European Agency for Safety and Health at Work

POLICY BRIEF

THE CIRCULAR ECONOMY AND SAFETY AND HEALTH: POSSIBLE IMPLICATIONS FOR FUTURE WASTE SECTOR WORKPLACES

What the circular economy might mean for occupational safety and health in the waste sector until 2040

The European Commission is committed to moving Europe towards a sustainable future. This green vision has two cornerstones, achieving climate neutrality (by 2050) ([1]) and creating a circular economy (CE) ([2]). A future 'closed loop' society would be based on minimising waste streams and using these as a resource: 'reduce, reuse, recycle' replaces 'take, make, waste'. This transformation promises to have considerable impacts on the waste sector in general, and specifically on occupational safety and health (OSH) in the waste sector.

In its new foresight cycle, the European Agency for Safety and Health at Work (EU-OSHA) uses scenarios to explore the effects of the implementation of a CE on OSH. These scenarios show alternative pathways to the future and demonstrate how broad the range of feasible developments is. They are not intended as a prediction on what the future might bring; rather, their primary role is to encourage dialogue and reflection about future possibilities. This policy brief aims to take a short look at the issues highlighted by the scenarios as they relate to the waste sector and the implications of the scenarios developed, as a basis for discussion.

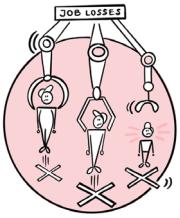
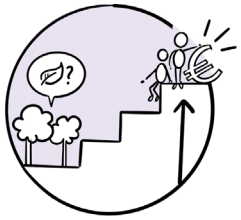
Implications for OSH in the waste sector under each scenario

Four different scenarios on the CE were developed for this project, which are all based on the same set of key factors. Different realistic future values were assumed for each key factor and logically grouped together using software to create consistent scenarios (EU-OSHA, 2021). The result is a set of scenarios that represents a range of different possible outcomes for near-future actions and events. In this brief, we will focus on the specific implications of the four CE-oriented scenarios for OSH in the waste sector. The effects assumed for 2040 differ between scenarios, leading to different implications.

The table shows the four EU-OSHA scenarios, which look at the future of the CE with a time horizon to 2040. A short description lists each scenario's characteristics, followed by the two to three most important implications for the waste sector.

([1]) See the Green Deal Action Plan (European Commission, 2019).
([2]) See the Circular Economy Action Plan (European Commission, 2020a,b) and the Circular Economy Package (European Commission, 2015).

Figure 1: An overview of the four scenarios and the OSH implications in the waste sector

			
The Roaring 40s — fully circular and inclusive	**Carbon neutrality — of a hazardous kind**	**Staying afloat — amid economic and environmental crises**	**Regional circularities — with European divides**
In 2040, the products that sell best are those that are cradle to cradle and 'net-positive' in terms of social and environmental sustainability. Re-use takes precedent over replacement, environmental and safety considerations dominate decision-making.	The year 2040 marks the achievement of carbon neutrality in Europe. But, with environmental outcomes having been prioritised above all else, this has often come at the expense of job quality and working conditions.	In 2040, the biggest concern for many is just having a job — not what the job entails. Most people are focused on keeping things afloat, so that there's little consideration for much else — not the environment, social rights or job quality.	In 2040, everyone knows that contracted employees are well looked after, but those in non-standard employment are not. Neither is the environment, with circularity being mostly regional.
Implications for OSH in the waste sector in 2040			
• Waste industry is highly automated, in particular with regard to the most hazardous steps, reducing risks to personnel • Comprehensive reskilling means staff are highly OSH-conscious and well-trained • Waste streams are more concentrated, new risks arise from items going through several cycles	• Rapid introduction of new materials into waste streams leads to workers being exposed to unforeseen risks during processing • Cost-saving measures ('austerity') result in reduced numbers of OSH inspections in the waste sector • No integration of OSH considerations into the drafting of new environmental legislation	• Waste volumes become more complex and increase considerably, overwhelming the sector's capability to process waste safely • During economic crises, workplace safety becomes a secondary issue for both employers and job seekers in the waste sector, and willingness to engage in risky behaviour increases	• Outsourcing of waste processing to less privileged regions leads to more inexperienced companies/informal workers handling waste, with higher injury rates among non-standard workers • Workers are confronted with new, undocumented materials in waste streams

European circular economies in 2040: cross-cutting impacts for OSH in the waste sector

Some of the specific implications identified for OSH in the waste sector from the CE in 2040 cut across all four scenarios and are described in more detail below. ([3]) Depending on the scenario, differences between regions (or Member States) will occur, depending on available investment capacity.

([3]) Please note: the automation of hazardous processes in waste management is assumed to increase across all four scenarios, hence, some OSH risks will reduced no matter the circumstances.

