

## Evaluation of a Co-Financing Model for the Mitigation of Runoff Negative Pollution

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**Abstract:** As a result of the intense traffic, characteristic of the developed world, urban and highway runoff are responsible for negative environmental externalities that has a huge impact on the quality of life and on ecosystems. Although there is scientific and technical knowledge to control this type of pollution, the financing model seems to be one of the limitations. In this sense, and based on the Contingent Valuation Method, a research was developed to study the main factors that influence the perception of the population and to assess their availability to participate, actively and financially, in the resolution of this problem. The results of this research provide a contribution for the implementation of co-financing strategies for holistic and integrated programs that, on one hand, mitigate the negative effects of urban and highway runoff and, on the other hand, enhance the sustainable development and life quality in the urban environment.

**Keywords:** sustainable development; environmental externality; urban runoff

The population growth observed in the last century has no paralleled in history. (UNDESA, 2014). This fact has not only led to an intensive use of resources (IPCC, 2014), but also to high environmental impacts. Therefore, it has been recognized that growth must also consider the social, cultural and environmental dimensions in order to provide more and better quality of life. It was in this context that the concept of sustainable development was developed (Bellen, 2004).

Since water is indispensable for life, it will always have a special relevance. The threats to this resource are immense, being strongly affected by polluting agents of the most diverse sectors and human activities. Road traffic is a clear example. Because of the increasing needs for mobility, as well as the constant growth of the roadways, the quality of the water that precipitates in the urban environment and migrates through paved surfaces is strongly affected, originating an extremely harmful runoff to the surrounding waters and respective ecosystems (EPA, 2015).

In Portugal, there is no specific legislation to promote the mitigation of the negative effects of these agents.

The existence, and in some cases the application of engineering solutions – retention basins, granular filters, permeable pavements, etc. – that can contribute effectively for the control of runoff pollution. However, their implementation involves high investments, leading to a discussion about who should be responsible for the financing: concessionaires of the roads, State or users. This type of problem has become extremely common, nowadays, in the economic models. Therefore, there has been an attempt to find ways to internalize these environmental impacts. In this context, the effects of urban traffic on water quality assumes as an environmental externality of enormous impact on the population (Kolstad, 2010).

The present research focused on this challenge: to analyze the main factors that influence the perception of the population in relation to this subject and to assess their availability to participate, actively and financially, in this problematic.

A survey – based on the contingent valuation method and in the distribution of property rights (Garrod *et al.*, 2000) – was carried out, with an overall sample of 1192 respondents. To understand the availability to pay, a set of intervals was also structured based on the average daily traffic, the travel cost – tolls – and the estimated cost of the treatment systems.

Analyzing the results obtained it was noticed that male, younger or higher income individuals were more willing to support a larger increase when compared to the others. Also, people who travel higher distances on highways, have less willingness to pay. On the other hand, it was also found that respondents who considered urban traffic to have a strong impact on the quality of the environment as well as those who, at home, do selective waste separation present a greater openness to accept a greater increase in the current tolls price for the financing of these systems. The final results showed that, on average, users would be willing to bear a maximum increase of 1,8%. This is a significant and relevant result considering two main factors. The first concerns the fact that this problem is still at an early stage in Portugal and is not a subject of public debate, so that the population may still not be globally aware of the impacts resulting from these runoffs. The second point is related to the fact that it was estimated that for the total cost of the implementation and operation of these solutions be fully supported by an increase in the price of tolls, it would imply an average increase of 14,7% of the current price. Therefore, the 1,8% increase of tolls, referring to the availability to be paid by the respondents, corresponds to 12,2% of the global cost, which is very relevant and positive.

These results reveal a clear concern of the populations towards water quality. However, perhaps influenced by the current economic situation, it is also the conviction of the respondents that these measures must be supported, mostly, by the State and the managing entities of the highways. Thus, it is believed that, in the future, the implementation of these solutions will be done through co-financing models, in which the users support a small part and the large percentage of the investment is assumed by the concessionaires and the State in a shared effort.

Combining these results with the decrease of the cost of treatment systems, and an increasing investment by car manufacturers to improve engine efficiency, as well as in the search for new forms of mobility – with emphasis on electric cars – it becomes clear that there will be conditions to reduce this type of pollution in the near future.

Aiming to promote a new paradigm approach, which translates into a holistic, comprehensive and articulated vision to the whole society in the control of runoff pollution and in the promotion of life quality, this work sought to contribute to the implementation of a new system of co-financing that allows the protection of water resources and ecosystems and, therefore, promote the sustainable development.

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