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Development of a circular economy and evolution of working conditions and occupational risks—a strategic foresight study

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Abstract

The circular economy can be defined as an economic system of exchange and production intended to increase the efficiency of the use of resources at all stages of products' life cycle (including goods and services). Since most natural resources are not inexhaustible, and fossil fuel consumption is considered one of the major factors of global warming, its development seems inevitable, even if it can only be progressive (spanning several decades) and may not apply to all sectors. The circular economy is likely to challenge work methods and working conditions. Consequently, a strategic foresight study has been conducted in order to assess the main consequences on occupational safety and health. In the practice of INRS which carried out this work, foresight is above all a tool to improve and facilitate thinking and decision-making.

Keywords: Circular economy, Working conditions, Occupational risks

Introduction

INRS (the French institute for occupational safety and health) regularly conducts strategic foresight studies on the possible developments in working conditions and the associated occupational risks in various fields and technologies (training, nanomaterials, cobots, etc.) [1]. The subject of the sixth study carried out in 2018 is more crosscutting: the possible consequences on working conditions of the transition from a linear economy model to a circular one, more respectful of the environment with less raw material and energy consumption.

R. Le Moigne describes our current model of production and consumption as follows: "Our economy is based on the linear model which can be summed up as 'extracting / making / consuming / discarding', which uses natural resources and energy for producing goods that will ultimately become waste" [2]. Since most natural resources are not inexhaustible, and fossil fuel consumption is considered one of the major factors of global warming, it seems increasingly essential to replace this current model with more sustainable models.

According to the French environmental agency (ADEME), a circular economy can be defined as an economic system of exchange and production intended to increase the efficiency of the use of resources at all stages of products' life cycle (including goods and services) [3]. One of the main aims is to avoid as much as possible the creation of ultimate waste that would exit the production system. As shown in Fig. 1, the loop must remain closed: everything produced through economic activity must be transferred and used somewhere else [4]. It reduces the impact on the environment without affecting, and sometimes even improving the well-being of individuals. The transition to a more circular economy implies environmental gains but also reallocations of employment between material-intensive activities and new "eco-activities". Consequently, it is interesting to examine the content of these new

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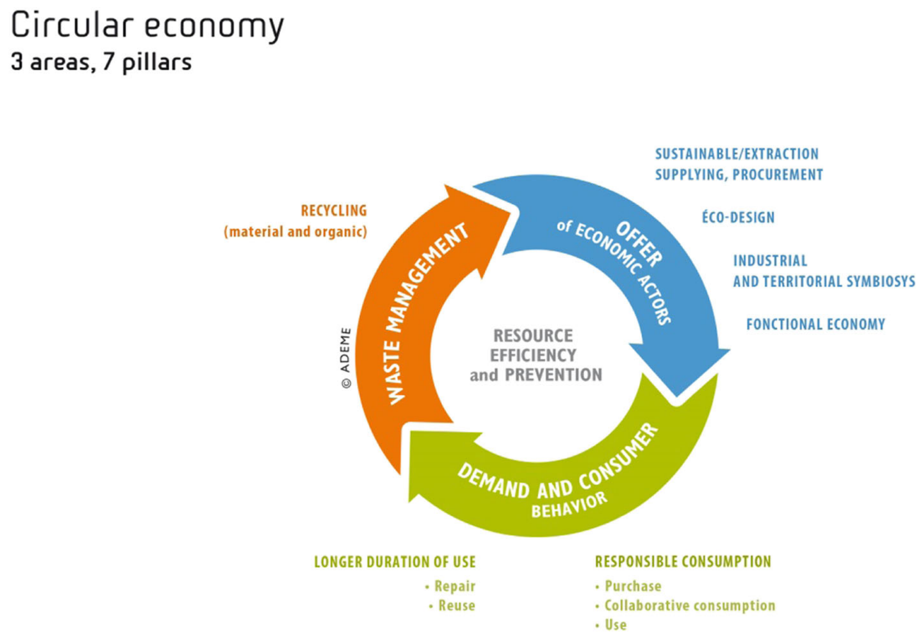

Fig. 1 The principles of a circular economy according to Ademe [3]

activities in order to grasp the extent of the transformations at work. An economic analysis estimates the current volume of employment in the circular economy in France at 800,000 full-time equivalent jobs [5].

