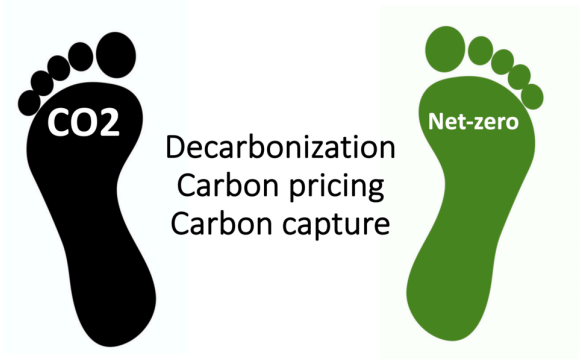


Carbon pricing for Net-zero, resulting LCOE estimates

Nicolas PAYEN
Passionate about Climate Change Mitigation | Experiences within Energy, Transportation, Building

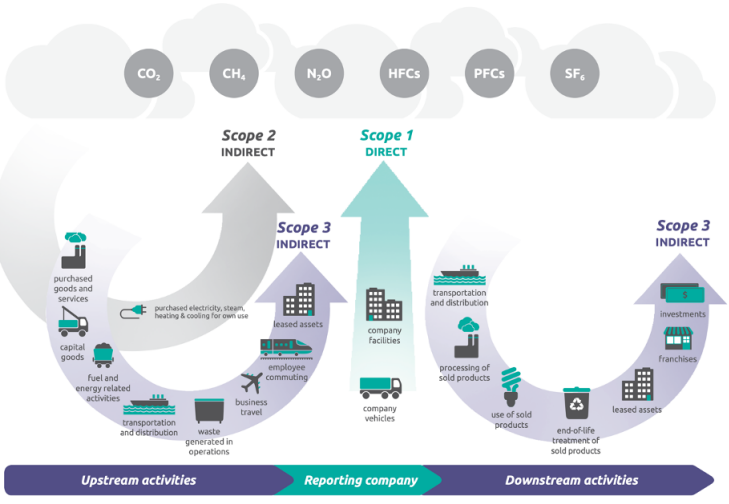
March 24, 2021

What is your carbon footprint? The GHG protocol.

It exists already well-established standards and norms to report your carbon footprint. A very commonly used one internationally is the GHG protocol.

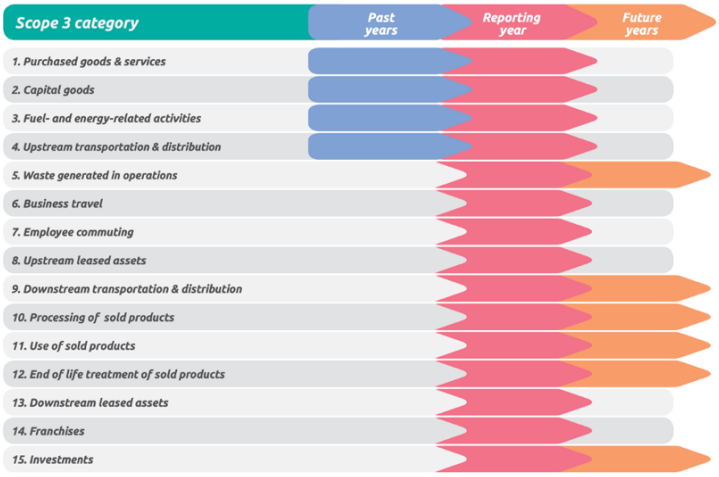
It classifies GHG emissions into three groups: Scope 1, Scope 2, Scope 3.

Figure [1.1] Overview of GHG Protocol scopes and emissions across the value chain



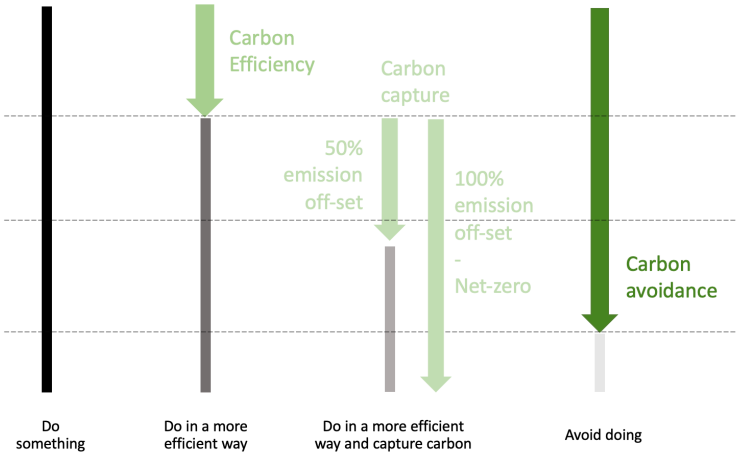
Scope 3 is the most exhaustive way to calculate and report your carbon footprint.

Figure [5.3] Time boundary of scope 3 categories



About decarbonization / CO2 savings

Regardless of the scope of analysis, few strategies are available to decarbonize and reduce your carbon footprint effectively. (source: Positive Energy Ltd)



- **Carbon avoidance**: If you avoid doing something, then you have the biggest impact on your emissions. But you will still have a footprint. Just by being, you have a carbon footprint. You may also decide to do something else that may have a bigger or lower carbon footprint than the initial activity scheduled.
- **Carbon efficiency**: You can decide to do something different or differently that produces the same outcome with fewer emissions.
- **Carbon capture**: Here, you find a way to remove the carbon you emitted in the first place. With active carbon capture, you use technology to remove carbon from an industrial process or even the air. Only direct air carbon capture allows you to have a negative carbon footprint.
- **Carbon offset** does not have a direct impact on your footprint.

