

CITIES IN THE CIRCULAR ECONOMY: NEW MODELS FOR MANAGING MATERIALS
AND DRIVING GREEN GROWTH

FOURTH INDUSTRIAL REVOLUTION AND CIRCULAR ECONOMY: **FASTEN YOUR SEATBELTS**

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Fasten your seatbelts

The waste management industry, the recycling sector are getting into a serious disruption and full of turbulence area.

The current business models will suffer because the digitization of everything will transform operations, competition and material flows.

New business models, powered by artificial intelligence and big data systems are already disrupting the industry.

Robots are already outlining the possibility for a jobless recycling.

Driverless waste collection is already tested. 3D printers are already working for plastic recycling.

But, in this turbulent world, there are signs of hope.

The magnificent advances of the fourth industrial revolution create, for the first time in our history, the possibility that Circular Economy will become the rule and not the exception.

And, as I will explain later, Cities can be the Change Catalyst that will stimulate a global movement towards a Wasteless Future. Well, fasten your seatbelts, but keep driving through the turbulence, exactly as C40 has learnt to do.

The Old Model in Crisis

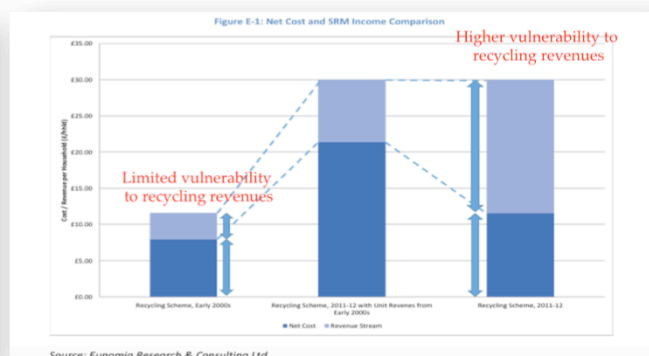
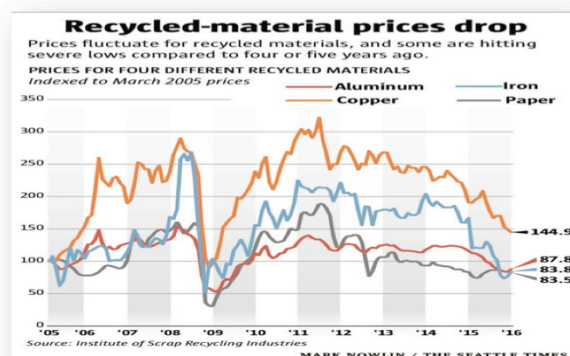


The old model of managing the waste with end-of-pipe solutions and big infrastructure has already finished in the developed world. We do not want to believe it, we prefer to suffer from the solution delusion, the feeling that what we have done up to now is more or less good enough for the coming period too.

We prefer to face the problems as isolated incidents, occurred due to local mistakes and particularities, rather than as pieces of the emerging disruption puzzle.

But, let's think about it. In Europe, the most advanced countries, that are famous for their long-term planning, are suffering by overcapacity, which means that the infrastructure in place is capable to treat much more millions of waste than it is currently available. In order to protect investments of billions of euros, the EU is thinking seriously to create a more or less free movement of waste from one country to another, thus exports of treated waste will become the rule and not the exception. In UK, facilities shut down because they are not able to deal with the changes in waste composition. In USA, there is an ongoing debate about the viability of recycling programs and MRFs, a debate directly linked with the high volatility of recycling markets.

The End of Recycling as we know it?



We are used to speak about problematic and volatile recycling markets, but we need to understand that recycling markets are seriously disrupted, not simply problematic.

They are disrupted by their direct linkage with the global commodities markets. We tried hard to make secondary materials an integral part of the commodities markets, and now we do not know how to make recycling programs viable with the current level of prices.

Recycling markets are disrupted by the shifts in supply and demand. As China, India, and Brazil have shifted to develop their domestic recycling markets, we face a hard time to identify proper buyers for the ongoing recycling programs. At the same time, our waste management systems have become more vulnerable to the recycling revenues. In 2000 recycling revenues were roughly 1-2% of the waste management costs in UK, today they are 15-20%, so any ups and downs in global markets results in viability problems.