Figure 1 shows that a circular economy should not be considered only from a waste perspective, but from an overall point of view, including new design techniques, consumption habits, sharing economy, etc.

An increasingly abundant literature deals with the circular economy in a variety of aspects. Unsurprisingly, many works have been devoted to the development of product life cycle assessment methods when products have been designed in a logic of circular economy [6, 7]. The possible disconnection, even opposition, between economic aspects and the impacts on human health and ecosystems has also been highlighted [8]. Such works were also conducted in a more complex scale and considering a large number of parameters [9], through the assessment of some regional circular economy systems with the aim of assessing the value of their business models.

These works provided a knowledge basis from which more systematic approaches have been built. Various indicators have been designed to assess the sustainability of the manufacturing product families [10]. Some elementary technological items (generally worded in re, such as recover, recycle, remanufacture, reduce, etc.) have been identified and used for assessing the goals expected in economic growth, environmental protection and societal benefits [11, 12]. Several key drivers used during the study were identified in these technological items, in particular those linked to the supply chain which is an important element in the development of a circular economy [13].

These works contribute to the definition of the organisational and technical (even normative, for example [14]) framework of our study. If we come to the question of human resources, the conceptual framework is less precise. The closest job family seems to be green jobs. However, the linkage of certain jobs in the circular industry with this family raises questions. Their similarities lie rather with industrial jobs even if the context is indeed the greening of the economy. Burger et al. [15] distinguish between core activities within the circular economy focusing on repair, reuse of materials, sharing economy, etc., and enabling activities such as management and ICT applicability to the design of new products meeting circular economy standards. The former are obviously connected with the green economy, the latter to a more industrial culture. Several studies conclude that green jobs imply high levels of formal education, work experience and on-the-job training, with high competency in the design, production, management and monitoring of technology [16, 17]. The contradiction was therefore only apparent. Green jobs are also more demanding than traditional jobs in terms of cognitive and interpersonal skills.

Concerning occupational safety and health issues, literature is mainly focused on toxicological risks in activities such as recycling, in particular E-wastes. Even in developed countries, many issues arise in the control of processes, leading to excessive exposure to pollutants [18, 19]. The main reason seems to be the heterogeneity of material treated. These phenomena are exacerbated in the developing world where operations are driven in poorly equipped workshops [20] or even through informal work [21]. More generally, waste treatment is set to take on increasing importance with the development of the circular economy, but the hazards are of the same nature as in a linear economy. It is the management of these hazards that will determine the level of risk in terms of musculoskeletal disorders (MSDs), psychosocial risks (PSRs), mechanical risks, etc. In this case too, the example of informal economies shows the importance of the stakes [22].

Collaborative consumption, and particularly a sharing economy, is an important component of the circular economy, especially if OSH issues are considered. The development of the online platform economy, for example in car sharing services provided by companies such as Uber and Lyft, has degraded the working conditions of drivers. This aspect of the circular economy remains marginal compared to the possible development of collaborative consumption, but is not insignificant in terms of working conditions [23].

The issue of occupational safety and health is a key challenge. Above all, a circular economy offers the chance for better integration of prevention ahead of the design of new production modes, new services and new products. But it can also result in negative effects if environmental concerns are taken into account to the detriment of the protection of workers' health. The potential risks are high when it comes to revising production processes or using other raw materials (particularly from recycling), rolling out new technology, developing repair and reuse activities, transforming waste for it to be reused, etc. Biological, physical, chemical, mechanical, but also organisational risks, along with every other type of hazard that workers are likely to encounter at work, have all been considered in this study.