They all behave differently (source: Positive Energy Ltd):

No alt text provided for this image

- **Carbon Efficiency** provides long-lasting impact (do once, benefit forever). Announcing major CO2 savings in the future does not account for the evolution of the carbon baseline. It claims by design higher numbers than reality unless they are 100% based on carbon capture. Net present CO2 saving is a better way to measure impact. It includes the evolution of the baseline in the calculation.
- On the opposite, **Carbon Capture** needs to be provided over time to keep

delivering its benefices.

- **Carbon avoidance** is the simplest and most impactful.

The covid-19 crisis generates a lot of short-term carbon avoidance. But post-crisis will be a challenge for the Climate.

The graph below is a good example of how the baseline related to the power sector may evolve, assuming an aggressive growth of renewable energies in the coming years to come.

No alt text provided for this image

About Carbon pricing

Net Zero commitment shall imply that every CO2 that is not saved is captured.

Consequently, a fair way to price a Tonne of Carbon is to use the actual Linearized Cost of CO2 Capture (LCCC) for Direct Air Capture of a Tonne of CO2. Today this cost is estimated at 130 to 340 USD per Tonne.

The graph below shows the current estimate for the LCCCs from the International Energy Agency (IEA).

No alt text provided for this image

Carbon pricing should then depend on the level of decarbonization targeted by a given country.

For example, the Carbon Pricing for countries targeting to offset 50% of their emissions could be 50% of direct air carbon capture cost: between 62.5 USD per Tonne and 170 USD per Tonne.

It means the Carbon Pricing for countries targeting Net-zero and so covering 100% of their emissions should be 100% of the cost of direct air carbon capture: between 130 and 340 USD per Tonne. Only Sweden and Switzerland have a carbon price close to this number today.

Countries with an important stock of adult trees in natural reserves - not already accounted by companies for off-sets - could include this in their calculation to reduce their carbon price.

Below is an overview of the current level of **Carbon Pricing** in the world.

No alt text provided for this image

About Carbon offsets

The current **Carbon offset price** on the voluntary carbon market is less than 10% of carbon capture's cost.

Carbon offsets are linked to already existing savings. These Projects are already financed and operational. It means the savings are already integrated into the 'current carbon baseline.' As the additionality is hardly proven, it has a minimal impact on real GHG emissions.

It is more a way to transfer money from polluters to CO2-saving asset owners. It is paid to the owner of the project that put in place the emission reduction. Consequently, we can see carbon offset has a "low-cost compensation" paid by carbon polluters to carbon savers.

New trees are a fantastic way to absorb carbon. But a new tree will help save carbon only after 20 years of growth. The atmosphere will accumulate more carbon in the air during the 20 years of its growth. Unfortunately, the overall inventory of trees is still declining. This makes the fight against current carbon emissions even more urgent.

No alt text provided for this image

Carbon capture, on the opposite, represents clearly immediate and additional savings against the baseline.

Playing with LCOE and LCCC for Net-zero

The Power sector is the biggest contributor to carbon emissions. Let's see the impact of such net-zero carbon pricing on the different power generation technologies.

Keep in mind that effective and scalable carbon capture technology is not available today. The current LCCC estimates are often not based on actual scale-up projects but only estimates based on pilot projects. Carbon Capture is still not a safe path/mean to reduce emissions as nobody can yet guarantee its efficiency and cost.

The table below calculates the **LCOE of carbon-free electricity** by adding direct air carbon capture cost to offset 100% of the electricity generation CO2 emissions. Coal is clearly no more commercially viable. We assume that the cost for direct air carbon capture is 250USD/tonne in this simulation (file **here**).

No alt text provided for this image

Battery storage solutions - not included in this analysis - should have a relatively low carbon footprint compared to the primary energy. They have indeed almost no operational emissions, and they offer a very high level of efficiency.

Solar and wind will enjoy the cost leadership position.

Gas could hardly be competitive with 100% carbon capture assuming direct air carbon capture technology becomes viable and cost effective.

If Oil & Gaz players want to remain relevant in the Climate Mitigation agenda, then they should invest now billions of dollars to develop, mature, and scale direct air capture technology.

Policymakers can make sure these investments happened by aligning the Carbon Pricing with the Direct Air Carbon Capture technology cost.

#renewableenergy #Climatefinance #climateaction #climatetech #carbon #carboncapture #energytransition #decarbonization #powergeneration #carbonfootprint

Comments

22 · 1 comment · 1 repost

Like Comment Share

Add a comment...

Most relevant

Rohini K Sahu · 1st
Strategic Advisor
3y

Simplified an complex topic, very helpful

Like | Reply

Nicolas PAYEN

Passionate about Climate Change Mitigation | Experiences within Energy, Transportation, Building Automation | Digital technology, software, marketing, finance | Interim & Change Management | Advisor

More articles for you

Charting the Skies: The Start-up Journey as an Epic Flight

Nicolas PAYEN

2 · 1 repost

2023 was a great year for Climate Tech investors

Nicolas PAYEN

3 · 1 comment

Are behind-the-meter battery energy storage systems the secret enabler of our 2030 climate targets?

Nicolas PAYEN

4 · 1 comment