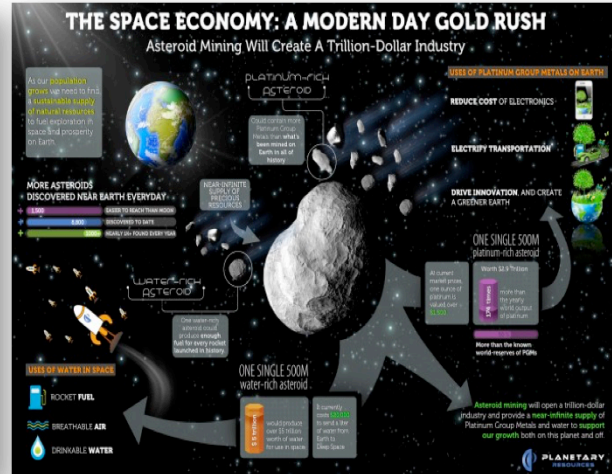
But this is not the end of recycling – it is the end of recycling as we know it. It is the end of cheap, dirty and low value recycling programs. It is also the beginning of the era of highly selective, pure materials recycling markets. The Era of Circular Economy, in which recycling is not the best option, but a rather low level solution comparing to waste prevention, reuse and repair practices. In this view, driving dirty mixed recycling in higher and higher rates, it is like keeping a baby crawling, while the baby has to learn to walk.

The Disruptors

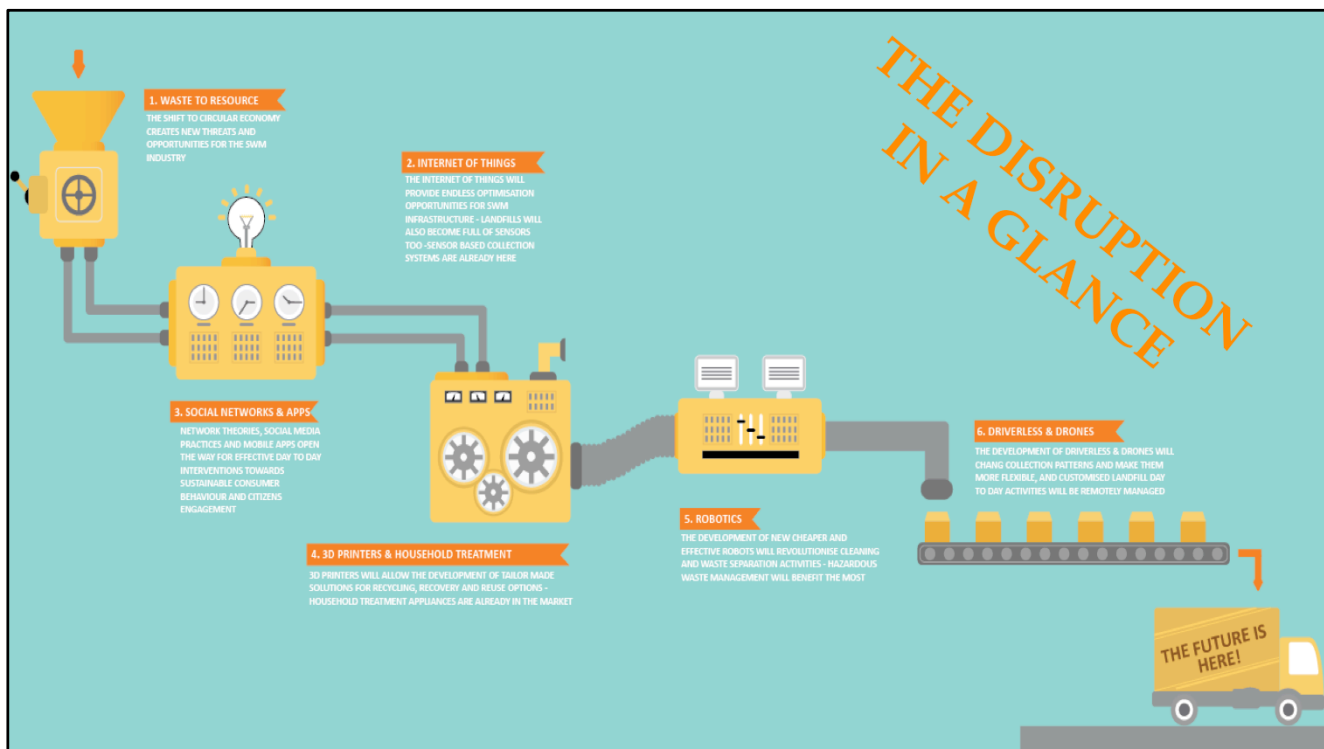


Some people believe that the major disruptor is the Circular Economy concept. I believe this is just a tree in a big, miraculous, as well as hopeful and risky forest.