Method

Foresight studies at INRS are governed by two principles:

- They are an opportunity to promote multidisciplinarity within the institute by associating different teams and divisions, each of them contributing their different academic specialties and their different modes of intervention
- Since INRS focuses only on occupational risk prevention, it is necessary to set up partnerships with various organisations that are involved in the subject and address it from other points of view; INRS's strategic foresight studies are always co-constructed with universities, trade unions, professional organisations, enterprises, etc.

Regardless of the subject and the partnership, the end goal is always to improve safety and health at work.

This study devoted to the circular economy was conducted in five steps:

1. A 15-member team was formed to follow the project from start to finish. This project team brought together strategic foresight experts, OSH experts and circular economy specialists. The latter were provided by the different project partners.
2. The project team's first task was to identify the main key drivers in the development of the circular economy. The combination of the different development hypotheses would lead to the building of scenarios for the future. This goal was achieved by pooling the project team members' knowledge about the subject in question, supplemented by individual or collective interviews with specialists from outside the group. The many varied skills of participants made this step even more fruitful.
3. Each selected key driver was documented by a member of the project team. It was then discussed in a plenary session, with special attention brought to future development hypotheses, including potential deviations from the current trend or even black swans.
4. On the basis of that material, overall scenarios were built highlighting in particular the combinations of drivers most likely to have a major effect on working conditions and their consequences on safety and health. In these scenarios, emphasis was placed on trajectories involving major transformations with gradual developments or possible deviations. Stories were then drawn up from these scenarios, the aim of which was to make more concrete the consequences of the development of the circular economy in a certain number of sectors of activity: particular emphasis was placed on specific sectors like building and public works, waste treatment and transport. Certain aspects of professional activity were also more particularly considered: design, traceability, after-sales service, etc.
5. The main objective of INRS strategic foresight exercises is to help its Board of Directors (social partners) to adjust their policy for the institute. Consequently, the data considered in the scenarios and the major trajectories were then translated in terms of OSH issues in all their complexity, i.e. taking into account the overall environment in which they are supposed to happen. This overall vision of context is necessary to develop realistic prevention solutions.

Overall scenarios

Four contrasting scenarios were written depicting the main options for the potential development of the circular economy by 2040 and the likely evolution in corresponding work conditions over the upcoming decades.

Circular economy driven by globalisation

The development of the circular economy is global, driven by private actors. The main drivers of the change are major technological breakthroughs disassociating economic growth from consumption of natural resources, in particular fossil fuels. Multinational corporations (from traditional economic sectors or technology companies) have a leading role, given the amount of capital raised for the research and development needed for such innovations. The virtuous environmental aspects of these changes correspond to consumer expectations. The role of public authorities is limited to social support for citizens during these changes.

European political voluntarism

The circular economy is developing significantly in Northern and Western Europe. The rest of the world lags behind for various reasons (different from one continent to another): lack of conviction, little opportunity, insufficient financial and technical means, etc. Europe's main motivations are connected to global political instability, climate change, issues with the supply of imports and various cyclical crises. Coordination is good at European, national and regional levels. After many years marked by more or less serious breaks in the supply chains, Europe experiences a stable situation in 2040.

Linear globalisation

Meeting the needs expressed by consumers continues to be a priority, in particular the needs of the middle classes in emerging Asian and African countries. Over the years, this results in shortages, worsening social, economic and political tensions, but also greater climate change and environmental degradation. The answer provided by public and private actors remains above all palliative: some technological development actions to optimise resource consumption and limit environmental impacts.

Transition managed locally

In spite of the impacts of climate change and pressure by some citizens, States remain unable, individually and collectively, to carry out truly effective concerted actions. Some companies engage in the development of processes that fall within a circular economy logic because of their economic interests. Some consumers adopt frugal ways of life, based in particular on self-sufficiency and self-organisation: local production, reuse, energy sobriety, etc. However, in a context of worldwide economic and social tensions generating supply instability, sobriety is often more an obligation than a deliberate choice.

