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Dear readers

A warm welcome to the first issue of JPR-Focus in 2023.

No advertisement seems to be complete without the word "sustainable". Is everything on offer today really sustainable?
A similar thing is happening with the circular economy. It is seen as the future way of doing business. But is it necessarily sustainable?

Such questions urgently need clarification. That is what we want to look at here.

I hope you have a good time reading.

Kind Regards
Yours Jean-Pierre Rickli

Sustainability – Circular Economy

1. Introduction

Not so long ago, everything had to appear in the colour green. The various exaggerations of the advertising departments gave this colour a very bad reputation. As soon as green was mentioned, the suspicion of a "green-wash" arose.

Today, you can find practically nothing - except the names of political parties - that is green, but everything is "sustainable". The advantage for the marketing departments? The colour green was still somewhat real and tangible. It could be directly associated with green nature. Everyone also had an idea of what nuances it could be and could have named them.

With the term "sustainable", one has already fully entered the domain of the virtual. Many might be of the opinion that they understand the term, but cannot describe it neatly. To give a reasonably clear definition of it is also illusory. A wonderful gift of words for the propaganda departments. You can wrap everything in it and you are never wrong. Well, voices are already rising who think that mischief is also being done with this word.

The realisation that we need to be more careful with our resources is coming through more and more in our society. That is wonderful. This means that everything should follow the example of nature in cycles. This is where the term circular economy comes from, as well as the current meaning of sustainability.

The cycles of nature, however, are multiply interlocked and coordinated. But our economic and production cycles are not, or at least not yet. We are only at the beginning. Is it then justified to describe a product whose entire life cycle is not known as sustainable? Would it not be more appropriate to call it something less polluting than its predecessor?

We will try to clarify this and other things in this contribution.

2. Fundamentals

2.1 What is the sustainability or being sustainable?

We are there already at the first problem.
There is an old but still valid and common definition in terms of the durability of a product or an effect, thus as a purely qualitative property of something. Instead of giving long definitions, here are a few examples:

- He left a lasting or durable impression with his speech. That means he and his speech will be remembered for a long time.
- This furniture is durable. In the past, such advertising meant that the furniture would accompany one or a couple until death.

Many advertising contents still refer to this understanding of the word and do so implicitly. Thus, it is up to the recipient of the message to interpret the meaning addressed. In this context, only the adjective "durable" is used, but not the noun "durability".

The term "sustainability" first appeared in the 18th century, explicitly for forestry and agriculture. In simple terms, it was meant to describe the result of an economy that would secure yields in the future. At that time, the understanding was rather limited to the concept of not harvesting more than what grows back.

It was only in the last few decades that the FSC label was created, extending the impact of forestry to the protection of fauna and native populations. Whether this is really the case is another story.

The words sustainable and sustainability are also understood and used accordingly today.

30 years ago, at a conference in Rio, these terms were expanded and given a three-dimensional meaning:

- An economically oriented meaning that implies business or economic stability,
- An environmentally oriented meaning that identifies sustainability with environmental justice,
- A socio-ecological meaning that defines sustainability as a bundle of ecological and social objectives.

Today, we still use these terms, sustainable and sustainability, in both the old and the new meanings, which also contain contradictions. Thus, they have degenerated into empty words. It is therefore clear: the recipient of the information has now the task of finding out which meaning applies in the specific case. This is a reversal of the basic principle of communication, according to which the sender is always responsible for the correct reception. Today, this is no longer the case.

One excuse given by many is that the topic is not easy to communicate or "to sell" and thus certain compromises are necessary. In view of this situation, some serious companies have decided to ban these words from their business messages. The propaganda departments of the other companies exploit these ambiguities all the more.

2.2 What is the circular economy?

We all realise that our current economic system with its three pillars - production, consumption, disposal - has reached its limits in a closed system like the Earth. The production side is having more and more trouble getting all the necessary resources to sustain the process. Many markets are so saturated that growth can only be sustained by more waste. On the end side of the process, more and more waste materials are produced. The earth has already degenerated into a rubbish dump.

To solve or at least mitigate the problem, clever minds have thought that the old products or even just parts of them could be re-injected into the production system. This is what the general term recycling stands for. Since everything has to be "sold" today, a suitable and marketable term had to be found: the circle was seen to be the right one, since the material circulates in an imaginary seemingly endless loop.

This idea was particularly well received because, from their tradition, people in the Asian region are used to think in cycles. The processes in nature are also based on this principle. Thus, the circular economy could be a good selling point for the expanding markets in Asia and for the environmentally conscious people.
The issue is, of course, much more complex and multifaceted than described in this way. It can also be realised in different ways. This was left open on purpose. After all, they are only "details". The propaganda departments did not miss such an opportunity.

