



Circular Economy Lab & Observatory

2020-1-IT02-KA201-079994

# SUSTAINABILITY

Importance of redesign of products  
and processes for sustainability

**Croatia-6.2**



Co-funded by the  
Erasmus+ Programme  
of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.



# SUSTAINABILITY

Importance of redesign of products and processes for sustainability

Croatia-6.2

Every single one of us in our society is trying to adapt in the modern world, find solutions to modern problems, such as having a roof over our heads and having food on our plates. Often, that is the only thing our focus is on, the only thing we care about and we do not really consider what remains after us. The same applies for large manufacturers. It is hard to succeed, thrive and still think about long-term sustainability in this modern and capitalistically-dominated world. Namely, since the industrial revolution, the living standards of the working class have improved significantly, which at the time made up the majority of the total population.



Due to the previously stated reason, since the industrial revolution, the world population has increased substantially (from less than a billion in 1800 to a little under 8 billion in 2021 <sup>1</sup>), and consequently, the portion of the middle-class and low-class inhabitants has only gotten bigger. In order to provide living standards for the aforementioned population, the demand for basic materials the industry is based on has risen, and like the population, will only continue to rise (projected population of 10,35 billion in 2100 <sup>1</sup>).

At the other side, due to the collective indolence present in the industry, many production processes have remained fundamentally unchanged since their creation in the industrial revolution. The problem lies in the fact that during the time of the creation and development of most industrial production processes, the Earth was a very different place, speaking both ecologically and demographically. The earth has changed since then, but the industry mainly stayed the same.



Nobody gave a thought to the long-term consequences of the production processes and was only appealed by the short-term benefits of improving living standards and more importantly, financial profit and income. As we know ourselves, why change a habit if we feel good, comfortable and benefit from it? The same applies to the industry. All the short-term benefits have contributed to the reluctance to change in the production processes and product design for the common good.

Development has surely happened, but not for establishing sustainability and prolonging the life-span of manufactured goods in the future. The goal was mostly to increase the current quality of life and gain financial profit.

Some industries at the moment, like the aviation or naval industry, are so developed to mindlessly use expendable and important resources like fossil fuels so that not a single alternative is in sight, nor is it in their interest to change (worldwide fuel consumption of commercial airlines in 2019 was 95 billion gallons <sup>2</sup>).

As it goes by the principle “if it isn’t broken, don’t fix it”. The goal for development was wrong and was living in the “now” and not thinking about “later”.

All products have their life cycle which starts with design and ends with disposal, and so far, the life of the product after disposal wasn’t given too much thought, because it didn’t really affect anyone.

This is the part that needs redesigning in order to make life on this planet bearable for future generations.



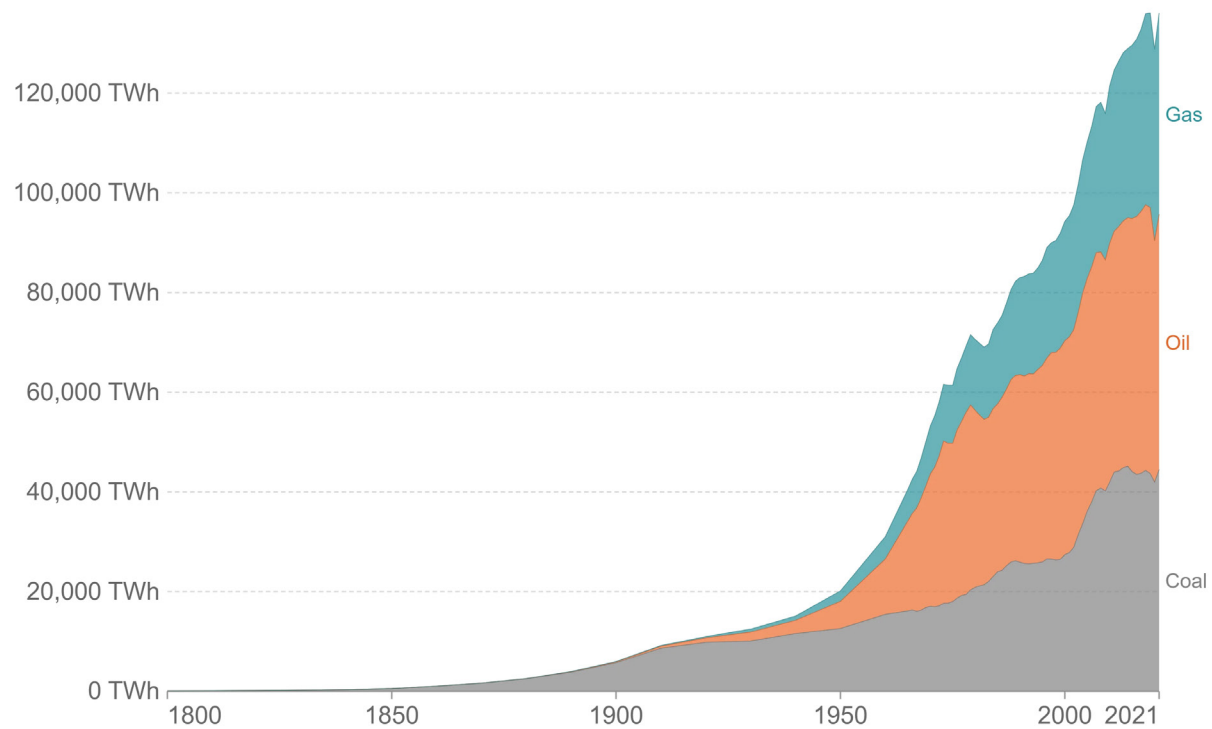
A chemical production plant (<https://unsplash.com/photos/c7RWVGL8IPA>; free to use under the Unsplash License)



