The circular economy as a means of territorialisation of our European industry

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Abstract

This contribution essentially aims to highlight the contribution of the circular economy in territorial development and the new industrial strategy for Europe. We highlight the main challenges of the circular economy and present the main obstacles to its deployment today. Finally, we propose the establishment of a European industrial and territorial ecology.

Keywords: circular economy, Europe, industrial and territorial ecology.

1. Introduction

Some 3 billion consumers in emerging countries are expected to join the middle classes by 2030. Due to the scale of this wave and its unprecedented impact, companies find themselves caught between rising and increasingly unpredictable commodity prices on the one hand, and competitive inflation and uncertain demand on the other. The turn of the millennium marked the point where the rise in the real price of natural resources began to erase a century of decline. The greatest economic crisis since 1929 slowed consumption for a time, but by 2009 prices had rebounded faster than global economic output. The time when we could ignore the cost of resources is over.

In the face of price volatility and even fears of depletion of reserves, there are increasing calls for a new economic model. And some companies are questioning the assumptions underlying the way they manufacture and sell their products. To avoid losing control of valuable natural resources, they are finding innovative ways to reuse products and components. Their success raises new questions. Can economic growth be decoupled from resource constraints? Can an industrial system be "regenerative"?

We can find an answer in the circular economy (Lieder & Rashid, 2016 ; Stahel, 2016 ; Geissdoerfer, 2017). The characteristic of a circular economy is to replace one postulate, that of the disposable product, by another, that of a restoration. Fundamentally, this aims to move away from "extract, make, consume, throw away" by designing and optimizing products for multiple cycles of disassembly and reuse.

The effort begins with raw materials, which are considered valuable stocks to be reused, not items that circulate once in the economy (Bruel et al., 2019). Circular economy aims to eradicate waste, not only in manufacturing as in lean management, but systematically throughout the multiple life cycles of products and their components (often what is considered waste can provide the material for future use stages). It is these close cycles of return and reuse, and a product design that lends itself to them, that define the concept of the circular economy and distinguish it from recycling, which wastes large amounts of energy and labor (Zhu, 1998).

The objective of this paper is to highlight to what extent circular economy can be an answer to design differently a new industrial strategy. In the very short term, the

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priority is of course to minimise the catastrophic effects of the virus on our health system and the circular economy does not necessarily provide an immediate response (even if some are already thinking about recycling sanitary masks to reduce the shortage). But it is in the perspective of building a more solid, more resilient and above all more environmentally friendly economic system that the circular economy finds all its interest.

Our hypothesis is that the development of the circular economy in Europe makes it possible both to territorialize production and to promote the reindustrialization of our economy.

2. The advantages and obstacles of implementing circular economy

2.1 The circular economy to reduce our dependence on the outside world

The onset of the epidemic in China first showed the fragility of the globalized supply chains set up by companies. Many of the larger companies have found themselves blocked or hindered by the fact that their supplies were relying on suppliers located in quarantined areas. Following a recent study, the 1,000 largest companies in the world have thus found themselves with more than 12,000 establishments (factories, warehouses, etc.) located in quarantined and confined Chinese territories.

The most painfully glaring example is of course that of surgical masks. As Western countries sought to replenish their stockpile, they realized that they were almost entirely dependent on China for this material, which is strategic for the protection of the population.

This is where the circular economy comes in. It can help to limit this type of risk by reducing the dependence of economies and territories on external supplies of both raw materials and finished products. By using secondary raw materials (recycled plastic, etc.), a company can diversify its sources of supply and reduce its risk compared to its usual suppliers (Dubey et al., 2019). Similarly, by developing repair and reuse, it can reduce its dependence on imports and suppliers whose decision-making centres are often far away from Europe.

However, the challenge of the circular economy goes far beyond securing companies' supply chains.

2.2 Circular economy to reduce the extraction of raw materials

It is now scientifically established that there is a link between the impact of human activities on nature and the development of viral pandemics of the kind we are experiencing today. In a very detailed report, the WWF explains that the development of human activities (urbanization, industrialization, deforestation for the benefit of agricultural land, etc.) has led to an increase in contacts between humans and virus-carrying species. Similarly, the reduction in biodiversity has led to the disappearance of species that could act as "buffers" between us and viruses. As the WWF states, "it is no coincidence that many recent outbreaks originate in markets selling a mixture of wild and domestic animals, mammals, birds and reptiles".

The protection of biodiversity and natural areas calls for vigorous solutions to prevent the ongoing disaster and, in particular, to try to prevent these "leaps" of viruses from wild species to humans (Buchmann-Duck & Beazley, 2020).

Here again, the circular economy can play an important role. For example, by developing the reuse of electronic devices, we reduce the production of new equipment, thereby preserving the drain on natural resources. Similarly, by supporting the recycling of these devices, we can recover metals and components whose extraction poses many environmental problems. For example, it is estimated that nearly 7% of the world's gold stock is now contained in the waste electrical and electronic equipment that piles up in landfills around the world. By reducing the need for "primary" raw materials, i.e. those directly extracted from nature, the circular economy contributes directly to reducing the pressure of human activities on natural areas and thus on biodiversity.