2.3 The physics of cycle processes

This is a key topic for many mechanical engineers, especially those in the drives and energy sector. Two aspects are important in the context of the discussion taking place in this paper:

- Any transformation from a qualitatively lower form of energy - heat, chemical, radiation, etc. - to a higher form of energy - electrical or mechanical - requires work. This normally takes place in a working process that runs according to a process cycle, depending on the form of the incoming energy. The reverse transformation from a higher form to a lower one, however, happens by itself.
- Every real process has losses. A process with 100 % efficiency and thus without losses is called "perpetuum mobile". Corresponding patent applications are rejected today without further justification.

All processes in nature are subject to these laws, without any exception. In many cases, the losses are not noticeable because they are cleverly used via other processes and perhaps bring us an advantage.

Plants and animals, including us, get the energy to grow and live from food, air and water. Our main energy, solar energy, is actually the waste energy in the form of heat and radiation from the processes taking place in the sun.

Thus, any statement about a loss-free process leaves only two possibilities: either it is a lie or the person has no idea. Lying could possibly be punishable, stupidity and ignorance, on the other hand, are trivial in terms of penal law.

It is also often praised that nature does not know waste. This is true, because everything is used either as energy (food) or as working material for another process. For us, on the other hand, waste and losses are often synonymous. Think of "food-waste". Waste is what we cannot or do not want to use, and therefore lost money. In nature, on the other hand, it is not waste, but only input materials for the next natural processes. Nature does not use money.

Thus, it also becomes clear that even nature, which is so highly praised, is not neutral in relation to its environment. A tree changes its environment. Certain crops grow up, others disappear. If the tree disappears at the end of its life, the environment is different from when the tree seed was laid and this change cannot be completely reversed. A hole that has been created and later refilled is also traceable and thus archaeologically a contemporary witness.

The difference with human-induced processes is the time period. Ours run much faster and in much shorter time intervals. Nature is often overwhelmed by this.

This means that sustainability is not an absolute measure, at most as an ideal from which one can or should come as close as possible.

2.4 The processes: a qualitative consideration

2.4.1 The usual human processes (linear thinking)

The development dynamics of human ideas, innovations and inventions proceed in three basic phases.

The initial stage: Phase A which can be represented graphically as follows (Figure 1):

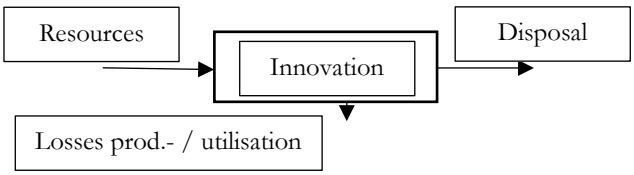

Figure 1: Development phase A of human innovations

In this phase, the idea is in uncharted territory. Its dissemination is uncertain, as is its scope of application. Thus, the need and use of resources are manageable and negligible compared to the available volume of resources.

The production and utilisation losses are small. This has to do with the fact that they are usually associated with costs or monetary values. In phase A, however, there is still some potential for optimisation.

In principle, disposal is similar to resources. The amount of disposal material appears negligible compared to the intake volume.

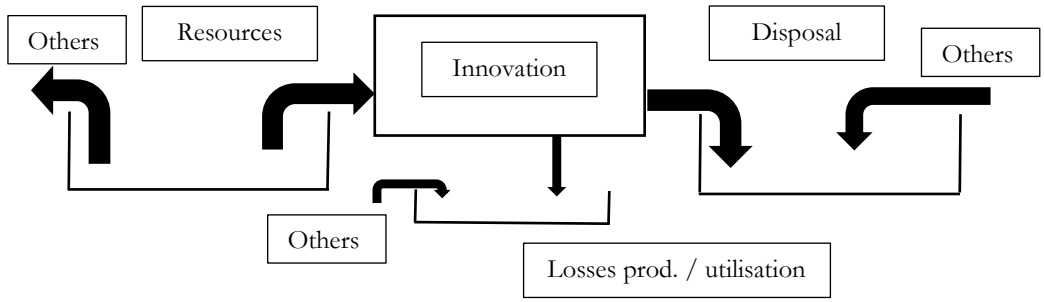

Figure 2: Maturity phase B of human innovations

The second phase, phase B, can be called the maturity phase. The idea, the innovation is established and is increasingly needed, used or bought. Graphically (Figure 2), the difference to phase A is small, but significant in its effect.
It is the phase where large numbers gradually become important. From the initial small number of customers, users or applications, there are now thousands and thousands. We are entering an area where even the human imagination reaches its limits.

