LIFE CYCLE ASSESMENT | DYNAMIC ROPES

BEWARE: Life cycle assessments are difficult to compare within different products and companies as the relevant ISO standards defining the assessment leave room for interpretation and methods that define different impact criteria. Only transparently disclosed assessments with similar research topics can therefore be compared with caution. This LCA was conducted in-house at EDELRID guided by the relevant ISO standards but has not been externally verified. The below table only assesses the carbon equivalents for our products and supply chain. Note that carbon is only one of many hazards for the environment! You find more detailed information about our assessment in the appendix below.

Model	Raw Material Extraction*	Pro-cessing*	Manu-facturing* @EDELRID	Retail & Usage*	Waste Disposal*	Total Transport*	Total*	CO_2/70m
Canary Pro Dry 8,6 mm	7,637	1,568	0,136	**	2,286	0,254	11,881	42,438
Swift Protect Pro Dry 8,9 mm	**	**	**	**	**	**	**	**
Swift 48 Pro Dry 8,9 mm	7,637	1,568	0,136	**	2,286	0,254	11,881	43,270
Swift Eco Dry 8,9 mm	7,637	1,568	0,136	**	2,286	0,254	11,881	43,270
Hummingbird Pro Dry 9,2 mm	7,637	1,568	0,136	**	2,286	0,254	11,881	47,430
Tommy Caldwell Eco Dry CT 9,3 mm	7,637	1,568	0,136	**	2,286	0,254	11,881	47,431
Eagle Lite Pro Dry 9,5 mm	7,637	1,568	0,136	**	2,286	0,254	11,881	51,591
Tommy Caldwell Eco Dry DT 9,6 mm	7,637	1,568	0,136	**	2,286	0,254	11,881	50,759
Heron Eco Dry 9,8 mm	7,637	1,568	0,136	**	2,286	0,254	11,881	51,591
Skimmer Eco Dry 7,1 mm	7,637	1,568	0,136	**	2,286	0,254	11,881	29,956
Apus Pro Dry 7,9 mm	7,637	1,568	0,136	**	2,286	0,254	11,881	35,571
Starling Protect Pro Dry 8,2 mm	**	**	**	**	**	**	**	**
Starling Pro Dry 8,2 mm	7,637	1,568	0,136	**	2,286	0,254	11,881	39,109
Kestrel Pro Dry 8,5 mm	7,637	1,568	0,136	**	2,286	0,254	11,881	39,710
Kinglet 9,2 mm	7,637	1,568	0,073	**	2,286	0,254	11,818	46,352
Eagle Lite 9,5 mm	7,637	1,568	0,073	**	2,286	0,254	11,818	51,318
Neo 3R 9,8 mm	5,962	1,568	0,073	**	1,714	0,254	9,571	42,235
Parrot 9,8 mm / Boa Eco 9.8 mm	7,637	1,568	0,073	**	2,286	0,254	11,818***	51,318
Boa 9,8 mm	7,637	1,568	0,073	**	2,286	0,254	11,818	51,318
Boa Gym 9,8 mm	6,562	1,568	0,073	**	2,078	0,254	10,510	50,081
Python 10,0 mm	7,637	1,568	0,073	**	2,286	0,254	11,818	52,973
Cobra 10,3 mm	7,637	1,568	0,073	**	2,286	0,254	11,818	56,284
Tower Lite 10,0 mm	7,637	1,568	0,073	**	2,286	0,254	11,818	54,629
Tower 10,5 mm	7,637	1,568	0,073	**	2,286	0,254	11,818	57,112

**) Results are stated in [CO_2 eq./kg Rope].*
***) Due to a lack of data we are currently not able to provide information.*
****) The Parrot 9.8 mm / Boa Eco 9.8 mm rope is a special case whose resulting CO_2 eq. we explain on the last page.*

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APPENDIX | GENERAL INFORMATION LCA

What is a life cycle assessment (LCA)?

A life cycle assessment is a method to estimate the environmental impacts associated with a certain product. For this purpose, the entire life cycle of a product is recorded and assessed, starting with the extraction of raw materials, through production and use, finishing with the disposal (cradle to grave). The structure, implementation and variants of a life cycle assessment are defined by the ISO standards ISO 14040 – ISO 14044.
A life cycle assessment is always product-specific and thus significantly dependent on each member of the supply chain as well as national legal and infrastructural conditions. The result of an LCA is a quantification of a certain environmental impact specific to that product. There are various environmental impacts of a product; Most LCAs consider midpoint impacts such as CO_2 emissions or water use. The number of impact categories differs from method to method and is not specified in ISO 14040 - ISO 14044. The LCIA PEF method we used, includes 16 different measurable environmental impacts such as e.g. water use, Human toxicity, cancer or ozone depletion. For now, though, we concentrate on the CO_2 emissions connected to our products.