## Global fossil fuel consumption

Global primary energy consumption by fossil fuel source, measured in terawatt-hours (TWh).

Our World  
in Data



Global primary energy consumption by fossil fuel source, measured in terawatt-hours  
(<https://ourworldindata.org/grapher/global-fossil-fuel-consumption>; Creative Commons BY license)

Many of the core resources have remained the same since the start of modern industry, such as fossil fuels and metals, and none of those resources are infinite (by some estimates, only “47 years of oil left, at current consumption levels”<sup>3</sup>), in addition to the use of fossil fuels causing the greenhouse effect. For now, all the resources we have are the ones stored on Earth, and once we use up all of them, they won’t disappear, because no mass can disappear. Instead, they are going to be stored in already processed and manufactured products and it is going to be much harder to extract and process them than if the products were designed to be recyclable.





That is why we need to stop utilizing new resources, and start redesigning products so once their usable life-span is over, they don't have to be thrown away, functionally "locking" the resources used in the product.

Resources are valuable, and it could be said we depend too much on a single resource like oil. Oil is used, of course, for fuel, but also for many other mandatory products like plastics, rubber, surfacing roads, medications and drugs etc. And as we all know, these are basic materials, without which we could not imagine everyday modern life as it is.

The same goes for many other building resources like metals, concrete etc. Moving away from these resources and finding alternatives would require a ground-up change in the process of everything we know, much harder than redesigning current products to make them more sustainable and suitable for the future.



Of course, one of the biggest problems is the use of fossil fuels in transport. There has been development in fuel efficiency, but the consumption hasn't stopped (around 40 quadrillion Btu <sup>4</sup>, 1 quadrillion Btu equivalent to 8007000000 US gallons of gasoline <sup>5</sup>).

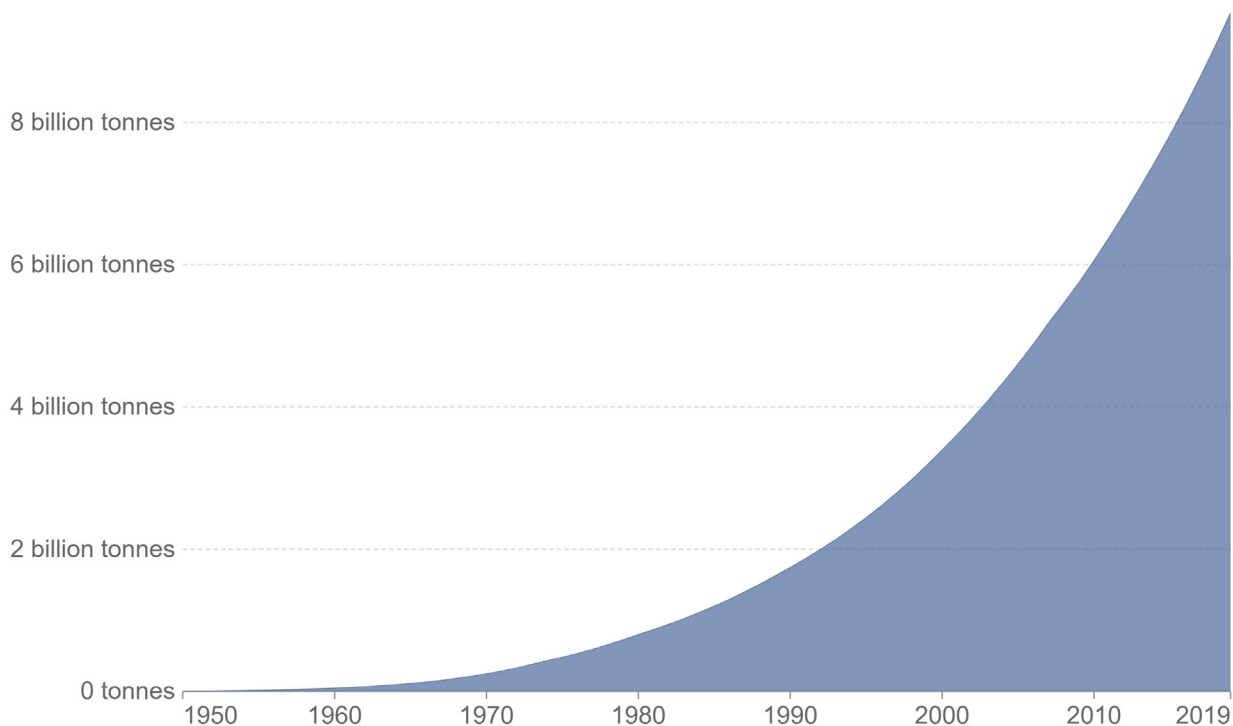
Many consider electric vehicles as a solution to this problem, but electric vehicles aren't perfect either. As we know ourselves in daily lives, an old phone can't hold a charge as well as it could when it was brand new, and electric vehicles are no different. They too use batteries which deteriorate over time and lose their capacity, so they have to be replaced. This, once again, creates the dependence on materials like lithium and various polymers to create batteries and creates waste.