Let us take a small example to illustrate this.
The innovation consumes one gram of material. In phase A, a few thousand, maybe ten thousand or even a hundred thousand applications were projected in the business model. This would have consumed about 100 kg of material; nothing to get excited or worried about. But if with the development of Phase B, all of a sudden almost all seven billion inhabitants of the earth consume this gram, then we are talking about seven thousand (7000) tonnes. A number that can no longer be imagined in real terms.

Thus, the resource volume suddenly becomes finite, still very large, but no longer infinite. In addition, one suddenly realises that other users are tapping into the same pot. This observation makes the pot even smaller.

Something similar is happening on the disposal side. All of a sudden, you can no longer dispose of things carelessly. The collection volume for the disposed goods also gets limited, which one has to observe more and more. Here, too, you realise that others are using the same volume for their disposal.

The production and utilisation losses, although relatively small (the processes have been further optimised), also become more important because of the effect of the large numbers, especially when it comes to things that are not necessarily harmless to health. The abrasion of a few thousand car tyres can be tolerated, but not so easily when it comes to the abrasion of millions of car tyres.

The third phase, phase C or problem phase, is actually the evolution of phase B into a problem, either in resource consumption, disposal, production and utilisation losses, or a combination of all levels (Figure 3).

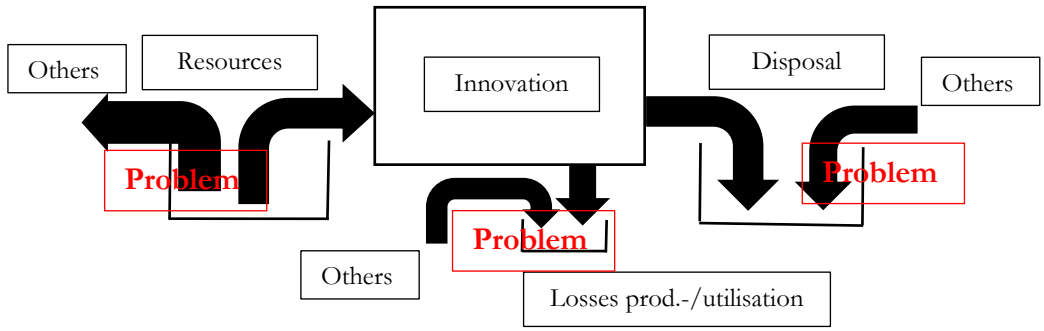

Figure 3: Problem phase C of human innovations

Many innovations, processes and technologies have come to this stage today. Problems are piling up and a solution is urgently needed.

2.4.2 The processes of the circular economy

As already mentioned, many processes have entered Phase C. Some only in terms of resource consumption, others in terms of product disposal or production and utilisation losses. Quite a number of them have problems at all three levels.
Here we discuss a few strategies that are touted as circular economy solutions:

- For PET beverage bottles, many empty bottles are collected and returned for reprocessing as new PET beverage bottles. This can be done up to five times for the same material. After that, it has to be discarded because of insufficient quality. This reduces the flow of resources as well as that of disposal. However, this does not really solve the actual waste problem. It is merely spread over a longer period of time in terms of quantity, which is already an improvement.
- With other PET containers, as with most plastics, direct material recycling cannot take place today because of the very different compositions. A part, about 30%, is transformed into

other plastics for industry, mostly with lower requirements, the remaining large part is simply fed into energy valorisation, as advertised, i.e. simply burnt in a waste incineration plant. The transformation of this part into pyrolysis products is being investigated. They could then serve as raw materials for the chemical industry or as high-quality fuels for the process industry and in the power generation industry. Perhaps solutions for mobility would also be possible? There, too, the disposal problem is not really solved. It is merely spread over a large period of time and is thus less acute.

- Sand suitable for glass production is becoming increasingly difficult to obtain. Returning used glass to the process thus relieves the consumption of sand resources, reduces the waste stream in landfills and also reduces the amount of energy required for glass production. This process is relatively environmentally friendly only in terms of raw material consumption. It brings relief in other aspects that should not be underestimated.
- In the printing industry, printer inks often contain harmful or polluting products. In the course of production, waste is always produced: inks that can no longer be used, waste products, etc. Water streams can also be contaminated by cleaning, for example, and then pollute the environment. Switching to degradable ink products can bring real relief. However, it is not a free pass, because the degradation of these products always takes place over a certain period of time. If quantities are discharged more quickly than they are degraded, these substances can also be a source of pollution.