Use of scenarios to determine priorities for action in the field of occupational risk prevention

As indicated above (part 5 of the "Method" section), the prospective studies at INRS aim to determine major evolutions in work and its environment that can have an influence on working conditions and occupational risks. Consequently, the four scenarios were discussed by a dozen experts from various disciplines in order to determine which are the most relevant subjects (stakes) to be handled by the institute in the following years. The selection criteria used to identify these stakes are very variable: high probability of occurrence (crosscutting several scenarios) and/or heavy predictable consequences and/or high number of workers seeing their working conditions impacted by the stake, etc. Above all, foresight is a tool to improve and facilitate collaborative thinking and decision-making.

From this study, four main stakes likely to have significant consequences in occupational safety and health were identified:

1. The consequences of the transition to a circular economy on the entire production chain and the role of information and communication technologies: major tools for the implementation of a circular economy and for the prevention of occupational risks
2. Maintenance and repair: essential for better durability of goods, new context for working conditions
3. Recycling—reshoring of (industrial) activities
4. Transport and logistics: a counterintuitive development in the flow of goods, but not necessarily synonymous with an increase in distances travelled

In the four following sections, the most sensitive OSH aspects are discussed for each stake.

The consequences of the transition to a circular economy on the entire production chain and the role of information and communication technologies (ICTs)

Many foresight studies dedicated to the future of production emphasise the contribution of ICTs to the changes to come, namely through automation [24]. It should not be any different in the specific case of the circular economy. In this section, we will examine the circumstances, nature and consequences of this contribution.

The "areas" and "pillars" of the circular economy identified by Ademe show the extent of changes in the domain of design imposed by the development of this new economic model (cf. Fig. 1). These specificities are for example:

– Eco-design: using non-renewable resources as little as possible, and taking into account the renewal rate of renewable resources, along with reclaiming end-of-life goods and waste to promote reuse, repair and recycling;
– Industrial and territorial ecology: optimising resource and energy consumption at the local level (groups of companies pooling their resources—one entity's waste can become another's raw material, for example) or more generally at the level of industrial sectors, regions or even the production system as a whole; and
– Functional economy: production must be consistent with a logic that favours the selling of a service through the provision of equipment rather than the selling of the equipment itself. As such, the supplier will have to focus on the lifetime of the equipment. This functional economy is mirrored in collaborative consumption which aims to promote pooling, sharing or leasing of products for a fixed period rather than individual possession of those products. In the long run, the whole production chain and life cycle of the goods are profoundly modified.

For workers in design, marketing or sales, this change can be unsettling. It is no longer a matter of designing to sell more goods and more often, but to focus on the service rendered over the medium and long term. These changes are likely to be very gradual, with the transition from a linear to a circular economy occurring at different rates depending on the sector of activity. Workers should be allowed enough time to adapt to the new policy.

The very principle of the circular economy requires the reuse of raw materials (henceforth designated as secondary raw materials in this article) and components (mechanical, electrical, electronic parts, etc.) that have already been used once or several times. Secondary raw materials will not always be as pure as first-use materials. Indeed, the purification operations are very energy and/or water consuming. It will therefore be necessary to adapt the industrial processes to this new data, to ensure higher resilience of plants and continued stability in operating conditions. Failures in the operation of industrial systems can in fact lead to industrial accidents or occupational exposure. Impurities in secondary raw materials can sometimes be toxic. Similarly, the reuse of deconstructed components in end-of-life goods requires that the manufacturing processes take into account the progressive ageing of these components. Reuse must not lead to a risk of breakage due to wear during assembly. These precautions also ensure the subsequent safety of the consumer.

