

The Cost of Carbon

An overlooked aspect in the
construction industry

What is Embodied Carbon

The threat of global warming constantly looms on a global scale, with experts stating that an increase of 1.5°C above pre-industrial levels in global average temperatures will spell disastrous, and in some cases, irreversible effects. As climate change worsens, dangerous events such as sudden climate shifts, starker temperature ranges, and steadily rising sea levels are becoming more frequent and severe.

One way of mitigating the threat of global warming is through decarbonization, that is, the reduction of carbon by looking at how our systems operate, and develop the means of reducing Greenhouse Gas



(GHG) emissions. GHG emissions have an inherent Global Warming Potential (GWP) which is what experts measure to determine how much an object or a system contributes to global warming. The built environment also has a role to play in decarbonization. As buildings are currently responsible for 39% of global energy-related carbon emissions¹, decarbonizing buildings through intelligent design, construction, and operation will prove useful in curbing global warming. While decarbonization can occur throughout a building's life cycle, this paper will be focused on decarbonization occurring in the design phase by introducing the concept of measuring and accounting a building's embodied carbon.

Embodied carbon refers to the sum of GHG emissions due to the energy required to produce a certain amount of material. For example, extracting

the raw material, transporting it to the manufacturing plant, and the actual manufacturing process contribute to its embodied carbon value. To quantify embodied carbon, it is normally measured in how much carbon dioxide is generated as a direct result of the material's construction. Take, for example, creating a kilogram of rebar. Extracting the raw materials, transporting the raw materials to the manufacturing plant, and the actual manufacturing process, will consequently produce an equivalent kilogram of carbon dioxide, generally expressed as kilograms of carbon dioxide equivalent (kg CO₂ e). In essence, it can be expressed akin to a formula where:

Embodied Carbon (kg CO₂ e)=

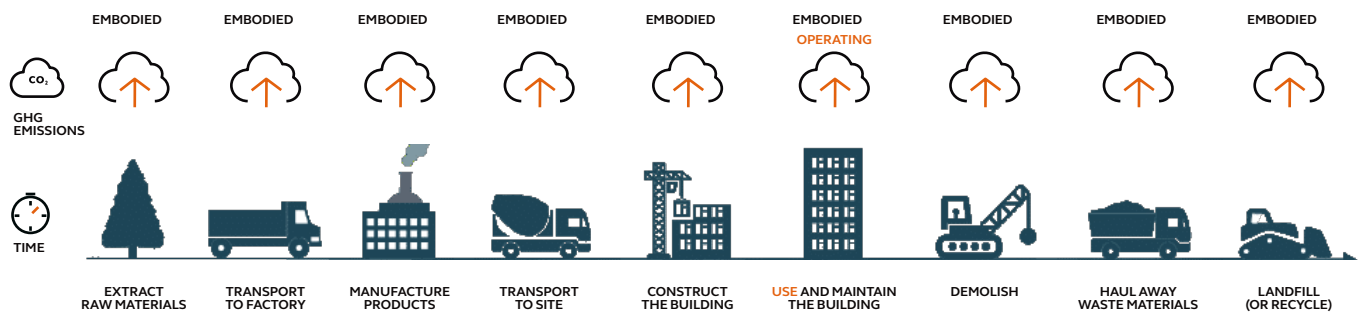


Figure 1. Representation of Construction Material Phases as well as the Emissions per Step.²

¹ M. Adams (2020). *Asia Pacific Embodied Carbon Primer*

² 2017. *Embodied Carbon of Buildings and Infrastructure: International Policy Review*



Embodied Carbon Reporting Globally

The Paris Agreement of 2016 by the United Nations Framework Convention on Climate Change introduced the need to decarbonize multiple global sectors. This paved the way for different countries to target carbon neutrality either by reducing the carbon emissions through intelligent use and management of systems, or by offsetting carbon emissions through activities meant to absorb the existing GHG emissions.

Currently, multiple countries have also pledged carbon neutrality come a certain date, with our neighbors Japan and China pledging to become carbon neutral by 2050 and 2060, respectively. Building codes are also being amended in different parts of the world to aid in decarbonization in the buildings sector, one example is that Marin and Alameda counties in California are incorporating limits for the embodied carbon emissions allowable for concrete³. Policies are also being enacted to further drive the goal of reducing carbon emissions, one such case can be found in Zurich, Switzerland where the city has set a 2050 target for the limiting of embodied carbon in residential buildings. We also have colleagues from Arcadis Netherlands who report embodied carbon values for their clients as it is required that a building or an infrastructure report their embodied carbon emissions before a building permit is issued.