Similar examples can now be found in practically all sectors of the economy. The diversity is therefore very great. It is becoming even greater because, today, practically all processes are highly subdivided. This is a consequence of globalisation, politely called the search for efficiency, which is actually only a search for the lowest costs.

Thus, practically all products and services today are the result of carefully nested sub-processes. As a result, practically no one is solely responsible for the entire product process. If a company is legally designated as responsible, then it covers itself towards the back and demands certificates and assurances from the suppliers of parts and services. Forwards, the responsibility is shifted to the customer or end user, via the operating instructions. This leads to a very restrictive view of what is called a product and thus of its responsibility. This view is reflected in the understanding of sustainability or what is understood as a circular economy. When a company talks about the sustainability of its products, it effectively means only the contribution to the whole process that it has made as a core competence.

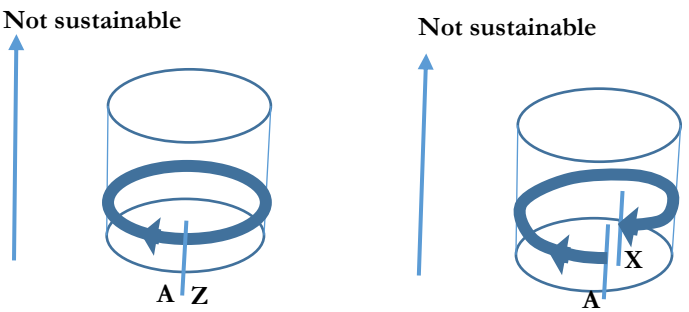

Figure 4a **Figure 4b**

Figure 4: Understanding of sustainable industrial processes and what are natural processes

No matter how broad or narrow the boundaries of consideration, the following idea of a circular economy usually prevails (Figure 4a). This image is also conveyed by the "cradle-to-cradle" concept. In comparison, there are the real, almost ideal processes as carried out by nature (Figure 4b).

A circular economy according to Figure 4a contradicts physics and is actually not desirable at all. If the starting point (A) is also the end point (Z), there is no change, no development, no growth and everything would remain unchanged. Sustainability, understood in this way, is not necessarily the right thing to do. There is no place for improvement, development and other changes. It is simply standstill.

In cycle processes like the one nature plays for us, the starting and end points (A and X) are very close, but not identical. The cycle is not really closed. On the one hand, there have been losses that now have to be recovered. On the other hand, the animal, plant, tree or human being has grown and stored material within itself. This material is returned to nature and processed at the end of the respective life cycle. Material has also been lost, such as fruit eaten by humans or animals and transported away.

Through growth there is room for change, we also call it evolution. This means that the cycle does not really run in a circle, but like a spiral. The new starting points show the growth. The whole art here is to allow this space and at the same time only allow it to be so large that nature and thus also we as part of nature are not overwhelmed with the change.

And what do the real industrial processes look like?
That is what Figure 5 shows us.

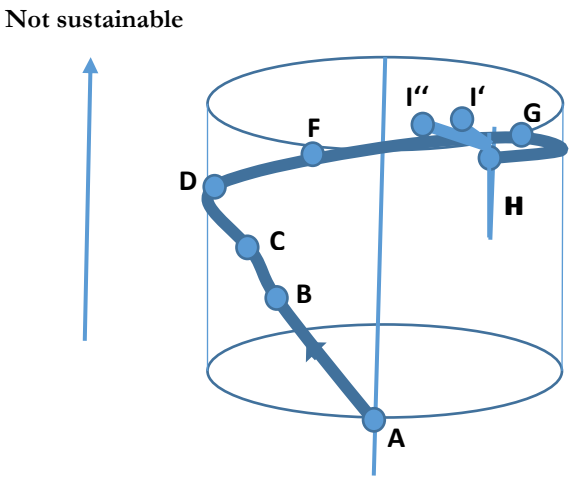

Figure 5: Typical industrial process today

A-B: Extraction of raw materials
B-C: Production of semi-finished products
C-D: Manufacturing of parts
D-E: Assembly and testing
E-F: Packaging and transportation
F-G: Storage and sales process

G-H: Utilisation

Nowadays, the process ends after use. The product is disposed of. This can be uncontrolled - plastic waste in the oceans - or more or less controlled in landfills.
Recycling is on the increase today. The field of recycling is very broad. For example: use as a less demanding material in other processes or energy recovery in waste incineration with simultaneous electricity and heat production. However, such solutions are not the first choice. They are primarily interim solutions until truly sustainable products and recycling processes are developed. They also help to reduce waste and clean up contaminated sites. To speak of circular economy in such a case is actually only meaningful if upstream and downstream processes are coordinated with one another and thus constitute one large process.
H-I' – I": Recycling in the same process. Actually, it is only then that it makes sense to talk about recycling and the circular economy. It brings the end of the process cycle from the product closer to the starting point. I' is a limited recycling of raw materials; I" is a more extensive one.