These two examples show the strong need for traceability within the circular economy. It is essential at all times to know the composition of a secondary raw material or the mechanical state of a component. ICTs will therefore play an important role. Regardless of the techniques used (physical or virtual marking or blockchain-type tracking in a less energy-intensive mode than today), they must make it possible to ensure perfect knowledge of the object in question so that it is used only under suitable circumstances. Traceability will involve the creation of a solid reference system that ensures the relevance of the data. According to the scenarios established within the framework of the INRS exercise, this reference system can be provided by regulation (important role of States strongly involved in industrial policy, in particular because of geopolitical considerations) and/or through standardisation (predominant role of the private sector, in particular the most powerful companies, namely technology companies). All of these provisions are particularly important for setting occupational risk prevention policy. In addition to the traceability they provide, they make it possible in particular to protect against piracy, which poses significant risks in the event of reuse of secondary raw materials or elements already used.

For a long time now, it has been accepted (at least theoretically) that all the operations likely to occur during a product's life cycle must also be considered from an occupational risk prevention point of view when the product is designed. These operations include, in particular, cleaning, maintenance, deconstruction and recycling at the end of life. Indeed, the design must imperatively take into account all of these phases that determine the success of the operation through the durability of the product and its components. The main challenge is having occupational hazard prevention becoming a strong requirement in the design phase.

Given recent changes and developments foreseeable in the coming decades, the use of automation and ICTs should be very significant [25, 26]. Examples of achievements in the deconstruction of cars, studied during the prospective exercise, show that considerable progress can be made. Some examples can be seen in a video [27]. For example, manual handling can be avoided, as well as awkward postures. Robots position the car so that the operator can perform the different tasks comfortably.

Cobotics (human-robot collaboration) make it possible to avoid deleterious efforts thanks to the use, for example, of assisted cutting pliers, originally designed to extricate passengers from vehicles after traffic accidents. ICTs also play a key role. They are used to track cars throughout the deconstruction chain. Depending on the model, they assist operators with determining the operations to be performed. This is an important element in occupational risk prevention: bringing an appropriate answer in safe conditions to a technical issue. However, using these tools in a way that would result in an increase in work pace (on the grounds that tasks are less strenuous) could lead to MSDs or PSRs [28]. In the same way, a decrease in the workers' ability to take initiative (work entirely prescribed and no leeway in terms of time and space when an exoskeleton is used) could lead to the same pathologies.

ICTs used to ensure traceability of secondary raw materials or the components of a product could also embed the essential data for the prevention of the corresponding occupational risks. They could also contain technical recommendations concerning the conditions of use of the products concerned. It should be possible for these data to be updated over time by recording how the products have been used and any modifications made to them.

This section has described the potential use of ICTs which are essential tools in the development of a circular economy. It does not suggest that no adverse occupational effects are possible. These are not specific to the circular economy and are likely to be the same as in a traditional economy—MSDs, PSRs, etc. For a description with numerous examples, see [28, 29].

The paramount issue of maintenance and repair

As discussed above, goods will have to be used longer and will have several simultaneous and/or successive users. They will have to be designed in such a way that they can be repaired easily. In addition, at the end of their life cycle, they must be easy to deconstruct so that they can be reused and recycled. Apart from a few specific activities (car repair, industrial maintenance or building maintenance), these activities have declined sharply in Western countries in recent decades. Moreover, for the purpose of energy efficiency, repairs will logically have to be made in structures within a relatively small geographical radius. Reasonable transportation costs could therefore be attained with good responsiveness to demand.

From these initial foundations, several hypotheses (which are not mutually exclusive) were explored according to the different scenarios:

– A network of small- or medium-sized enterprises, more or less specialised in different niches and acting as subcontractors; organised at the initiative of designers and manufacturers (generally large companies that subcontract these operations)
– Independent micro- and small-sized enterprises responding to various requests inside a local geographic area, including some forms of grey and black economy
– Investment in the social and solidarity economy (SSE) by companies which find opportunities in these repair activities to reintegrate excluded workers back into the workforce; they develop stable outreach activities in this niche with a workforce that is gradually acquiring skills

Overall, regardless of the type of enterprise, experience in the design of this type of workshop complying with "healthy and safe" conditions is limited today and much know-how will have to be acquired.