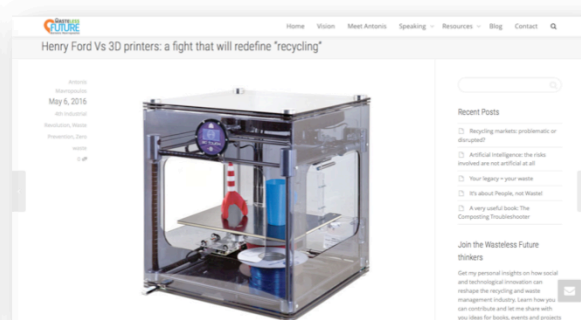
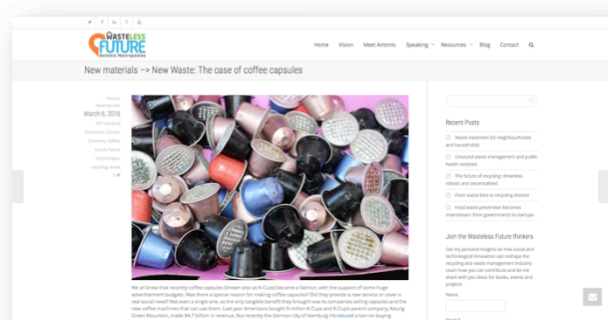
But see Apple's Liam, a robot that can dismantle 1.2 million iPhones and iPads per year. Think what will be the impact of Volvo's robotic waste collection without human intervention with the bins. Imagine the impact of driverless waste collection. Study the impact of the digital platforms like Rubicon and the RFID tags in the markets and the daily habits of citizens. Follow up the hundreds start-ups that create disruptive innovation for food waste and by-pass the traditional players dealing directly with the citizens and the waste generators. Watch the informal recyclers in Dar es – Salam working with 3D printers for upcycling plastic recyclables. The Game Changers are already here and most of them have few direct relations with the traditional waste management and recycling sector. They bring software developers, big data providers and artificial intelligence applications. And, you know, whatever becomes digital is sooner or later transformed in a magic and usually unpredictable way. We saw it with the media and cinema industry, we live it with the taxi drivers, we notice it with the booking and travel industry, we are going to see it with the reshaping of the automotive industry in the next years. Is there anyone who seriously believes that the waste management sector will be an exception?



Well, I think my main message becomes more clear if you compare what happened in December 2015 in EU and IS. While the EC was approving the ambitious Circular Economy package that was driving a rather radical rethink – remake and reboot of the way we manage resources, the US Congress was approving a bill that allowed US companies to extract resources from asteroids. So, here is my second message. The technology advances of the fourth industrial revolution allow us both options. So, are we going to use them to deliver Circular Economy and a shift from Waste to Material Resources or we are going to use them to continue the business as usual linear model that drives resource depletion? Are we going to develop closed loops or we are going to search for resources with a new Space Race? The case is open.



Wasteless or **Wasteful** Future?



There are two ways to work with the advances of the fourth industrial revolution. We can use robots for better working conditions and less hours of work in waste collection, in recycling plants, in sanitary landfills. We can use sensors to monitor the life-cycle of each and every product that involves crucial resources or hazardous waste. We can use 3D printers to end plastic pollution. We can use driverless cars to drive customized, on demand collection that will drive behavioral changes. But we can also use robots to create a Jobless future and make the end of pipe solutions cheaper and easier, making waste disposal more attractive instead of minimizing it. We can use sensors to drive more consumption instead of preventive maintenance and life-cycle extension. 3D printers and drones can be part of the future e-waste tsunami, if they are to be designed with the same built-in obsolescence that mobile phones have. And, we can use driverless collection to strengthen the wrong attitude to citizens: out of sight – out of mind, it's not your business. Clearly we can follow a path towards a Wasteless Future or we can continue towards a Wasteful Planet. The choice is up to us and the role of Cities is probably the one that will determine what will be the outcome.

We need an **Urban** Circular Economy

- ❑ The challenge of local closed loops
- ❑ IoT and Product Life Cycles
- ❑ Hybrid, optimized and on demand
- ❑ Robotic but not jobless
- ❑ Communities, networks and sharing economy

The Circular Economy either it will be urban or it will not exist. Cities hold the keys to deliver and stimulate a Wasteless Future for three reasons:

1. Governments are too big and too slow to adapt in the rapid changes.
In contrast cities have to manage our daily lives, thus they are capable to understand in time the emerging changes and they try to adapt on them immediately
2. Circular Economy should involve global and local supply chains.
Without local closed loops, Circular Economy will never touch and shift human behavior. The development of local closed loops, especially in organic fraction, is cornerstone of the shift towards Circular Economy.
3. Communities have the major role in advancing sharing economy business models, in driving reuse and prevention patterns and human networks will finally determine the viability of any shift to Circular Economy.