As you can see, we are far away from the originally conceived circular economy, ideal or real according to Figure 4, despite all the claims of sustainability on all sub-processes. In addition, improvements in certain stages do not automatically have a positive effect on the entire process.

Many such improvements take place in the sub-process "G-H: utilisation". This is where they have the most cost, advertising and sales impact. Very often addressed topics at this level are energy efficiency, CO2 emissions or the use of renewable energies. The technologies used in these areas are relatively advanced. Improvements very often require the use of special materials, the extraction of which can be quite polluting. Thus, a small improvement in sub-process G-H can have a very large negative impact on sub-process A-B. A global view could lead to abstain from the improvement.

What happens after Station H is very often not cleanly controlled. The decisive action is left to chance or to the high environmental awareness of the end consumer. The notes in the instructions for use, for example not to throw the product in the rubbish, primarily serve to clear the conscience of the manufacturers. This can be seen quite clearly in the case of disposable packaging, which actually belongs cleanly in the rubbish bin or in the appropriate recycling process and not simply, carelessly thrown into nature.

3. What should one pay attention to?

We have seen in chapter 2.1 that the rules of communication have been turned upside down. The sender of the information can use the terms as he sees best. He does not even have to make clear how he interprets them. It has thus become the new task of the buyer to find his way through this jungle of terms and to interpret the statements made adequately.

Here are a few hints to support with this new task.

3.1 In a statement about sustainability

First, as we have seen before, we must realise that sustainability is something relative. Sustainability is an ideal that cannot be achieved, even by nature. Consequently, no product or service can be

sustainable. They can only be more sustainable than something comparable. It is also possible to qualitatively grade the degree of approach to the ideal and to indicate the level to which the company, its products or services belong. This step has already been taken by a few companies. The simple claim: our products are "sustainable" without any further explanation is simply propaganda and should be ignored. I even tend to consider the company as non-serious.

Sustainability is not only reflected in individual products, but should actually be part of the company's philosophy. Since sustainability can only be approached in this way, it is not primarily the current status of individual products that is important, but the approach of the entire process in the company. A company and its products can only become more sustainable over time. The company and its products must be measured against this goal alone. An absolute claim is simply propaganda. The qualitative gradation here offers another advantage. It allows an appreciation of whether the company is developing over time and making progress in the process towards better sustainability.

3.2 With products

I can already hear the objections:
How am I supposed to check the sustainability of products?
How can that be done without specialist knowledge?
There are labels for such things?
And much more.

My answer is: You can do it with some common sense and also with some basic knowledge. However, common sense and knowledge are what everyone should get at school, if the curricula were focused on what one needs in life. There is certainly often some catching up to do; with a little good will and interest, it is possible.

Here are two examples of how this can work:

- It is late March-early April and we are in a supermarket. Fresh strawberries are on sale. At this time, none of them grow naturally on the ground in our country. These strawberries are therefore products from greenhouses, probably in faraway countries. So, sustainability can no longer be the big issue.
  If you look further at the label and find Spain as the country of origin, which often happens, then further cutbacks are due in terms of sustainability. Strawberries are very juicy and therefore need sun but also a lot of water to grow. Spain offers one thing, but in the case of the other, the country tends to be considered as a desert area. The water therefore has to be brought from far away or pumped up from the groundwater. Sure, you can use solar power for the motors. But that doesn't really make things better; it just makes them less bad. The long-distance transport to us would also have to be taken into account.
  This leaves practically only the cardboard packaging for sustainability. At best, the organic designation is still possible, because hardly any pesticides are used.
- Even with a piece of furniture, you don't need to be a specialist to be able to roughly classify its sustainability. Before you get to that, you should first remember the main rules of advertising: the advertisement must not contain any untrue statement. Furthermore, one shall not denigrate the competition; for this, a company is not obliged to report on the disadvantages of its products; unless there is a legal obligation to do so. What else is deduced from the advertising message is entirely up to the buyer. For example, if it says "new

formula" for a product, it simply means that the composition, quality or origin is different than before. If the buyer thinks that the product has become better, then it is a conclusion that is not compelling. The advertising was genuine, the deduction inappropriate.
Thus, what is not mentioned is a good indicator for the qualitative assessment of sustainability. If the description of a table only says "FSC wood" and the tabletop has a plastic surface, then the label only stands for the wood chips of the tabletop. There is then no need to think about sustainability or the circular economy. There is nothing in it at all.