Consequences in terms of occupational risks are different in the three cases described above. In the first case, it is about independent companies, but de facto subcontractors. In theory, they have the technical means to develop a real prevention policy, but may lack economic means (margins shrunk by the constraints of subcontracting) unless a virtuous logic of corporate social responsibility is promoted by the outsourcing company. In the other two cases, in addition to a less standardised intervention than in the first, it is necessary to consider the difficulty in designing and equipping workshops, possibly with limited funding, in which diverse technical interventions will be carried out.

In the third case, there is a major need for workers previously out of employment to (re) learn workplace safety rules. Reintegration into the world of labour through SSE is not only a matter of techniques, but also of OSH.

Recycling—reshoring of activities

Regardless of the progress made in the design and durability of materials, elements remaining after the deconstruction of products cannot be used infinitely and at some point, it becomes necessary to consider recycling in order to recover metals, possibly in the form of alloys.

Several studies have already shown high levels of occupational exposure to a wide range of pollutants and highlighted the difficulty to implement protective measures such as capture and ventilation in the workshops [18–20]. Even if most of the literature is devoted to the recycling of electronic waste, other studies show that the problem is not limited to this activity sector but concerns the entire recycling sector which is confronted with difficulties in ensuring healthy environments [30]. The heterogeneity of the material to be recycled represents a major element in the design and dimensioning of installations. In particular, it makes it difficult to regulate processes, which results in malfunctions that can in turn generate emissions.

As the transition from a linear economy to a circular economy progresses, the quantities of products to be recycled will increase, and it is possible that in the long run, it will be easier to form more homogeneous batches ahead of the actual recycling operations. However, even if the quality of waste collection improves, the preliminary sorting operations will probably remain indispensable and these are among the activities that expose workers the most.

It would be antithetical for the circular economy to lead to the continued export of a large proportion of toxic waste to developing countries, as is currently the practice. More generally, this approach could lead to the reshoring of factories of which the production was transferred over the last decades to countries generally less demanding with respect to labour and environmental regulations. Given the evolution of technology in recent decades, it is legitimate to think that these production units, reshored in France, would focus on automation. Two unknowns still exist to evaluate the plausibility of this hypothesis:

– The respective costs of human labour and robotisation: the decline in the cost of unskilled labour in recent years does not favour the automation of certain tasks
– When tasks require skill, flexibility or situational intelligence, human beings are often still much better than machines

Many contradictory phenomena come into play, in particular the trend identified by many recent prospective studies: that of heavy production automation. Will it be effective in this specific case of recycling or will State policy go against it in order to keep jobs for the least skilled workers?

Transport and logistics: a counterintuitive increasing of flows, but not necessarily synonymous with an increase in distances travelled

Paradoxically, the circular economy could increase transport flows rather than reduce them, even if the logic of industrial and territorial ecology aims to reduce the overall distances travelled by goods (see Fig. 2). This is why it will be important to act on parameters such as capacity and filling rate of vehicles, especially for return journeys, in order to reduce the negative externalities.

Indeed, it will be necessary to have the fully adapted logistics to collect products from the user's premises or at collection points. The subsequent operations will be sorting, repairing, repackaging, deconstructing to recover parts that will be reused, recycling (secondary raw materials) or decommissioning final waste parts. Based on current practice, this situation can result in a number of occupational risks:

– Those related to the operations already mentioned and the collection that precedes them: mainly physical risks such as low back pain and