Why do we do a life cycle assessment?

We are not just a manufacturer of climbing equipment. We are climbers, boulderers, hikers, industrial climbers, arborists, paragliders and skiers ourselves. As such, we love being in the vertical world and have an undeniable responsibility to preserve it! To do this, we must reduce our footprint wherever possible. The first inevitable step to reduce impact and to find alternatives, is to understand what creates it, where it is created and in what amounts. “Recycling” sounds awesome but what does it do? Transportation from eastern Europe to Germany sounds worse than within Germany but how bad is it? A braiding machine runs 24/7 – sounds bad for the environment but how bad is it? At EDELRID we always want to know!

What does it help you as a rope owner?

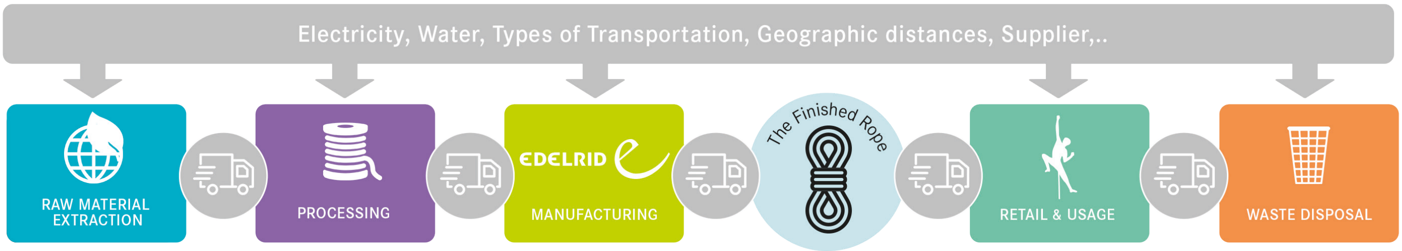
We at EDELRID always want to know. But not only for ourselves. We want to share it with our community and everyone that is interested to know for themselves. It should at least be possible for everyone to come to know what your impact is and thus decide how to act. And even those who have not yet thought about all of this get, while stumbling upon this information, food for thought on the connection between buying decisions and environmental impact.

How is the “life cycle” of a life cycle assessment defined?

In general, the most comprehensive cycle imaginable for a dynamic rope is divided in 6 phases:

1. Raw Material extraction
2. Processing
3. Manufacturing
4. Retail & Usage
5. Waste disposal
6. Transportation (as the sum of every transportation within each phase)

An assessment of the environmental impact now can look at one, more or all these phases. Which phases are looked at can depend on the purpose of the LCA, the specific product or sometimes simply the feasibility. In any case, all members of the supply chain with all their individual processes must be analyzed and quantified with regard to the desired environmental impact.
Without a doubt this is no trivial and quick task and also explains why LCAs are conducted so rarely from other manufacturers. For our conducted LCAs for dynamic ropes for example we excluded the phase of retail and usage as too many assumptions had to be made and would make the numbers to vague. In any case, the influence of this phase is also considered very small.



What is the result of a life cycle assessment?

The objective and therefore the result of an LCA is the quantified environmental impact of a product. Environmental impacts can be divided into different areas. The most popular is climate change expressed in CO_2 equivalents. The release of gases affects our climate and the greenhouse effect. Every gas affects the greenhouse effect in different intensities. To be able to compare different gases with each other, the CO_2 equivalent is used. TheCO_2 equivalent describes the so-called greenhouse potential of a gas compared to CO_2.

Finally, in order to get a result, an impact like the CO_2 equivalents needs to be put in relation to the product. So, depending on the product, the result of the life cycle assessment is expressed in CO_2 per kg or piece or meter or whatever is suitable.

Climate Change in CO2 Equivalent?

Anthropogenic emissions influence the warming of the atmosphere, also known as climate change. Through to the global warming potential index the impacts can be determined. This index compares the potential for greenhouse gas effects of emissions. Each gas will absorb different amounts of energy over time. For reasons of comparison this energy is put in relation of the energy absorbed by 1 ton of CO_2. This factor is referred to as CO_2 equivalents or climate change equivalent. Each substance is given a factor to represent climate change in CO_2 equivalents. The consideration of climate change is internationally recognized by the IPCC.

How is all of this possibly assessed and measured?

