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## **Taking into account the territorial dimension of work for sustainable work system The case of waste sorting centers**

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### **1. Sustainable development and waste management**

This communication focuses on working conditions and occupational risks prevention in waste sorting centers, in a context of sustainable development. Regarding the three conditions of sustainable development – economic, environmental and social – our aim in this communication is to promote the health of workers onto environmental issues relative to waste management. Various authors have already questioned the links between sustainable work systems and ergonomics (Eklund & Brännmark, 2009; Lee & Kang, 2013; Ryan & Wilson, 2013). In a recent article, Duarte et al. (2014) recalled that « *the concept of sustainable development cannot be reduced to economic and environmental questions: the “social dimension” (i.e. work and employment which are explicitly designated in the Brundtland report as a need for the people) constitutes one of the pillars of sustainable development and is therefore a legitimate issue.*” In this paper, based on a research led with the French National Institute of Research for Safety at work (INRS) and the Ergonomics Department of University Lyon 2, we will argue the need for a better understanding of the links between the working conditions of the sorting operators and territorial policies.

#### **1.1 Waste sorting management and sustainability**

The concept of sustainable development, as it appeared in the late 1980s in the Brundtland report, argues for the need to better link dimensions of economic efficiency, environmental sustainability and social equity. Such an articulation is particularly important to grasp for waste sorting centers if we agree with the idea that the “social dimension” (i.e. work and employment which are explicitly designated in the Brundtland report as a need for the people) constitutes one of the pillars of sustainable development, and is therefore a legitimate issue. Forging the link between these three dimensions remains a challenge. But at the same time, most researches on Environmental law and public action show that environment and sustainable development are local issues carried out by actors on a given territory (McNutt & Rayner, 2012). In this communication, we will argue that developing and implementing prevention strategies in waste sorting centers require a “territorial approach”.

#### **1.2 Work in waste sorting centers: a “green” job?**

Waste management has mostly been studied in ergonomics, and studies point out considerable problems in working conditions, environmental and system performance: like biological risks and respiratory consequences on health (see Rosenberg, 2007; Rapp et al., 2009), risks linked to contact with hazardous waste like syringe needles (see Vu-Khan et al., 2011), and physical and psychosocial risks linked to work environment (see Engkvist, 2010). These studies show that work in waste sorting centers is not sustainable, and they provide elements that contribute to design (see INRS, 2011). However, our study shows that a key question is the integration of one sorting center in a complex network of decision-making, i.e. interactions between decision making of national policy makers and actors from territorial governance on the one hand and decision making of the operating company (in terms of work organization or technical system) on the other hand.

### **2. Method : work analysis in waste sorting centers**

In parallel of a global analysis of the organizational system of waste management in France, we carried out a research in four waste sorting centers in France using the Ergonomics Work Analysis (EWA) method (Daniellou, 2005). The ergonomics study lasted from January 2012 to March 2014. The ergonomist made 22

sequences of observations of work of the sorting belt employees in the 4 waste sorting centers, considering work task, determinants of work activity and actual conditions under which the work is done. Our work aims at analyzing constraints and working conditions. We study “the factors determining activity, the characteristics of activity and its effects” (Daniellou, 2005, p. 412).

### **3. Results : Disconnection between technical system and territory**

#### **3.1. Quality and composition of incoming waste : a territorial issue**

We characterized incoming waste variabilities and workload variations. We identified that variabilities are due to dimensions like consumption of inhabitants, seasons or climate variations, tourism in the sectors, etc. Nonetheless, there is no technical adaptation of the process system for these variabilities. Incoming waste can also contain large numbers of undesirable and *non* recyclable products that are sources of problems in the sorting centers. Waste can present a source of risk for the employees, for example syringe needles and gas canisters are frequently found on the sorting belts. There are technical problems consecutive to the “jamming” of machines like breakdowns and equipment failures. To ensure performance and quality of production, workers make constant “regulations”. They adapt their activity (swiftness, gestures, actions on the products, collective actions on the belt, etc.), by making balances between production and health, often not beneficial for health. With this diagnosis, we look for levers of action in order to develop sustainable work systems.

#### **3.2. Disconnection between technical system and territory**

The quality and the composition of collected waste are essential elements for a sustainable work. Our results highlight that the activity performed by the operators and regulations efficiency are highly dependent on the quality of incoming waste. The quality of incoming waste results from three dimensions:

- Firstly, diversity concerning sorting instructions on national territory that is taken into account on design and technical dimensions of the waste sorting center. Indeed, work activity also depends on the composition of the incoming flows of waste, which varies as a function of local authority and collection mode: bags, door to door, and containers used for voluntary deposits.
- Secondly, variability relative to geographical events. For example, work activity is influenced by the geographical conditions (sea, mountains, etc.) and by the meteorological conditions of collections.
- Thirdly, variability linked to the evolutions of the territory and the decisions of territorial actors that are disconnected to the technical system of the waste sorting center. The regulations by work activity of sorting operators are not sufficient in these situations. They have to face to cognitive overflow situations and work intensification.

Consequently, a central issue for prevention involves the search for a coupling between different configurations in a given territory (quality and types of waste, collection processes, etc.) on the one hand and the tools and technical systems provided in the waste and recycling sites and its effects on work organization on the other hand.

### **4. Discuss : designing sustainable work systems : action and actors interplays and on system plasticity**

These results lead us to question the disconnection between the territory (in terms of sectors and flows) and the waste-sorting sites (in their technical and organizational dimensions), and to search for a better coupling at a given time, and as an ongoing process evolving in time.

Ideally, a connection should be made between the characteristics of each sector of the territory with those of the sorting center. Choices should be made at the territorial level itself to organize collection by taking into account the reality of the sorting center, and the technical choices made concerning it (level of automation,

type of technical equipment, etc.) as a function of the territory's characteristics. Working conditions and work activity are dependant of the territorial dimensions. In the same way, technical choices must be taken in the sorting center according to the characteristics of the territory.

The involvement of the territorial governance actors is needed for improving coupling between territorial governance and work systems plasticity and working conditions of sorting employees. Actually, in the context of our research, the territorial governance actors define sorting instructions, organize waste collection and manage waste sorting centers (Boudra & Béguin, 2014). The territorial governance is composed by various actors such as local councilors (communities of communes, municipalities, etc...), engineers and managers of the communities and management of the operating companies of the sorting.

In this perspective, we developed two working axis to improve the articulation between territorial governance and work systems plasticity. A connection between the sorting center and its territory is a technical system's "plasticity" issue. Technical systems are plastic when they "*leave the activity sufficient freedom to maneuver to render technical aspects more efficient whilst remaining in good health*" (Béguin, 2007). The second axis deals with actors from territorial governance who make decisions that impact the sorting center and work activity. The ergonomic approach in waste sorting centers created spaces for discussions about working conditions in waste sorting centers with territorial actors who are quite distant from work activity. These spaces represent some opportunities for governance actors to develop forms of coordination that take into account the impact of their choices on activity and health of sorting employees.

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