## Cumulative global production of plastics

Plastic production refers to the production of polymer resin and fibers.

Our World  
in Data



Global plastics production  
(<https://ourworldindata.org/grapher/cumulative-global-plastics>; Creative Commons BY license)

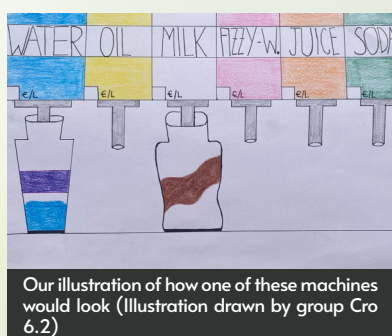
Old electric vehicles are harder and more dangerous to handle than fossil-powered ones, and recycling of old batteries is still not a widely spread process, as it is for some other, more conventional materials. Another problem is the overuse of plastics in packaging. Packages are designed to be opened once, thrown away and in most cases, not given much thought during design about what happens to them after the moment they are opened. They usually use multiple different materials and are constructed in such a way that makes them very hard and in nobody's interest to recycle.

One of the most problematic materials is plastic and some of the first examples that come to mind are plastic bottles, straws, cups, cans, wraps, bags etc. – anything disposable (of all the industrial sectors in 2015, packaging generated the most plastic waste with 141 million tons <sup>6</sup>).

There are two solutions – we could stop relying on resources we’ve been relying on since the start of industry and create alternative production methods that exploit a different resource, but this only delays the problem and moves it to a second resource – or we could solve the problem altogether and start using materials that are easier to reuse as a resource – a resource we “generate” ourselves.



In most cases, the first solution isn’t the best, but for instance, completely removing or redesigning single-use packages made of them could be a good solution. Product redesign is defined as “material substitution, redesign of the product to simplify assembly, etc.”<sup>7</sup> An alternative for plastic bottles which are nowadays overused could be a new way of selling various fluids and drinks that are usually sold in them.



A possible solution is to install machines that allow people to refill their containers with the aforementioned liquids such as water, milk, juices or any other liquid, which would, again, otherwise be sold in plastic bottles. By introducing this method people wouldn’t be forced to buy unnecessary plastic packages. These stations would ideally be placed in grocery stores or any other places that are easily accessible. A great example of large-scale product redesign is McDonald’s.

A worldwide fast-food company, which has, as many other large companies, already made a step to improve sustainability. McDonald’s has showed the world that it can be done by replacing their usual design of packaging and food containers with more eco-friendly alternatives. These new packages are usually made of paper which is a much better option than plastic, because not only can it be recycled much more easily, but even if not recycled and thrown away, it can decompose much quicker than plastic. Normally, plastic items take up to 1000 years to decompose in landfills.

But plastic bags we use in our everyday life take 10–20 years to decompose, while plastic bottles take 450 years<sup>8</sup>, meanwhile on average, it takes paper approximately 2–6 weeks to decompose in a landfill<sup>9</sup>. There is another option, even better for the environment, but a bit more radical. Grocery and shopping bags should be made exclusively and entirely out of fabric so we can reuse them.