Today there are several software options to structure, keep track and sum up all data documented for a LCA of a product. However, the crux here is how to get the data. For the person conducting the LCA there are basically three ways to get the necessary data. Which one to choose usually depends on feasibility. Weighing up feasibility, the three possibilities should always be prioritized in the following order:

1. Measure the data yourself (e.g. electricity meter on a machine).
2. Ask the supplier for data (if you can't measure it yourself, someone else may have already done it).
3. Take average data for comparable industrial processes from environmental footprint databases.

So, option 3 is always the last resort but makes an LCA feasible in the first place. As more and more industries take on the concept of LCAs for their products, the data bases get more and more accurate.

We are currently using Open LCA as the software option to maintain our LCAs. As a rope manufacturer our control of the supply chain reaches quite deep, which is why we are able to measure almost all data for the phases of processing and manufacturing ourselves. As for the data bases we used Environmental Footprint Database (EFD).

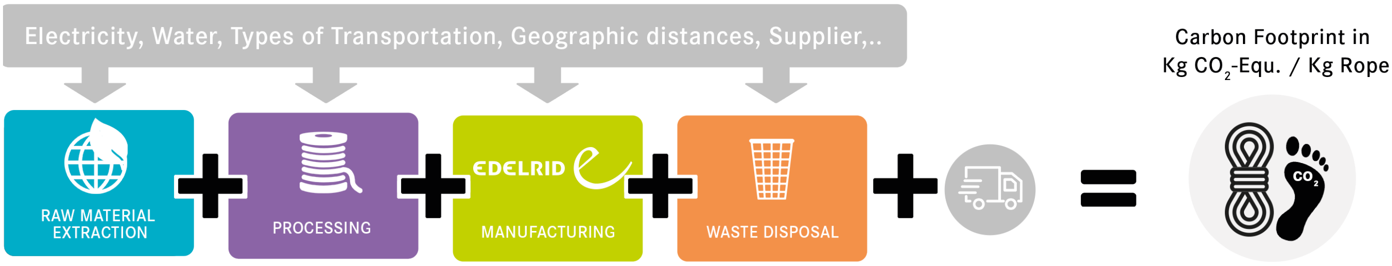
How can I be sure that a manufacturer does the assessment accurately and honestly?

As LCAs are specified in ISO standards, an official LCA has to be certified by a third party. As with other product relevant characteristics like e.g. safety aspects, this is currently the best way to rely on. If an LCA however is not certified, the degree to how much you trust the numbers solely depends on your trust in the brand and its people which again is strongly influenced by how transparent and humble they are willing to present and talk about the data. For us, LCAs are a completely new field and we want to take the first steps by ourselves in order to fully understand the workings, informative value but also difficulties of an LCA. Currently the data above is not certified by a third party as costs and additional efforts are yet to be determined. However, we try to be as open and humble as possible about the presented data. Please, always feel free to give us your honest feedback and questions. We will try to do the best we can to adapt to this.

APPENDIX | SPECIFIC INFORMATION ROPES

The conditions and assumptions for the LCA of an EDELRID rope

In the results presented above, we considered the assessed carbon emissions of 5 out of the 6 identified phases. We excluded the phase of Retail & Usage as in this phase the different possible scenarios resulting in carbon emissions are so wide, that resulting carbon emissions are too wide to give meaningful numbers. We sell our ropes all over the world and what a user does to her/his rope varies dramatically. Instead we add up carbon emissions from the 5 other phases as shown below. For each step of these phases carbon emissions were assessed. Below we try to give a few examples of the processing steps in each phase. However, this is not the complete list of assessed steps.

