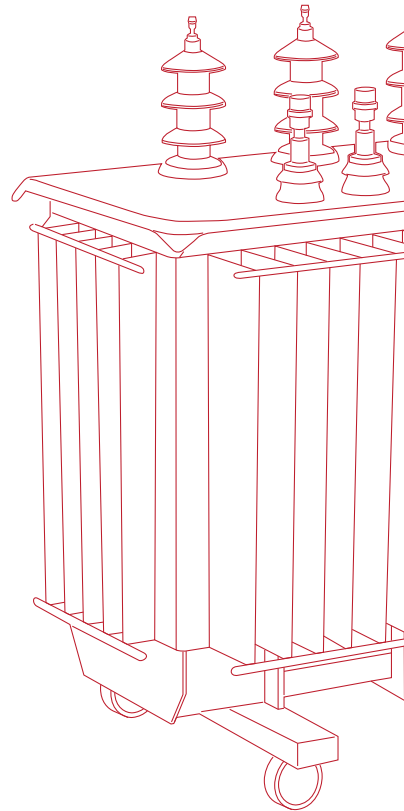


MAKING YOUR BUSINESS CASE MORE SUSTAINABLE

A Guide to Sustainable Asset Investment Decisions
Based on the Circular Economy Paradigm

Sustainability has become a hot topic over the recent years. Probably not unrightly so. Over the recent years, environmental issues have become more apparent than ever. But these environmental issues can also lead to business opportunities and financial benefits. How? By proactively including sustainability into the business.

The research that led to this publication concluded that there are three main aspects to look at when including environmental sustainability. These are Resource Utilisation, Ecological Footprint and Environmental Impact.



THE NEED FOR INCLUDING SUSTAINABILITY

If you are manufacturing products or you are the one buying those products, there are many decisive factors which product you will develop or buy. In most cases the financial costs and benefits are leading. After all, the business needs to be viable on the longer run and thus financially sustainable. Other traditional elements consider the technical performance, the alignment with your strategy, and how it matches with stakeholders. These are all factors that help to ensure that the investment will be effective and pay out.

In recent years, environmental sustainability has become such a factor as well. Many companies have started to value the CO₂ emissions of their investments, sometimes driven by financial motives or legislative pressure. Actively including environmental

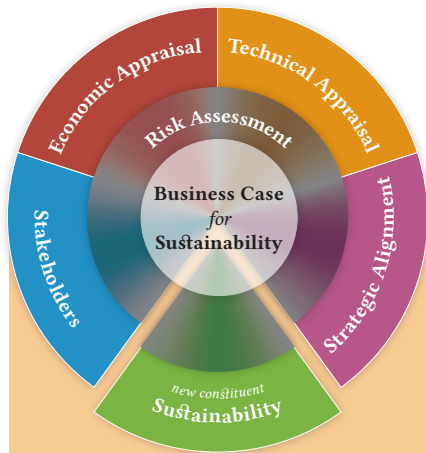
sustainability does not only help to avoid such costs, but may give the company a competitive advantage. Consumer may be more attracted to that business, but more importantly, environmental sustainability may result in higher efficiency, less critical dependencies and more stable revenues. To achieve this, it is important to understand what environmental sustainability comprises of, and what the relationships with your business are. To effectuate the benefits on the long run, the sustainability aspect should be secured in the business in addition to the other decisive factors. For example in the design and manufacturing process, or when investing and disposing of products.

What is Environmental Sustainability?

So, what is environmental sustainability comprised of? Of carbon emissions, energy usage or waste production? The most common definition is rather abstract: to meet the needs of the present without compromising the ability of future generations to meet their own needs. So what does that mean, and what does it mean in practice?

To determine this, the Circular Economy has been used as basis within this study. The idea of the Circular Economy is based on the limited amount of raw materials that the Earth can provide. Our economy is bound to that limit. And so is nature. Although, nature has the ecological capacity to regenerate materials (soil, wood, mineral oil, etc.) and act as sink of our waste products.

This means that through our economic activity we should not only feed ourselves, but also take care of the nature to preserve that ecological capacity that we are dependent on. If we damage that capacity, it will become very hard to mine new materials to fulfil our needs. Possibly quicker than we may think.



■ This is an example of a business case model in which environmental sustainability was added. In this example, sustainability is taken into account in addition to four other aspects. On top of that the risks of each of these aspects are separately considered.

MEASURING ENVIRONMENTAL SUSTAINABILITY

So, it is important to consider our environment within the business case. But what should we look at, and how can we measure it? From a Circular Economy perspective, the main element to look at would be the material use, or resource utilisation. Are we using our materials effectively and efficiently, where do they come from and can they be used afterwards? It is approximately known how much kilograms of each material is present on the Earth, and thus it is useful to measure our usage in these terms.

Next to material usage, we should preserve the ecological function of material regeneration and waste processor. Therefore, we should not damage or destroy the responsible ecological systems. Consequently, the reduction of ecosystems, or the footprint we leave on the ecology is the second element to take into account. This can be quantified in terms of area of damaged ecosystems.

In addition to these two substantive effects, there are also effects that are not easy to measure. For example, the CO₂ emitted into the air or hot water into rivers. We know that CO₂ it affects global warming, but we do not know how much. Or that warm water affects river life, but how and whether this is positive or negative is uncertain. Such externalities, the environmental impact, make up the third factor to include in environmental sustainability. It comprises of a qualitative analysis of our impacts on our environment.