2.3 The circular economy to fight global warming

We are all obsessed today by the Covid-19 crisis, which is perfectly normal as its consequences are likely to be profound for our societies. However, the major challenge of our century remains that of global warming, the impact of which could well be much more negative and much more lasting (Muray et al., 2017). It is also striking to note that, although containment policies are significantly reducing CO2 and other greenhouse gas emissions around the world, this reduction is limited and will not be enough to avoid the worst-case scenarios predicted by scientists.

If the confinement of almost half of the planet is not enough to reduce CO2 emissions sufficiently, it is proof that a deeper paradigm shift is needed to meet the objective of zero emissions in 2050 and thus keep the warming target limited to 1.5°C.

Switching to decarbonised energy will only reduce" 55% of current emissions. To take care of the rest, the deployment of a much more circular economy is certainly the most promising avenue. The Ellen MacArthur Foundation's report[1] on the subject shows that by applying a circular model in just 5 sectors (cement, aluminium, steel, plastics and food), we could eliminate almost 25% of global CO2 emissions. The extraction of raw materials, which is necessary to produce new materials, and the production of new goods are among the most CO2-intensive activities. Let’s note that this foundation is an independent organization that works with business, academia and government to accelerate the transition to a circular economy (box 1).

Box 1. The role of the Ellen MacArthur Foundation to develop circular economy

Ellen MacArthur made history in 2005 when she broke the single-handed round-the-world sailing record. She now leads the Ellen MacArthur Foundation,

"When you embark on a round-the-world sailing trip, you know you have so much food, so much fuel. And you become incredibly connected to those resources. As you see their levels drop, and you're 2,500 miles from the nearest port, you really understand what the word "limited" means. I've realized that our global economy is no different - that it operates on limited resources at the end of the day - and that this is a much greater challenge than sailing around the world. Our global economic system is based on extracting something from the ground and transforming it into something else, and then the raw material, or the product it goes into, is finally thrown away. In the long run, this cannot work. Once you have

[1] https://www.ellenmacarthurfoundation.org/assets/downloads/Completing_The_Picture_How_The_Circular_Economy-_Tackles_Climate_Change_V3_26_September.pdf

finished a round-the-world boat trip, you can refuel and leave again. But this is not possible on the scale of the global economy.
One of the most striking things I've learned from talking to analysts and investors is that it took just ten years to erase a century of falling commodity prices. This rise in prices and their greater volatility means that discussions with companies very quickly turn to questions of efficiency and the need to use less energy in manufacturing. Companies are receptive because they are aware that the pressure on commodity prices will be even greater with the arrival of 3 billion new middle-class consumers in emerging markets. A few adjustments to the system will not be enough: it's a matter of rethinking how the economy can function in the long term. When we set up the foundation in 2010, our aim was, first and foremost, to demonstrate through analysis the economic validity of the circular economy. Then, in order to work with companies, we created the platform "The Circular Economy 100", which brings together major groups such as Coca-Cola, H&M and Unilever, emerging innovators, SMEs and regions. Finally, we are cooperating with a number of universities in Europe, the United States and India, and next year in China and Brazil. We see ourselves as a catalyst of a great system. In the first two years, we have seen the "circular economy" move from a stage where it was just being practised to one where it is becoming a mainstream, and we are happy to have helped it gain credibility. We are now in a phase where companies need to get started and get more value out of it. And the sooner this happens, the sooner everyone will follow. Nor is it something that will take fifty years. It can go - much - faster. »

This text is adapted from an interview with Tim Dickson of McKinsey Publishing. The full video of the interview, "Navigating the Circular Economy: A Conversation with Dame Ellen MacArthur," is available at www.mckinsey.com

2.4 Circular economy: what are the obstacles?

There are many obstacles to this transition. The first is of course the question of price. Throw away, not worrying about the second life of a product is often cheaper for a company. Similarly, "primary" plastic, directly from the para-oil industry is often cheaper than recycled plastic, depending on the evolution of oil prices.

However, the price dimension should not be overestimated: often the circular economy is an opportunity to make savings (by buying cheaper or reducing landfill costs), or even to generate new resources by recovering what was previously considered as simple waste.

The sticking points are mainly due to the reluctance of the existing players to change, the scale of the changes to be made and the cost of the related investments. It is indeed a question of completely rethinking the way in which a product is designed to anticipate its second, second and third life... It is therefore sometimes necessary to review the materials used, find other companies that can reuse them, set up a second-hand channel, etc... This represents a considerable change that can put off many companies that have a lot of other things to manage elsewhere.

Nevertheless, we are convinced that the current crisis will force each of us and each company to rethink its relationship with the world and the planet and that mentalities are now ready to change. A recent study that uses focus groups with consumers (Sijtsema et al., 2020) shows that even if some of the respondents did not have a clear vision of what the circular economy was, people felt that they could play a new and

more active role in consumption. They asked for more awareness of the sustainable use of resources based on the circular economy.