If we want this new system to function, we need to change our mindsets and be aware of the ways that these conventional materials, which we are all – too – well used to, influence our life on Earth.



Only that kind of psychological change can encourage our daily routines to change. Another example of large corporations' focus on only economical profit are chips bags, in which usually the amount of food is only a fraction of the total volume of the bag. At first, this is inconvenient because it doesn't contain as much product as people expect, but the main issue is the creation of significantly more waste, than if the packages were designed more efficiently.



An example of a single use and refillable container (Photo taken by group Cro 6.2)

If manufacturers seek package designs that protect the product from being damaged (in this case chips being crushed), they shouldn't settle for the cheapest option, which coincidentally creates more waste, and instead put more thought in creating more recyclable packages, regardless of the production price. Again, a solution for this specific case, would be designing air – tight packages or boxes constructed with paper, which would be stronger than soft plastic bags.



An example of a redesigned package, from plastic to paper (Photo taken by group Cro 6.2)


We have come to the conclusion that due to high utilization of nature and its resources; if we want to survive as human kind, we are going to have to make some changes to many processes and products that make up our daily lives. Product redesign is inevitable if sustainability is a goal. Primarily, redesign should reduce environmental impacts, and secondarily, during redesign manufacturers have the opportunity to improve the quality of their product, extend its lifespan and even reduce manufacturing costs. And it's not like there is nothing being done about it.

With the recent rise in importance and dependance of large corporations' public images on their outlooks on sustainability, culminating in the ESG index <sup>10</sup>, many companies, just like aforementioned McDonald's have taken some steps to improve their environmental impact. Motivated by this, another company making changes for sustainability is Apple – who have started using more paper (and of that more recycled paper) in their product boxes and stopped providing unnecessary chargers with every phone, justified by the assumption that people usually have multiple chargers from other devices (which are not a simple product to recycle).

A second example is Formula 1 – which at first – racing cars burning fossil fuels – doesn't seem so environmentally conscious.







But FI has introduced many measures to reduce its environmental impact. Since 2009, and further enforced in 2014, FI cars have started using hybrid engines (alongside the conventional combustion engine, electric motor providing power), and this year, 2022, the fuel powering the cars is composed of 10% ethanol, a much more sustainable fuel.



It is further planned to use 100% sustainable fuel by 2026, and to reduce the carbon footprint in transportation and freight by 2030 with the Net Zero Carbon campaign. And with many developments from race cars making their way into road cars, the sustainable fuels, compatible with normal combustion engines could be used in road cars in the future, as shown in Great Britain and their introduction of E10 fuel in 2021 <sup>11</sup>.

Of course, we can't expect drastic changes to immediately take effect and that is why many of these companies are gradually introducing changes to meet an absolute goal by a deadline year.

In the capital of Croatia, Zagreb, actions about separation of waste have already been taken. In addition to the classic four different containers for waste separation (paper, glass, plastics and mixed waste) being redesigned and biodegradable bags for bio-waste being introduced a few years ago, more recently, redesigned garbage bags have been introduced city-wide so that the amount of waste can be controlled and reduced. The billing plan for waste management will be fairer and households will pay depending on how much waste they throw away, and not on a flat rate.



The new bags for mixed waste and biodegradable bags for bio-waste in Zagreb (Photo taken by group Cro 6.2)

“The more you separate the waste, the less you pay,” is the motto of this movement. It is hard to instantly change the ways of a large population, but it is a step in the right direction. A crucial factor for these effective changes is a responsible state or city government or authority, which acts upon for the sake of sustainability and enforces eco-responsible actions by law, ensuring that everyone has to comply, from big corporations to every citizen.

But also, in order to take any kind of action, every person has to be informed about and understand the problems and their influences on the future, so for these changes to become normal and widely accepted, as with presenting other ideologies to the wide public, authorities should reach and motivate the whole society to make changes by constantly talking about it and spreading awareness. A key factor through which these incentives would be presented would be the media we consume every day such as television, newspapers and news portals, social media etc.