Thus, the following aspects define environmental sustainability from a Circular Economy perspective:

- » Resource Utilisation
- » Ecological Footprint
- » Environmental Impact

The relation between the three is depicted in the image below. On the right, there are some tools and references listed to measure these aspects.

TOOLS & METHODS

Various tools and methods are available to determine the ecological footprint and environmental impact.

RESOURCE UTILISATION

For resource utilisation, there are not yet many accepted methods available. However, a simple approach would be to measure the percentage of materials that is from recycled origin, the amount of materials that can be recycled and the total life span of the material.

ECOLOGICAL FOOTPRINT

The ecological footprint can be calculated with help of many online tools. A simple tool is the Earth Day footprint calculator: www.earthday.org/footprint-calculator

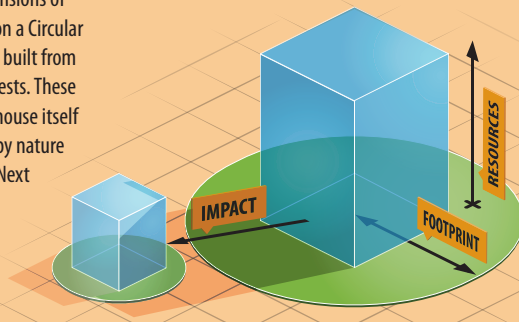
ENVIRONMENTAL IMPACT

Life cycle analyses (LCA) are an appropriate tool to identify the environmental impact. They are however complicated tools that require a lot of time. Simplified LCA tools are being developed and available online. For example at www.lcacalculator.com

MORE INFORMATION

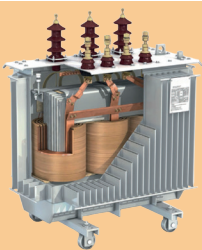
An overview of tools and more information will soon be available on www.circularsource.com

■ This image shows the three dimensions of environmental sustainability based on a Circular Economy paradigm. When a house is built from wood, the wood is retrieved from forests. These are reduced leaving a footprint. The house itself also uses space that cannot be used by nature or other economic activities (circle). Next to that, the house has an impact (the shadow it casts) on other elements through waste production, heat, light, etc.



AN EXAMPLE – DISTRIBUTION TRANSFORMERS

The research leading to this handout focussed on distribution transformers. These devices transform electricity in the energy grid from a high voltage to a voltage that enters your home and is suitable for your home appliances.



■ This is a cross section of a distribution transformer. Inside you can see the copper coils. These are normally surrounded with mineral oil, which is not depicted in this image.

Transformers are simple devices with a large impact. They are built from a small number of materials, such as copper, steel, oil, aluminium, paper and some porcelain. Their reliability is high and they may last more than 40 years, but their physical principles cause them to have inherent energy losses. A simple way to reduce the energy losses is to use more materials. However, increasing the

amount of materials means an increase in energy usage during production, shipping and recycling.

Taking sustainability into account

So what would be the best option? From a Circular Economy perspective, it is all about material preservation. For the transformers a Material Flow Analysis has been conducted to investigate the current material needs. This was the basis for further analysis. This resulted in a multicriteria decision analyses based on the developed sustainable business case model. The results of this analysis considering environmental sustainability will be shortly introduced:

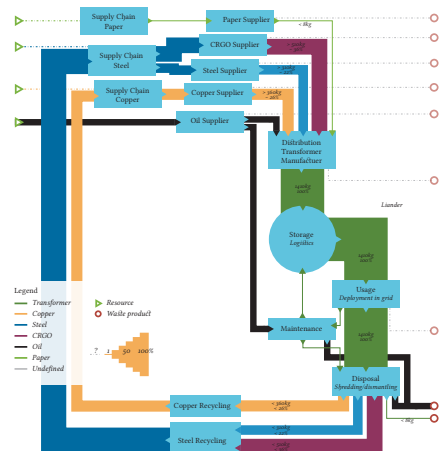
Looking at resource utilisation, the ecological footprint and the environmental impact, the following analysis was made:

The current use of mineral oils has a large impact on the resource usage as it is only used once. When the transformer is recycled at its

end of life, the oil is disposed of through incineration. The current circular value of the transformer was determined to be 27%. That means that only 27% of the material is from non-scarce origin and can be recycled again. When recycling the oil after use, or using bio-oil, the circular value can be increased to up to 45%.

Considering the ecological footprint, there are some alternative technologies available that may increase the lifetime of transformers and their recyclability. This helps to reduce the need for additional mining, disposal and manufacturing. These alternatives are adding buffers to the energy grid. Also a better design for disassembly would benefit the ecological footprint.

The environmental impact is mainly influence by the current energy losses during the lifetime of the transformer. This impact can be greatly reduced if the energy losses are not compensated with non-renewable energy, but by producing energy locally from renewable resources.



■ The Material Flow Analysis of a distribution transformer. The green line is the part where it is a transformers, the rest are separated material flows. The oil is depicted with the black line.

This hand-out is part of the thesis Circular Economy in Asset Management: A Business Case Model to Make Sustainable Investment Decisions (2015), Korse, M., University of Twente.