Resilience of Waste Collection in Unconventional Scenarios

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Extended Abstract

This work aims to highlight the critical issues that may occur in the waste collection sector in cases of emergencies, the countermeasures to be adopted to keep the service as efficient as possible and, secondly (through a practical case) the potentiality of the sector of information and communication technologies to manage these scenarios. The main emergency situation that has been analysed is the case of a pandemic; in addition to this, situations of staff strikes and anomalous peaks in waste production due to high tourist season periods will be also considered.

As regards the critical issues encountered in the pandemic, it emerged the sudden shortage of operators, and therefore the difficulty in covering all collection routes, the anomalous increase in some waste fractions (e.g., domestic waste, infected or non-infected medical waste) [1], the increase in "on demand" requests to hospitals and healthcare facilities, the possible need for distribution of specific equipment for collection, and the need for staff training.

During the COVID-19 emergency, a crucial point that may determine the collapse of the collection system is the classification assigned to COVID-19 waste coming from households in quarantine or self-isolation and from healthcare facilities [2]. Limiting the classification to infectious hazardous waste (European Waste Code, EWC 18 01 03*) only where strictly necessary, and considering the rest of the waste similar to the residual one (20 01 03) it helps to keep stable not only the collection service, but also the flow of hazardous waste destined for thermal treatment plants, avoiding saturation [1].

From the analysis of an enhanced tool for waste collection optimisation available in the sector and suitable for the analysis of resilience object of the present work (the LeO.Web application [4]), it emerged that, as it is, the system already provides facilitating tool for the management of such scenarios; being an integrated management tool, it allows to have under control, on a single platform (and therefore from a single office), everything necessary for the collection design. This type of approach is advantageous because it allows companies of the sector to work with greater efficiency, unlike, for example, having different programs and offices that deal separately with each area of the service.

The LeO.Web application, as illustrated in the work, allows both historical and real-time consultation of the position and activities of the vehicles, then incorporates a database of resources (human resources and vehicles) connected to the availability calendar and the management of the "skills" that can be attributed to them.

The application also has a section for the creation and planning of collection routes based on the GIS and a section for their scheduling and automatic assignment of available resources. In particular, referring to the resilience concept, the system is also able to automatically manage the reassignment of resources if they are unavailable and the possibility of viewing and assigning the resources of other nearby companies.

There is also a section dedicated entirely to the programming of ODS (On Demand Service) requests that allow creating "work schedule" in a versatile way ready to be processed. A routing system is connected to it for the optimization of the route between one objective to the next.

Summing up, the analysis of the characteristics of the LeO.Web application is a demonstration that the innovation of the sector has already reached a level to guarantee an adequate resilience to the system of waste collection.

Acknowledgments

References

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