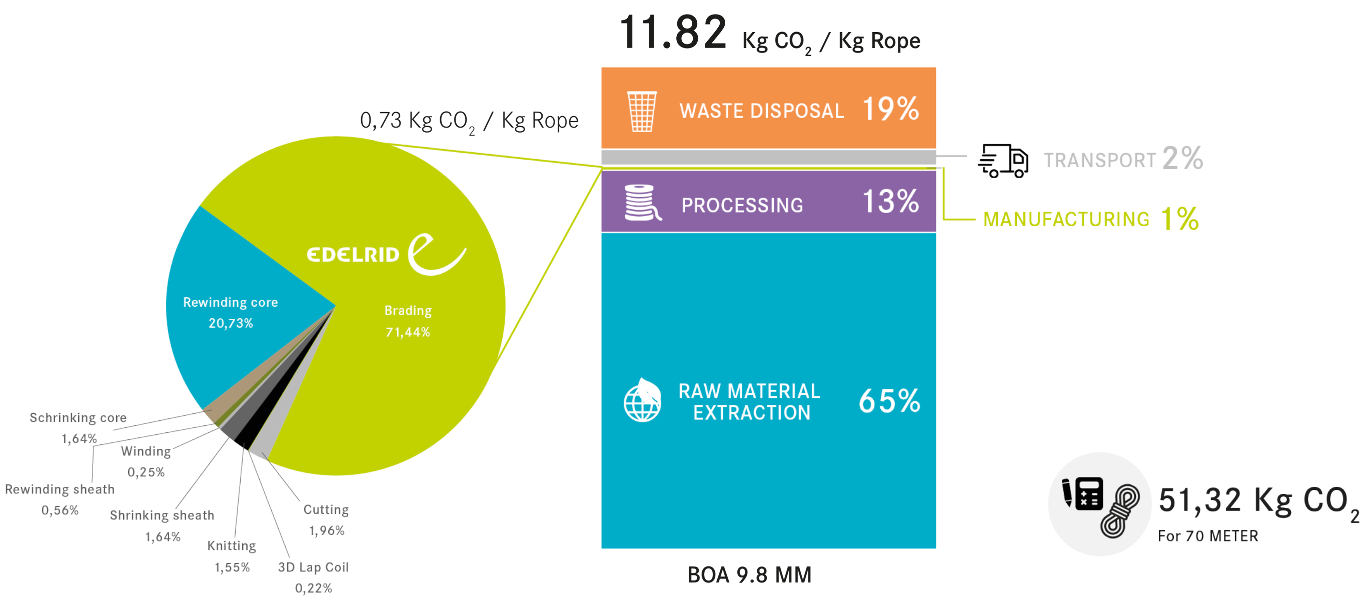


BEWARE: Since many processes are interwoven, such as raw material extraction and waste, it is sometimes not possible to clearly separate them into the categories.

Phase 1	**Raw Material extraction**
Description	In this phase, natural raw materials are processed into plastics and prepared so that the plastic granulate is ready for further production steps.
Steps	Crude oil extraction by cracking naphtha and gas oil in a steam-cracker, Polymerization, technical gas production, Granulate production, Transport.
Phase 2	**Processing**
Description	In this phase, the plastic granulate is further processed into fibers and finished so that it is received by EDELRID as raw material. Also, all packaging production is included in this phase.
Steps	Fiber spinning, Yarn refining, Twisting, Yarn dyeing, Paper and plastic production for packaging.
Phase 3	**Manufacturing**
Description	This phase includes everything that happens in our production at EDELRID in Isny, Germany.
Steps	Winding, Knitting, Shrinking, 1st Refining, Rewinding, Braiding, 2nd Refining, Coiling, Packaging.
Phase 4	**Waste Disposal**
Description	In this phase, all processes that finally process the waste generated at each stage in the life cycle, if it is identifiable, are summarized.
Steps	PA6 (thermal recovery), Paper (thermal recovery), Plastic packaging (thermal recovery).
Phase 6	**Transportation (as the sum of every transportation within each phase)**
Description	All transport chains only go through Europe. Since the attempt is made to keep the transport distances short, mainly neighboring countries are involved. Since there are sometimes changes to the suppliers, the countries are not listed.
Steps	Fuel production, Wear, Exhaust, Modes of transportation, Vehicle types used.

The average carbon footprint of an EDELRID rope

When we look at all the different rope models EDELRID offers, differences that would influence the carbon footprint of a given model lie mainly in the production processes within our factory as well as in the selection and quantity of the raw material (for example: Polyamide or Polyester), as we have a very stable supplier network within Europe. To get an idea of how an average CO_2 equivalent LCA for an EDELRID dynamic Rope looks like, let's take as an example the result for the EDELRID Boa 9,8 mm:



What becomes obvious here is, that over 80% of the total carbon emissions of the Boa 9,8 mm rope are caused in the first and last phase of the life cycle. On the other side transport and manufacturing make only a small fraction of the total impact of the product.
As for our dynamic ropes we use almost exclusively the same raw material for every model. Since differences in the production process have only a very small influence on the final impact of the rope, results in the table on the first page look very similar for Kg CO_2-Equivalent/Kg Rope. Knowing this gives us a valuable insight in to where to adjust if we want to minimize the harm our products are doing to the environment.