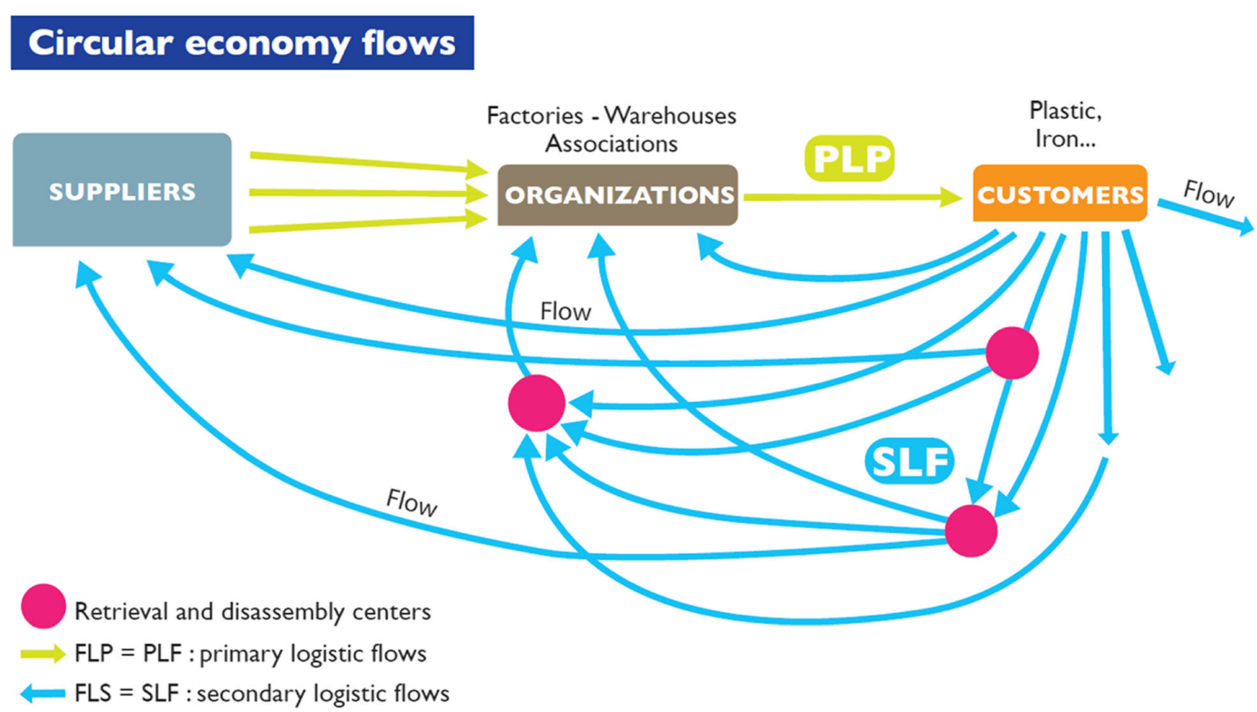

Fig. 2 Example of flows in a circular economy

musculoskeletal disorders, but also chemical, biological and mechanical risks

– Those related to the possible transformations undergone by the goods collected, most often with a complete lack of traceability. As such, the cleaning of containers used for returns may, for example, become an important prevention issue.

There is therefore a need to develop new forms of organisation in logistics and transport. These transformations could lead to the operational implementation of the concept of "physical internet". This is the circulation of physical products in standardised "packets" that are routed via automated hubs (as with data on the "digital internet"). This physical internet could be favourable to the improvement of working conditions. Standardisation of containers, automation of loading, unloading and container flows in hubs, can reduce the risks associated with handling. These risks include those related to the carrying of heavy loads, but also to picking, which involves collecting and packing the items ordered. Similarly, the creation of these hubs, geographically well distributed, should allow all drivers to avoid sleeping away from home, improving their quality of life. But operators involved in the final, last-mile stage, like those of the first-mile stage, will be confronted with potential risks related in particular to handling: loading and unloading, unbundling, checking and contact with the end customer. Technical solutions, such as industrial exoskeletons, should help reduce the difficulties encountered at these workstations [31].