## References:

- <sup>1</sup> – Max Roser, Hannah Ritchie, Esteban Ortiz-Ospina and Lucas Rodés-Guirao (2013) – “World Population Growth”. Published online at OurWorldInData.org. Retrieved from: ‘<https://ourworldindata.org/world-population-growth>’ [Online Resource]
- <sup>2</sup> – IATA (2019) – “Industry Statistics Fact Sheet”. Published online at IATA.org. Retrieved from: ‘<https://www.iata.org/en/iata-repository/publications/economic-reports/airline-industry-economic-performance-december-2019-data-tables/>’ [Online Resource]
- <sup>3</sup> – Worldometer (2016) – “Oil”. Published online at worldometer.org. Retrieved from: ‘<https://www.worldometers.info/oil/>’ [Online Resource]
- <sup>4</sup> – EIA (2016) – “International Energy Outlook 2016”. Published online at EIA.gov. Retrieved from: ‘<https://www.eia.gov/outlooks/ieo/pdf/transportation.pdf>’ [Online Resource]
- <sup>5</sup> – Wikipedia (2022) – “Quad (unit)”. Published online at Wikipedia.org. Retrieved from: ‘[https://en.wikipedia.org/wiki/Quad\\_\(unit\)](https://en.wikipedia.org/wiki/Quad_(unit))’ [Online Resource]
- <sup>6</sup> – Hannah Ritchie and Max Roser (2018) – “Plastic Pollution”. Published online at OurWorldInData.org. Retrieved from: ‘<https://ourworldindata.org/plastic-pollution>’ [Online Resource]
- <sup>7</sup> – Joseph Berk, Susan Berk (2000) – “Quality Management for the Technology Sector”. Retrieved from: ‘<https://www.sciencedirect.com/topics/engineering/product-redesign>’ [Online Resource]
- <sup>8</sup> – NEIC – “How Long Does It Take Garbage to Decompose?”. Published online at NEIC.org. Retrieved from: ‘[http://storage.neic.org/event/docs/1129/how\\_long\\_does\\_it\\_take\\_garbage\\_to\\_decompose.pdf](http://storage.neic.org/event/docs/1129/how_long_does_it_take_garbage_to_decompose.pdf)’ [Online Resource]
- <sup>9</sup> – Globe Conscious (2020) – “How long does it take for paper to decompose?”. Published online at GlobeConscious.com. Retrieved from: ‘<https://globe-conscious.com/paper-decompose-how-long/>’ [Online Resource]
- <sup>10</sup> – “Environmental, social and governance (ESG) is a term used to represent an organization’s corporate financial interests that focus mainly on sustainable and ethical impacts. While ethical, sustainable and corporate governance are considered non-financial performance indicators, their role is to ensure accountability and systems to manage a corporation’s impact, such as its carbon footprint.” – Sandra Mathis (2022) – “environmental, social and governance (ESG)”. Published online on WhatIs.com. Retrieved from: ‘<https://www.techtarget.com/whatis/definition/environmental-social-and-governance-ESG>’ [Online Resource]
- <sup>11</sup> – UK Department for Transport (2021) – “E10 petrol explained”. Published online at gov.uk. Retrieved from: ‘<https://www.gov.uk/guidance/e10-petrol-explained>’. [Online Resource]

## Bibliography:

Dr. Jean-Paul Rodrigue (2020) – “The Geography of Transport Systems”. Published online at [transportgeography.org](https://transportgeography.org). Retrieved from: ‘<https://transportgeography.org/contents/chapter4/transportation-and-energy/>’. [Online Resource]

Chris Busch (2017) – “Apple’s Paper and Packaging Strategy”. Published online at [Apple.com](https://www.apple.com/environment/pdf/Packaging_and_Forestry_September_2017.pdf). Retrieved from: ‘[https://www.apple.com/environment/pdf/Packaging\\_and\\_Forestry\\_September\\_2017.pdf](https://www.apple.com/environment/pdf/Packaging_and_Forestry_September_2017.pdf)’. [Online Resource]

Formula 1 (2022) – “F1 continues push to hit Net Zero Carbon by 2030 target”. Published online at [Formula1.com](https://www.formula1.com).

Retrieved from: ‘<https://www.formula1.com/en/latest/article.f1-continues-push-to-hit-net-zero-carbon-by-2030-target.7fGtPCNCwOnMFFt9YsIHAA.html>’. [Online Resource]

Formula 1 (2021) – “How Formula 1 is striving to create a 100% sustainable fuel”. Published online at [Formula1.com](https://www.formula1.com). Retrieved from: ‘<https://www.formula1.com/en/latest/article.watch-how-formula-1-is-striving-to-create-a-100-sustainable-fuel.IENHVTjKDbXNolidEJ8okc.html>’. [Online Resource]

Apple (2022) – “About Apple USB power adapters”. Published online at [Apple.com](https://support.apple.com/en-us/HT210133). Retrieved from: ‘<https://support.apple.com/en-us/HT210133>’. [Online Resource]

## GROUP

Lea Bartolović, Ana Ćurić,  
Lovro Komesar, Ante Tolj.