Ways to improve the footprint of an EDELRID rope

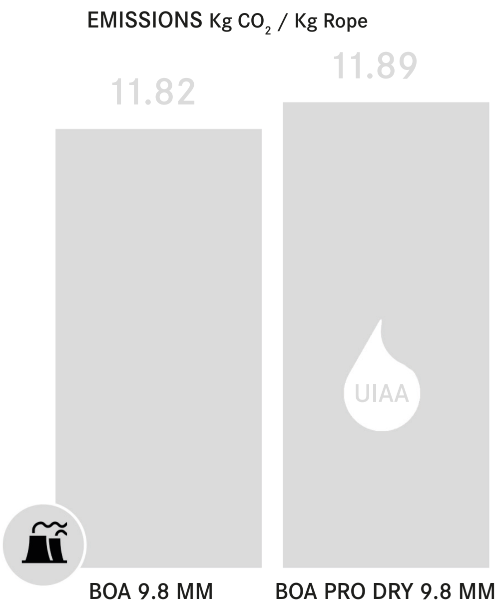
What are the options now to reduce our and finally your carbon footprint when buying a rope? Well an easy answer would be: buy a thinner diameter. Thinner diameters use less material and therefore have a smaller carbon footprint. But a thinner diameter rope may wear faster under certain circumstances. This is exactly what could happen in the phase Retail & Usage which we have excluded from our calculations, because of the above-mentioned reasons. So yes, the impact of a thinner rope is practically smaller, but you might need to replace it earlier. So, this might not be the best approach.
But considering the distribution of the carbon emission above, raw material is the key! With our Neo 3R 9,8 mm rope we have a rope that uses 50% recycled Polyamide in the rope. Here we have the perfect example to test the impact of using recycled material. Recycled material surely needs some other steps, but it takes away carbon emission in both phases Raw Material Extraction as well as in the phase of Waste Disposal. This way we were able to show a total reduction in the CO_2 equivalent of more than 19%!

Another interesting difference within our rope range is the Pro Dry and Eco Dry treatment for our water repellent ropes. As we have seen that the production phase only has a very small influence in the resulting impact, a dry treated rope only causes 0,6% more carbon emissions compared to the same rope without any treatment. Also, there is no difference between Pro Dry and Eco Dry at least for the carbon emissions. Both treatments need the same extra production steps causing an equal amount of carbon emissions. It is important to note that we have to look over the frame of this document. The Eco Dry treatment may have the same effect considering the carbon emissions, but it causes less harm in terms of emitted toxics (e.g. PFCs).

Impact of changes in the production process

EDELRID MANUFACTURING

+0,6% if Dry treated

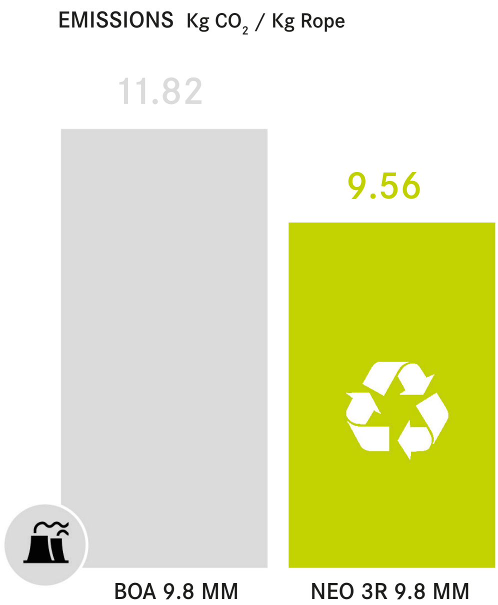


Impact of changes in the raw material and disposal process

RAW MATERIAL EXTRACTION

WASTE DISPOSAL

-19% If 50% recycled material is used



*** The Curious case of the Parrot 9.8 mm / Boa Eco 9.8 mm

This rope model was developed with the approach in mind to adjust our internal logistics and flow of goods in order to use leftover yarn from our production and thus reduce waste. This should positively impact our waste statistics and lead to a reduced CO_2 equivalent for this specific rope model. In particular one could argue that we do not need to consider a Raw Material Extraction step for the leftover yarn at all since it used to be waste material anyways. However, it is difficult to relate this to only this model, as on the other hand the leftover yarn comes from all our other ropes, which in turn would impact their final phase of the Disposal. Thus, we have decided that the most honest way to present this, is to show that the final result of each of our ropes is better and the improvement cannot be attributed specifically to the Parrot. We rather see it as an improvement of the overall production with an impact on every single rope made here in our factory. However, through the production of the Parrot/Boa Eco rope, EDELRID is able to reduce the annual Polyamide 6 waste by 17 360 kg, which corresponds to approx. 202 860 kg CO_2 eq.

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