As we have seen above, labels are first and foremost a "clearance permit", which also means that one did not want to deal with the issue. This task has simply been delegated to others.

3.3 With companies

Of course, it is useful or necessary to evaluate companies under these aspects only when longer business relationships are entered into. For private individuals, this can be the bank, the retailer from whom one regularly buys products whose sustainability is important to us, or an insurance company.

In business, it is also about which companies to enter into long-term cooperations with. As we have seen, sustainability is not a state, but a dynamic process that never ends. In addition, as Figure 5 has shown us, sub-processes are not solely meaningful for the product. Only when everything is considered, from the extraction of raw materials to disposal/reuse, is it possible to make a statement about sustainability.

Thus, it is not so much the current status, and certainly not in the perfected form of "sustainable", that is of importance, but the path to continuous improvement. Labels also testify primarily to the current status and not to the process. What is important for a company is how it follows the path, the attitude with which the whole company stands behind it and how seriously it does it.

To find out, reports and press releases are important. But they are no substitute for personal contact. This takes time to build the appropriate trust. During this time, marketing departments must primarily act as listeners. Only then are they in a position to formulate the appropriate messages.

4. Limits for the circular economy and the sustainability

This is a topic that many prefer to skip over because it seems unpleasant and hostile to progress. Today, the limitless is still the only right thing. But that does not correspond to what happens in nature.

It is nevertheless the central theme. We will not get around it whether we like it or not. The earth is a spatially defined system, so they are automatically boundaries. These can be purely spatial. They can also be defined by the processing capabilities of natural processes and thus represent a practically absolute limit for us, or simply restrict the flow of our processes. In terms of quantity, limitations are also unavoidable. With them, it is often a question of time until they act as limits. If we are frugal, we can push these limits far into the future.

Limits exist for both the circular economy and sustainability; sometimes with mutual effect. It is a mistake often made to forget or even ignore this fact. But this is done very, very often today. Unfortunately!

Here we would like to point out a few limits to sustainability:

- The resources needed for our processes - energy, raw materials, cooling, etc. - are not unlimited. These limitations can be of various natures. On the one hand, they can be absolute, for example in the case of raw materials, if these materials are not renewable by nature. When the supply is exhausted, another solution must be found. That is when sustainability is already questioned. An improvement of the situation can only be made possible by recycling these materials. This way, the supply can be used for a much longer time until it is exhausted. Limitations can also be imposed by natural processes. That which renews itself in a certain time is that which can be used in that time.
- In the case of production and utilisation losses, the restrictions today are primarily due to regulations regarding waste disposal. This is likely to intensify in the future. A switch to less environmentally harmful products may perhaps bring some relief. However, even degradable products take time to become harmless. Thus, only as much of such products may be disposed of as can be absorbed and degraded by nature. The small but unavoidable loss of raw materials will also set limits to the sustainability of any product.
- Limitations are also likely to occur at the end of the product's life. No matter what happens to the products, there will be both the capacity of recycling processes or degradation in nature to consider. Not to forget, as we have seen, no process is perfect. Losses, especially of raw materials, cannot be avoided. They can only be kept as small as possible ...and justifiable....
- Sustainability obliges to a certain local approach. It is certainly possible to alleviate the restrictions by opening up local, or at best regional, borders. However, the resulting transport will have a significant negative impact on sustainability. The limits of local resources will thus set the limits to business.

The circular economy is also subject to certain restrictions. Closing the loop does not necessarily mean a true circular economy. For sustainability, it also depends on how the cycle is closed. It makes a difference whether the products are simply incinerated and the energy content is used to produce electricity and heat, or whether they are converted through pyrolysis, for example, into products that can be used much more widely in industry or as fuels.
It is also possible to recycle these original products into similar, equivalent or less demanding products. With each of these steps, we come closer to a true circular economy. Whether this also improves sustainability is another question. The answer to this question depends on various factors, such as the amount of energy, materials or substances, and transport that is required. Not everything that is feasible is also reasonable and automatically leads to more sustainability.

