1990s (EU)\*\* further intensified competition among transportation companies, compelling them to offer higher service levels at lower costs. In this context, effective route assignment, scheduling, and fleet management have become crucial for maintaining competitiveness.

### \*\*5. Relevance to Sustainable Development Goals (SDG)\*\*

This problem is highly aligned with the \*\*United Nations Sustainable Development Goals (SDG)\*\*, particularly:

- \*\*SDG 9: Industry, Innovation, and Infrastructure\*\*, which calls for the development of sustainable infrastructure to foster innovation and efficient industry practices.

- \*\*SDG 11: Sustainable Cities and Communities\*\*, which encourages reducing the environmental impact of cities by optimizing transportation networks and lowering emissions.

- \*\*SDG 13: Climate Action\*\*, which emphasizes the importance of reducing greenhouse gas emissions. Efficient vehicle routing directly contributes to this goal by minimizing unnecessary fuel consumption and optimizing delivery routes.

By addressing time-dependent routing issues and improving logistics efficiency, this project contributes to the broader goal of creating sustainable, resilient, and efficient transportation networks that are aligned with global sustainability efforts.

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### \*\*Conclusion\*\*

Urban logistics is facing significant challenges due to varying travel times, congestion, and the need for sustainable delivery systems. The involvement of agencies like ADEME and the alignment of this problem with the SDGs highlight the importance of finding innovative solutions for vehicle routing. Optimizing delivery routes under real-world traffic conditions is not only essential for improving business efficiency but also for promoting a more sustainable and resilient future.

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### Key Changes:

- \*\*Reorganization:\*\* Grouped the content into sections that flow logically from the background of ADEME, to the problem, to vehicle routing's evolution, and finally to its relevance to SDGs.

- \*\*SDG Integration:\*\* Included a dedicated section to explain how the project aligns with SDGs, making its importance to sustainability clear.

- \*\*Flow and Readability:\*\* Broke up the content into shorter, manageable sections that maintain a smooth narrative.

Would this structure work for your deliverable?