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## Non-technological innovations for sustainable transport

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## ABSTRACT

Because they are subject to economic but also to environmental and social pressures, transport companies are forced to innovate. These innovations are commonly focused on technologies to improve fuel economy and ultimately transform the energy basis of transport. Our purpose is to focus on non-technological innovations for sustainable transport, i.e., a more environmentally and socially friendly transport, in order to provide a taxonomy of trajectories of them, which contribute cost-effectively to this transport. To achieve this objective, first, we base this on a conception of transport not only as a manufacturing industry, but also as a service industry. And, second, we use the data from the European project on transport: CANTIQUÉ. At the end of our study, we conclude that there is not a single trajectory of non-technological innovation for sustainable transport, but a variety and that each of them has a particular logic.

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## 1. Introduction

Managing greenhouse gas (GHG) emissions from transport is a priority. According to the European Commission [1], an increase of 74% is projected for GHG emissions from the EU transport between 1990 and 2050. If we examine the global emissions of CO<sub>2</sub> by transport mode, we could note that the emissions from light-duty vehicles dominate and are projected to continue to dominate, but that growth rates in road freight transport and in aviation are equally large. To curb the expected growth in these emissions, transport policies promote innovation but, generally, only technological innovation. For example, the last International Transport Forum [2], which brings together Ministers, leading decision-makers and thinkers, emphasises

technological improvements as the core of the climate change policy in the transport sector. The technological innovations that improve fuel economy and transform the energy basis of transport are essential for GHG abatement. But these innovations must not obscure the role of non-technological innovations in reducing emissions. For example, innovations in traffic management or “green logistics” [3] are non-technological innovations that could reduce emissions related to road transport. Compared to technological innovations, non-technological innovations are less visible. Perhaps this is why politicians prefer technological innovations rather than non-technological innovations. But the latter also contribute towards the abatement of environmental problems caused by transport. Moreover, non-technological innovations are generally less expensive than the others. Thus, for example, RAND Europe [4] shows that non-technical innovations may contribute cost-effectively to reducing transport emissions. In consequence, non-technological innovations in transport must be taken seriously.

This article will focus on non-technological innovations for sustainable transport. It is not easy to define non-technological

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innovation. The second edition of the *Oslo Manual* thus offers a definition of non-technological innovation by stating the negative: “non-technological innovation covers all innovation activities which are excluded from technological innovation” [5]. Technological innovation itself is defined as “the introduction of a technologically new or substantially changed good or service or the use of a technologically new or substantially changed process” [5]. This being the case, the *Oslo Manual* reduces non-technological innovations to two categories: organisational innovations and managerial innovations. These innovations consist of:

“the implementation of advanced management techniques, e.g., TQM, TQS; the introduction of significantly changed organisational structures; and the implementation of new or substantially changed corporate strategic orientations” [5].

The third edition of the *Oslo Manual* tries to differentiate these two kinds of innovation. Thus it suggests defining a marketing innovation as “the implementation of a new marketing method involving significant changes in product design or packaging, product placement, product promotion or pricing” and an organisational innovation as “the implementation of a new organisational method in the firm’s business practices, workplace organisation or external relations” [6]. Even if they are no longer described as such, these two kinds of innovation always refer to non-technological innovations, whereas the other two kinds of innovation, “product innovations and process innovations, are closely related to the concept of technological product innovation and technological process innovation” [6].

Yet classifying all the non-technological innovations into only two categories can prove to be difficult. For example, an innovation in how a company’s after-sales service functions has as much to do with commercial innovation as with organisational innovation. Consequently we will not follow the non-technological typology proposed by the *Oslo Manual*, which we believe is not precise enough, but by one of the typologies offered by studies which deal with innovation in services. These studies naturally address the question of non-technological innovation to the extent that the services sector is a sector of low technological intensity. One could make a particular reference to the functional analysis of innovation, which has two advantages. Firstly, it offers a precise breakdown of non-technological innovations. Secondly, the functional analysis allows a dynamic vision of innovation by combining different functional innovations in a “trajectory”. However, we should add that the existence of an irreducible minimum of technology in the services sector will prevent us from identifying the trajectories of “pure” non-technological innovations. So the expression “trajectories of non-technological innovations” should be understood as “trajectories of mainly non-technological innovations” in the rest of the article.

The article’s aim is to suggest a taxonomy of non-technological innovation trajectories for “sustainable transport”. By the latter expression, we refer to a transport, “that meets the needs of the present without compromising the ability of future generations to meet their own needs”, to repeat the formula of the Brundtland Commission [7]. In other words, a sustainable transport is a transport, which seeks to

limit its negative effects on the environment and society.<sup>1</sup> The innovations in favour of sustainable transport are varied, in particular because of the diversity of transport activity: passenger transport, freight transport... Consequently, a taxonomy of trajectories of these innovations could help the authorities to decide when implementing innovation policies to support sustainable transport.

From a methodological viewpoint, this taxonomy will on the one hand rely on a preliminary re-assessment of the concept of transport. Indeed, in order to consider non-technological innovations in transport, it is necessary to re-assess this activity. This should be considered not only as an industrial activity but also as a service activity in order to be able to understand the innovations, which do not relate either to the product or the process. In contrast the taxonomy will be based on the results of the CANTIQUE (Concerted Action on Non-Technical Measures and their Impact on Air Quality and Emissions) project, which assess the effectiveness of non-technical innovations, based on a detailed review of past and present European experiences, and on the analysis and interpretation of results achieved so far.

Consequently, the article is structured in several sections. Section 2 will review the literature and explain the theoretical background. After a brief outline of sustainable transport and innovation (Section 2.1), we will look at the foundations of the non-technological innovations for sustainable transport (Section 2.2). Section 3 will draw up a typology of trajectories of transport innovation. Section 4 will present the CANTIQUE project. Section 5 will apply the taxonomy previously set out to the results of the CANTIQUE project and will try to provide reasons for the dominance of some trajectories of non-technological innovation over others in sustainable transport. Section 6 concludes with a summary of the key arguments and a proposed agenda for public decision-makers to develop non-technological innovations in transport.

## 2. Literature review and theoretical background

After a brief literature review of sustainable transport and innovation, we will look at the foundations of the non-technological innovations for sustainable transport.

### 2.1. Sustainable transport and innovation

The expression “sustainable transport” is recent, as it dates from the beginning of the 1990s. It is largely inspired by the definition of sustainable development provided by the

<sup>1</sup> This definition sums up the definition of the OECD [8], which defines a sustainable transport system as one that:

- “Allows the basic access and development needs of individuals, companies and society to be met safely and in a manner consistent with human and ecosystem health, and promotes equity within and between successive generations.
- Is affordable, operates fairly and efficiently, offers a choice of transport mode, and supports a competitive economy, as well as balanced regional development.
- Limits emissions and waste within the planet’s ability to absorb them, uses renewable resources at or below their rates of generation, and uses non-renewable resources at or below the rates of development of renewable substitutes, while minimizing the impact on the use of land and the generation of noise”.

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