Perhaps an overall view, as required by the circular economy, could help. This would also show that the best results are achieved with the best interaction and not necessarily when individual sub-processes are excellent. For example, compromises in energy efficiency in the utilisation phase of a product could possibly lead to simpler solutions in terms of material choice and composition. This could significantly improve the sustainability on the raw materials side as well as in recycling. Again, the saying here applies: less is often more.

The circular economy only works in sectors where material goods are produced, sold and used. There is no circular economy in electricity or heat production. This also applies to the transport sector. It is not even appropriate to talk about sustainability there. One can only try to limit the impacts, whatever the limits may be.

5. Critical economic sectors

The narrow focus of science and politics on CO2 as the cause of all climate problems means that as soon as something is created with no or only low CO2 emissions, it is immediately declared sustainable. This creates biases and important aspects get lost. Worse, wrong approaches are taken. This explains, at least for a large part, why we are not making any progress on the climate issue.

As we have seen in chapter 2.1, sustainability goes far beyond the aspects of zero CO2, CO2-neutral or net zero. If we now look at sustainability as what it has been defined and should be, many sectors have to be seen as critical. Here are a few examples:

- The metals
  In the future, it will almost certainly be possible to extract steel from iron ore and produce it without the help of coal. And thus, without CO2 emissions. Whether the steel produced in such a way is truly sustainable, remains an open question. One could positively say a little more sustainable and a little more realistically a little less dirty.
  For an assessment of sustainability, one would also have to take into account ore extraction and its impact on the landscape and the environment, transport as well as its emissions. Last but not least, iron is non-renewable. Its reserves are finite.
  With almost all metals: Copper, chromium, nickel, aluminium, titanium, lithium, gold, silver, the problem of sustainability is very similar; only differently critical.
  In the case of rare earths, which are trace elements used to improve the properties of other metals, devices or equipment, the question of their finiteness is even more acute. Their supply is very limited. They are added in small to very small proportions in huge production quantities. Thus, it is a matter of large overall stockpiles that are needed. Furthermore, since they are used in a very diluted form, they have to be recovered immediately at the end of the product useful life. Once the base material has been mixed in the disposal site with other materials, they are considered to be permanently lost.
- The energy
  The focus on CO2 emissions has led to everything else being side-lined. The fact that electricity generation has been branded as the main cause of the misery has reinforced this tendency. The result? Industries such as steel construction, cement production, plastics production, mining of iron ore, aluminium, copper, lithium and rare earths have been ramped up, industries that together emit much more CO2 than electricity production and also leave behind major environmental damage. The transport of all these substances and materials is not even taken into account. To make matters worse, because of the much lower energy density of renewable energies compared to fossil or nuclear sources, 100 to a thousand times lower depending on the type, the efforts for the infrastructure per kilowatt hour produced are correspondingly higher.
  Regarding the sustainability of electricity production from solar and wind energy, the following questions could still become relevant: Was the solar heat now being extracted for electricity production really of no benefit to the climate and the earth? Will the wind power

now being extracted for electricity production not be lacking in the longer term for the sustenance of ocean currents or for the natural water cycle? Basically, however, energy conversion cannot be undone. What has been converted is no longer available in its former form and never will be again.

- The illness system
  Some will ask what this designation is about? Others, what this system has to do with sustainability and the circular economy?
  On the first question, quite simply because the system does not recognise healthy people. Healthy people are either symptom-free sick people, sick people who do not (yet) know they are sick or who have not been examined or tested enough. Healthy patients are not a business.
  On the second question, because the products have to be disposed of in elaborate processes after use or after decay. Only small parts of the packaging can be recycled. Much worse, if the preparations are taken properly, large quantities of these products enter the environment through excreta, where they cause great damage to animal and plant life. This problem is to be alleviated in Switzerland by providing large wastewater treatment plants (WWTPs) with an additional treatment stage.
- The food industry
  Spontaneously, one thinks of the agricultural industry when thinking of this topic and does not see any major problems apart from the issue of pesticides.
  If, on the other hand, we look at the entire food production chain, things look a little different. Let us take a look at a major distributor.
  In the vegetable department, there are standard sizes everywhere; for carrots, courgettes. Even cauliflower comes in standard 500 g sizes. Where have the smaller or larger natural carrots gone? Has nature been tricked or have they ended up directly in the compost container? That would be a misconceived circular economy, because the main purpose of nourishment has not been fulfilled. No wonder that modern cooking recipes lack weight information. You don't need them at all. The number of items suffices. The picture is no different with fruits. If you look at the countries of origin, you will see that most of them have already made a long journey. In order to survive this journey reasonably intact, they have to be picked unripe, neatly packed in plastic, hence the standard size, and brought to us in refrigerated rooms. The ripening takes place (perhaps) at the customers. Sustainability looks different!
  Sustainability is even more limited in the case of non-fresh products. The energy required in production and the necessary more or less unhealthy chemicals that are often found in the excreta make a discussion about sustainability almost irrelevant.
- The chemical industry
  In this sector, a distinction must be made between the use of the products and their production and recycling back to the original products. The users set the requirements and are responsible for the use, because they have done the sustainability analysis of the different solutions (not all of them are chemical). The chemical sector is responsible for the product itself. There, one is still at the very beginning of the sustainability process.