The IoT and the revolution of sensors open new unimaginable ways for optimization and customization – big data reveals new patterns and provides new views for old problems.

An Urban Circular Economy should deal with its social footprint. We need a Circular Economy that will advance robotic but not jobless services. We need a Circular Economy that will serve the individuals with tailor-made solutions, and at the same time it will boost community involvement and sharing economy.

Urban Hopes for Climate Change

- ▣ Cities as Complex Adaptive Systems
- ▣ Social & Technical Innovation
- ▣ Laboratories and backyards

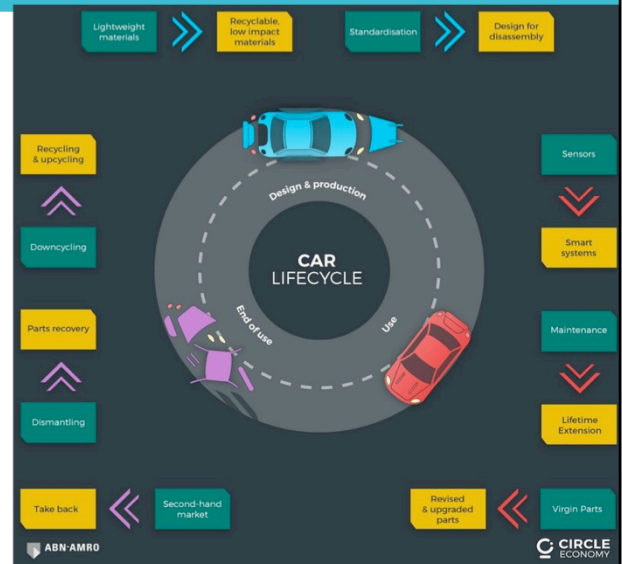


I went through the Deadlines 2020 report and I really support its main message. The fight against Climate Change will last for years, but if we want to keep the temperature increase below 1.5 degrees, we must focus on delivering substantial changes within next four years, until 2020. But there is hope that we will deliver the social innovation required in order to be able to use the plethora of technical innovation around us. Cities are the hubs of human creativity, the centers of innovation and we should be hopeful that the combined human interaction in urban centers will deliver, as it has already done. All of us admired the efforts that were presented in the C40 city awards yesterday, a tangible proof that cities are already preparing the future.

Efforts towards the Circular Economy can deliver upfront results and support the overall efforts to bend the curve. But, first, we need to shift our attitude. Sometimes, there is tendency to discuss about the contribution of waste management underestimating its potential to GHGs reduction to 5-7%. But 50% of the GHGs are related to materials. Forget waste and think about materials. If we manage to reduce the the materials related emissions by 20-30%, then we will have done a huge step forward. The future of Circular Economy is already prepared not only in MIT labs, but also at the backyards of