- **Digitalisation**

Digital technologies could be applied in the waste management sector much more widely than they are today, creating a broad range of new opportunities or solving existing problems, particularly with regard to Europe's move towards a CE, for which a push for digitalisation in the waste sector would be a key enabler. The tracking of products over their entire lifecycle (e.g. through the Internet of Things), in combination with sensor-equipped waste bins, would, for instance, permit more precise automated sorting and better communication with customers (e.g. bonus schemes) (Eionet, 2021).

(Further) digitalising waste processing could also bring considerable improvements in OSH. For example, if waste collection and transport — currently a major source of accidents (Eionet, 2021) — were to be carried out by autonomous vehicles, the risks for workers could be minimised. In addition, a greater sensor density would increase awareness of waste stream contents, thereby reducing hazards for workers during handling and sorting.

- **Robotics and artificial intelligence**

Currently, human labour continues to dominate waste stream management and processing. Over the next two decades, this is destined to change: learning robots are becoming progressively more adept at identifying recyclable components in increasingly complex waste streams (PwC, 2018). However, as robots become more independent, their actions become less predictable and may increase hazards for workers (ILO, 2019). Overall robot complexity and degree of artificial intelligence integration will depend on the legislative environment and (regional) investment capacity, both of which determine the pace and extent of technology diffusion. Hence, some uncertainty remains regarding the degree of their implementation in 2040 (ILO, 2019).

Automation of hazardous processes in waste management is expected to greatly reduce OSH risks. Human-robot interaction, on the other hand, will probably become more complex, as workers potentially over- or underestimate robot capabilities and situational awareness. Overreliance on automation may also lead to deskilling, particularly in emergency situations. If workers manage automated processes without contact with other human beings, psychosocial risks may increase through a lack of social interaction with, and social support from, peers.

- **New materials and processes**

Convergence of technologies is expected to result in innovative advances, particularly with regard to new materials (e.g. nanomaterials) or new processes (e.g. industrial biotechnology). With regard to the green transition, rapid adaptation of these developments promises a greater likelihood of achieving the targets set for the near to mid-future (reduced material inputs in production, better insulation, higher output in renewable energy production, etc.).

As new materials enter the waste stream, their recyclability will frequently remain insufficiently explored (e.g. as currently in photovoltaics (Franz and Piringer, 2020), e-vehicle batteries (Thompson et al., 2020), new energy storage technologies (Linja-aho, 2020), nanomaterials in biofuels (Khoo et al., 2020)), potentially leading to new risks in waste processing. Similarly, recognition and separation of these new materials during waste processing may pose difficulties. Genetically engineered products could lead to biohazards during recycling or processing, particularly if these should be insufficiently labelled.

- **Regulatory measures, standardisation and documentation**

The current regulatory push in the EU for increased standardisation in electronics (e.g. standardised chargers for mobile phones) could greatly reduce e-waste complexity. Similarly, there are efforts to improve documentation on the chemical content of products and to build more detailed databases for all materials (Ellen MacArthur Foundation, 2017). Law-makers have also been tasked to better integrate OSH considerations into the drafting of environmental and other legislation (EPSU, 2020), and focus more on risk assessment before new materials are approved.

As we progress towards a CE, regulation enforcing better recyclability could become a key factor in reducing OSH hazards in waste processing. Standardisation could dramatically increase safety in dismantling products, while better documentation would have a positive impact on OSH both upstream — in that products are to be safe and sustainable by design — and downstream, i.e. during end-of-life processing.

- **Reskilling**

The Just Transition mechanism (see EU-DGIP (2020)) aims to provide financial support to regions to help them better manage the transition to a more climate-neutral economy. This includes large-scale reskilling of the working population to close the skills gap between lost and newly created jobs. The EU's Lifelong Learning Programme will also help to develop the learning sector in Europe in future.

Currently, too many workers in the waste sector are considered insufficiently skilled, which leads to higher OSH risks (EPSU, 2020) and hampers modernisation processes (Eionet, 2021). Continuous reskilling in the waste sector could help workers to better navigate the increased complexity of a more automated environment, reducing the likelihood of OSH events. As training for jobs in the waste industry improves, new hires would offer significantly increased skills and OSH capabilities.

Conclusions

As Europe transitions towards a more circular economy, the product of today will become the raw material of tomorrow. The waste sector will play a pivotal role in this development; however, unless it performs to much higher regulatory standards, Europe will not be able to meet its ambitious objectives. The integration of (often costly) new technologies while meeting new challenges will be a complex undertaking, but the reskilling offensive necessary offers opportunities to considerably improve OSH practices and outcomes for workers if OSH considerations are made an inherent part of this process from the beginning.

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