Synthesis: which OSH policy for each scenario?

In the first scenario, given the high technological level of the leading players, the challenge is to convince them of the value of integrating OHS issues at all levels of the product life cycle: design, initial manufacture, repair, end-of-life deconstruction, logistics and transport, etc. They have the technical and financial means to do so, and ICTs are very effective tools for such an approach. The fear is that, reproducing the current model, they will subcontract a number of these operations to smaller companies without giving them the technical and financial means to implement an effective occupational risk prevention policy. In such a case, at all levels, many risks may emerge which may be very difficult to deal with. Conducting a responsible environmental policy is not necessarily synonymous with virtue in terms of OSH and the State, which in this scenario is reduced to a supporting role, may not have the means to influence the policy of multinationals.

The second scenario is characterised by a slow and very gradual development of the circular economy: the gradual closure of borders has deprived the economy of a number of imported raw materials that had to be replaced. The adaptation of processes has sometimes been difficult. This policy requires the support of the population and in particular of the workers. The latter are largely involved in the transition: in particular, their know-how is regularly called upon. This context favours the taking into account of OHS issues as and when they arise, even if the temptation is sometimes strong to give primacy to production to the detriment of working conditions. The fact that the entire population is involved in this transition from the linear to the circular model makes things easier, since citizens shift their consumption patterns towards a more sustainable model and thus participate, at their own level, in the setting up of waste collection and treatment operations or the installation of repair workshops.

In the third scenario, there is no concerted policy for the development of the circular economy. The few initiatives benefit from few resources. There are therefore difficulties in guaranteeing the stability of manufacturing processes and a lack of rigour in the management of repair, deconstruction and recycling operations for raw materials, which potentially generate occupational risks. In view of the economic difficulties of the production system, parallel forms of the circular economy are therefore appearing, without any framework. Under these conditions, it is very difficult to put in place a real policy for the prevention of occupational risks. Ideally, they are handled at the scale of one or a few installations.

In the fourth scenario, the transition to a circular economy is promoted by two main players: a few companies that have an economic interest in it, for example to counter the scarcity of a resource, and individuals who join it out of conviction. For companies that make this circularity a commercial argument, it is important to display a corporate social responsibility, of which working conditions are a part. On the other hand, for individuals, the system put in place is essentially based on craftsmanship: it is therefore necessary to develop specific prevention measures. Given the diversity of situations and limited resources, this prevention of occupational risks remains confined to generalities.

Conclusion: preventing occupational risks in all sectors, regardless of the forms of employment

It is obvious that the transition from a linear production model to a circular model will only take place gradually. From an OSH point of view, this delay is rather welcome, as it can help to integrate prevention in new processes. We have seen that the new model will involve a profound change in the organisation of production, particularly with regard to the design and use of (secondary) raw materials. Evidently, it will be necessary to make sure that these new processes take full account of occupational risk prevention, but it is clear that for the moment, advances in robotics or ICTs are probably not enough to guarantee this in the future. In any case, technology in its broadest meaning is likely to play a major role in this transformation.

This paper has barely touched on the topic of outsourcing, but it is likely to be pivotal as concerns OSH issues in the development of a circular economy. In a transitional phase, large and growing operations such as sorting could be outsourced to external companies, since they are not part of the "core business" of the user enterprise. Similarly, maintenance and cleaning issues could be of particular importance with less stable industrial processes due to the greater variability in the composition of secondary raw materials used: this is also outsourced work. Regardless of the jobs and tasks involved, occupational risk prevention should still be considered right from the design phase.

Lastly, it must be stressed that correctly addressing an issue from an environmental point of view in no way guarantees success for OHS issues. The logic, the context and the working methods are different and the immediate interests can be antagonistic. In conclusion, the main challenge is to have OSH requirements taken into account in the design of goods on the same level as marketing, production and environmental concerns. The transition from a linear economy to a circular economy is a good opportunity to fulfil this aim.

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