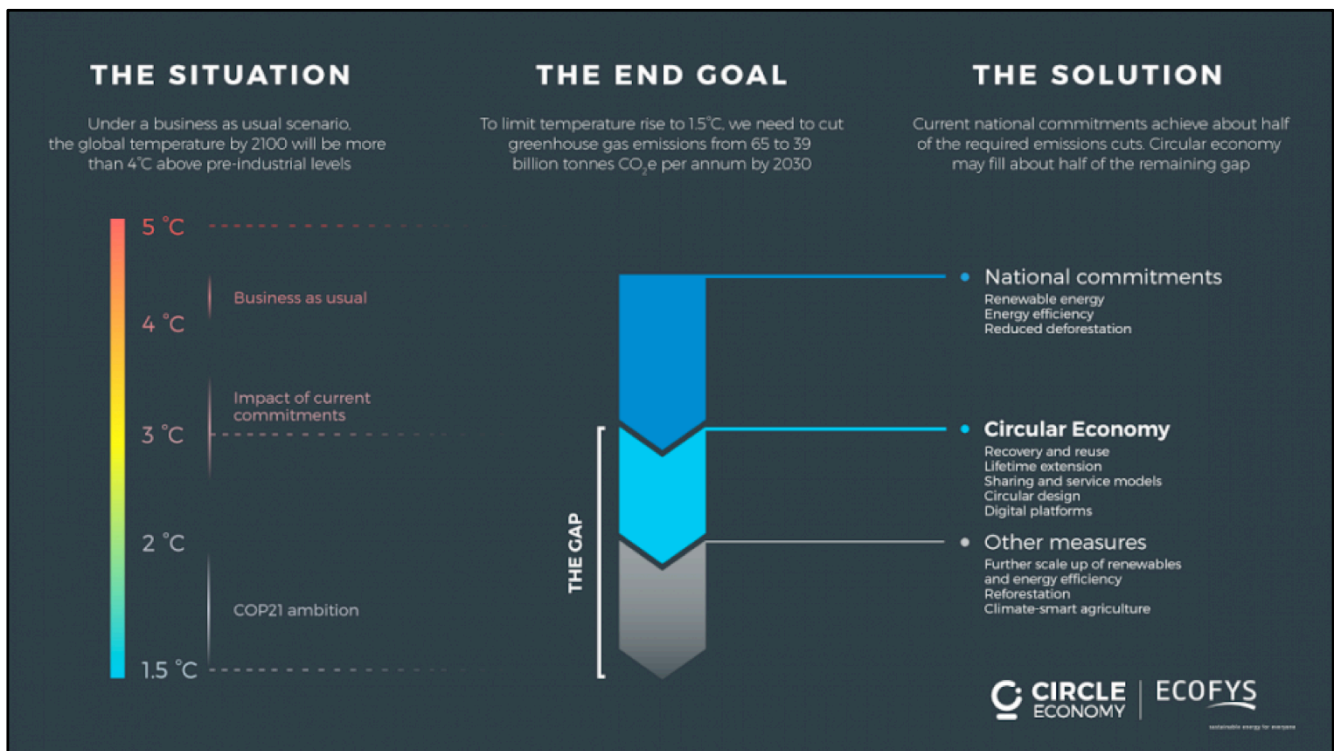
How Circular Economy can massively reduce CO2 emissions ?

- Do more with less: the 7% challenge
- Substitute carbon intensive materials
- Domino effects: Extraction → Consumption
- Efficient use of energy
- Digital disruption



So, let's see how Circular Economy can drive massive GHGs reductions

1. 60bn tonnes of raw materials are extracted from the earth annually. Of all these raw materials used by the global economy only 7% are reused. Cities should drive reuse and waste prevention
2. Typical climate policies focus on reducing emissions e.g. per ton of cement produced (5% of the global emissions). We have to think beyond that, for safe alternatives and/ or substitution of concrete or designing modular buildings. An example of this forward thinking approach is Park 20|20, a business estate in Amsterdam that is built with modular materials so that they can be reused indefinitely. Alternatively we can use low- carbon alternative materials like Cross-Laminated Timber (CLT) to construct skyscrapers such as the proposed 35-storey Baobab tower in Paris.
3. As we said, 50% of the GHGs are related to the extraction, transport and processing of raw materials. Increasing circularity means reducing our dependence on raw materials and results in a reduction in the amount of energy needed to extract, transport and process these materials. That creates a domino effect resulting in exponential reduction of GHGs.
4. Although improved efficiency reduces costs, sometimes it also leads to increased demand. This a challenge that we have to manage in time.
5. We are getting into a disruptive age. Physical services are being replaced by online equivalents, effectively dematerializing services. This reduction in material use due to service delivery is optimizing resource use and maximizing value.



The emission reduction commitments made by 195 countries are a leap forward, but not yet sufficient to stay on a 2 °C trajectory, let alone a 1.5 °C pathway. Current commitments address only half the gap between business as usual and the 1.5 °C pathway. There is still a reduction of about 15 billion tonnes CO₂e needed to reach the 1.5 °C target. Further solutions are therefore needed; solutions that go beyond decarbonizing our energy system. Since over half of the worldwide greenhouse gas emissions are associated with producing basic materials, there is a clear role for circular economy strategies in reducing this gap.

A recent report estimated that the potential of circular economy is estimated to close half of the emission gap between commitments and the 1.5 °C pathway in 2030. If we are able to reduce the emissions related to materials with about 20-30% with circular economy strategies, we are already closing half of the emission gap between current commitments and the 1.5 °C pathway in 2030.

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The fourth industrial revolution will fundamentally alter the way we live, work, and relate to one another. In its scale, scope, and complexity, the transformation will be unlike anything humankind has experienced before. The waste management industry will not be an exception; it will be redefined too. In each and every industrial revolution the discovery of new techniques and new materials drives the creation of new types of products. Each and every new product, sooner or later becomes a new type of waste.

It's about People – not Waste