Moreover, let's not forget that the circular economy can be a tremendous source of growth and jobs in what are likely to be complicated economic times (Horbach et al., 2015 ; Schroeder et al., 2019). Continuing in the only logic "extract / produce / consume / throw away" leads us directly to the wall. The coronavirus crisis is an opportunity to launch a new, more robust and resilient business model.

3. Towards the establishment of a European industrial and territorial ecology

The concept of industrial ecology first emerged within a scientific community of engineers, as can be seen from the origin of N. Frosh and R. Gallopoulos (1989), the two authors of the first article referring to it. Based on a systemic approach, industrial and territorial ecology (ITE) is an operational approach that draws on natural ecosystems to strive for optimal management of materials and energy: the industrial system can be considered as a particular form of ecosystem.

Thus, like the functioning of food chains in the natural environment, the waste and co-products of one activity can become a resource for another activity. Companies can reuse their production residues (vapours, co-products, exhaust gases, effluents, waste, etc.) among themselves or with local authorities and thus limit pollution, resource extraction, waste production and energy consumption.

In addition, the ITE makes it possible to establish partnership relations and encourage exchanges between economic and industrial players while promoting local economic development and the consideration of environmental issues.

The name "industrial and territorial ecology" comes from several contrasting notions that mean:

1) Ecology: scientific ecology, study of ecosystems
2) Industrial: industrial society as a whole (production, consumption, agriculture, transport, etc.)
3) Territorial: an approach that is delimited and anchored in a territorialized space

Whatever the vision adopted, many agree that industrial ecology is a territorial approach. Indeed, the strategies by which it becomes operational only make sense and have economic and environmental rationality if they are deployed locally. The analogy with the functioning of natural ecosystems also calls for a localised consideration of the different actors of the industrial ecosystem, if we refer to the principle of locality according to Korhonen (2004). Locality is one of the four principles considered in the analogy with natural ecosystems, the other three being flow looping, diversity and the notion of progressive evolution. The term "locality" refers to the use of local resource consumption, taking into account local environmental constraints and limiting the impact of activities, as well as cooperation between actors.

The objective is to encourage collaborative dynamics and the implementation of concrete and shared actions. These actions are seen as synergies between economic actors. They are of different types:

1) Sharing and pooling - These strategies consist of pooling goods, resources or services, thus enabling economies of scale and reducing some of the environmental impacts of economic activity.

For example: waste management, reuse of rainwater, security guards, collective catering, crèches, inter-company travel plans, vehicle sharing, etc.

2) Flow trading - These strategies consist of valuing the externalities issued by certain companies from other neighbouring entities.

For example: industrial waste water, heat, waste, co-products...

Exchanges of flows may require the presence of interface activities to allow the valorisation of by-products, the development of products or services, the management of a common resource...

ITE is a perfect response to the challenge of ecological transition in territories through its innovative, systemic and transversal approach to the optimization of material flows (water, energy, waste). Industrial ecology provides a global and integrated response by proposing to draw inspiration from natural ecosystems, characterised by optimal recycling of matter and energy, to reorganise the industrial system in a viable way.

ITE is a mode of organization set up collectively by several actors. This approach is characterized by an optimized management of resources (water, energy, materials), a strong recycling of material and energy on the scale of an area, a territory or simply between two companies. This may involve, for example, the sharing of infrastructure, equipment (heating networks, production tools or spaces, etc.), services (collective waste management, inter-company travel plans, etc.) or materials (production waste from one company may be used as a secondary material by another).

4. Conclusion

Our paper highlights the double interest of circular economy: (i) to territorialize production and (ii) to promote the reindustrialization of our economy. We advocate the need to move from the linear to the circular model. If this is done, the benefits for the European economy and its industry could be of different orders:

1) savings in raw materials. On a global scale, net savings on raw materials could reach $1 trillion per year. For the European Union, the annual savings for products with a moderate lifespan could reach 630 billion dollars. They would be most significant in the automotive industry ($200 billion per year), followed by the machinery and equipment sector;

2) less risk on supply. Applied to steel consumption in the automotive, mechanical engineering and transport sectors, a circular transformation would result in a net global saving of 110 to 170 million tonnes of iron ore per year in 2025. This could reduce the volatility of demand in these sectors;

3) increased potential for innovation. Redesigning materials, systems and products is a fundamental requirement of a circular economy. It is also a huge opportunity for companies to innovate, even in product categories where it is not normally expected, such as carpets;

4) job creation. According to some estimates, repackaging and recycling already accounts for about one million jobs in Europe and the United States.

Concentrating public effort on these four levers would have a decisive systemic effect. The EU could address the issue of raw material flows, which are the most universal industrial asset. The ultimate goal would be to close the loops and reach tipping points where raw material flows would return to the system, with high volumes and high quality levels, via well-established markets. The creation of pure material stocks would help companies to start this process while giving them strong incentives to innovate. Industrial and territorial ecology is another important point

that the EU must keep in mind when designing its strategies for a greener and more virtuous Europe.

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