6. Improvement approaches

We have seen that achieving absolute sustainability is a utopia. Even the circular economy, although a very viable approach, is not an all-encompassing cure. However, we should not despair, because there are ways to keep our footprint, if not non-existent, at least as small as possible. This way, we can leave an earth that is still functional to the next generations.
On the path to continuous improvement in sustainability, the following approaches are useful:

- A holistic view is to be applied. We have seen that the approach "everyone does his best in his field" does not necessarily lead to optimal whole solutions. Only an overall view of all process stages can lead to the best result. The circular economy provides a great deal of support in this regard. It promotes this overall view by taking sub-processes into account.
- A Pareto analysis of the sustainability impact of the different sub-processes should be carried out - such an analysis was described in a previous issue of JPR-Focus - and the processes with the greatest impact should be tackled first.
- When non-renewable materials are being used, the appropriate recycling procedures must be developed from the very beginning of the product development.
- Consider the aspects of circular economy and recycling in the design.
- Simple solutions are often more sustainable than highly sophisticated and complex ones. The latter often lead to costly resource flows and recycling solutions.
- Transport always leads to sustainability losses. Therefore, local or decentralised solutions with short transport distances are usually more sustainable and preferable.

Working on these approaches will bring further important aspects to light and open up deeper optimisation possibilities.

7 Conclusions

The main findings from this more detailed analysis of the topic of sustainability and circular economy are:

- The original content of the word "sustainable", lasting impact, has been enriched with new content over time and, at least in relation to the environment, has acquired an opposite meaning "without lasting impact on the environment". The use of the words "sustainability" and "circular economy" is new. Their definitions are qualitatively descriptive. Thus, there is a large scope for individual, creative, extensive and partly contradictory interpretations of these terms.
- This means that the receiver of the information is now responsible for keeping the different messages apart and understanding them. This is a clear reversal of the old principle of communication, according to which the sender is or was responsible for the clear content. But that is not so difficult.
  In addition, what appears at first glance to be a loss is actually a huge gain that was not intended to be.
  The recipient has to deal with the communication and can no longer simply acknowledge it with a "I like" or "I don't like". Instead, he or she gets the right to interpret the message, which was probably not intended. This can be a problem for companies. Some "shitstorms" already experienced in the social media have shown this.

- Sustainability is an ideal state that cannot be achieved, not even by nature. In fact, absolute sustainability is not desirable, because it would give no room for development, evolution or simply growth. Thus, nothing can be sustainable in this sense. At most, it can be more sustainable than something comparable. The predicate "sustainable" is thus only to be used in its original sense, a lasting effect.
- Since sustainability is absolutely unattainable, it can only be approached. This is a continuous process in which we have to check again and again how far away we are from it, at least in qualitative terms. Some companies have already implemented something like this and introduced a five-step assessment. The first step is about recognising the problem and taking the first steps. The next steps are gradations to make the progress visible. The fifth step is about showing that the optimisation process towards sustainability has not only been introduced, but is also alive and that constant steps towards sustainability are being initiated and progress is being made.
  Sustainability is thus first and foremost a state of mind, personally as well as in companies.
- The degree of conformity to sustainability of a sub-process has only a very limited significance for the entire product. An overall view of all sub-processes is necessary to be able to really assess the product. The circular economy can be of great help here. The attempt to close the cycle leads to a search for alternates in order to find the best possible one.
- There are a few economic sectors that are critical in terms of their degree of sustainability. A fundamental rethink would have to take place there in the future. However, alternative solutions are available.
- Solutions that use local or regional resources and meet local needs will often dictate the extent of possible degree of activities and be the reference to which sustainability is achievable.

I hope to have provided some clarity in this field with this contribution. It is sobering to realise how far the powerful media statements of companies or politicians are from reality. There is not necessarily ill will behind it, but certainly a lot of ignorance.

Yours Jean-Pierre Rickli

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