³ M. Lewis (2020). *Looking Ahead to Embodied Carbon Policy Action in 2021*



Embodied Carbon Reporting in the Philippines

With regard to the Paris agreement, Philippines is reported to be on track in advancing implementations towards the goal of decarbonization. Reports from the Climate Action Tracker (CAT) indicate that the Philippines is the first country in Southeast Asia to set a moratorium on new coal and implementing measures to support the growth of renewable energy⁴. The Department of Energy (DOE) stated that it will no longer endorse new coal plants and will push for the transition to cleaner energy sources to ensure more sustainable growth for the country. The moratorium on new coal could reduce emissions by 32-35% in 2030³. The graphs below⁵ indicate what the effects of the coal moratorium could look like come 2030, the vacuum left in the wake of the coal moratorium means the interest and reliance on renewable energy sources will spike.

While a moratorium on new coal is in place, which will push key industries and sectors to look into more sustainable energy sources to meet the goal of decarbonization and ultimately the goal of limiting the rise of global average temperatures by 1.5°C, there are, unfortunately, no regulations or policies in place aimed at limiting the embodied carbon emissions for buildings and infrastructure. Amid the global pandemic, significant strain has been placed on the country and economic stability will, for the foreseeable future, be a national priority. This does not mean, however, that the initiative to push for a sector-wide approach to decarbonization should come later. In fact, the World Bank encourages governments to incorporate such efforts in their recovery plan, allowing for policies and regulations aimed at decarbonization to be backed by the momentum of a strong economic recovery.

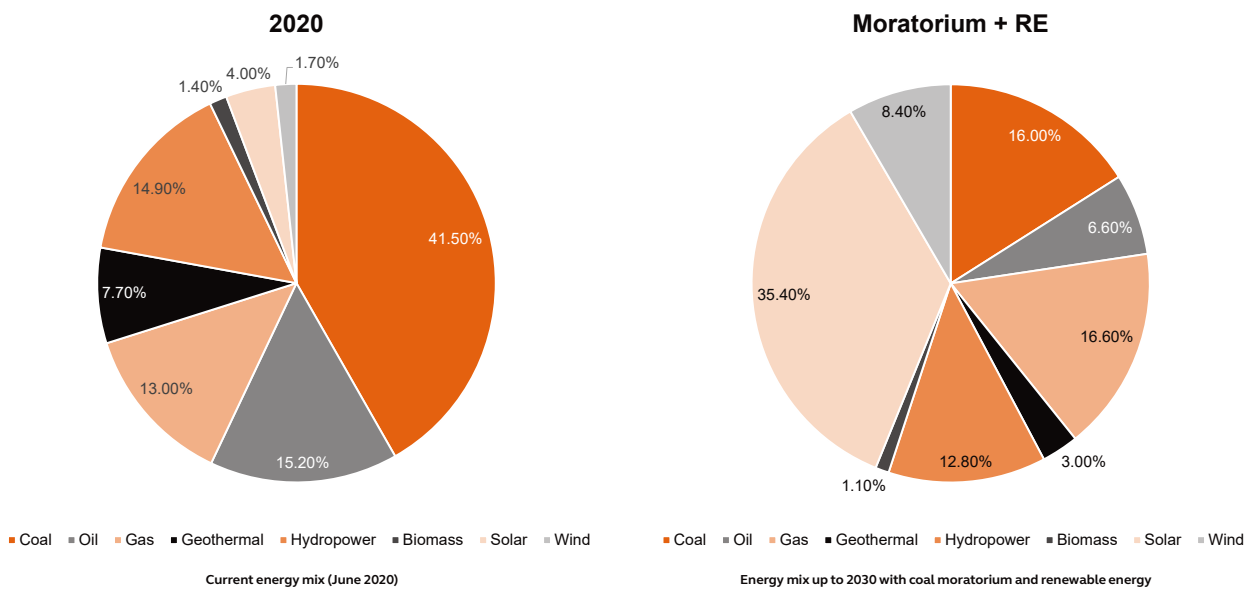


Figure 2. Possible Shift in Energy Reliance due to the Coal Moratorium

³ M. Lewis (2020). Looking Ahead to Embodied Carbon Policy Action in 2021

⁴ 2020. Climate Action Tracer - Philippines

⁵ H. Fernandez (2021). What the Philippines needs to do in 2021 to deliver its climate pledges

Arcadis' Capability in Reporting Embodied Carbon to our Clients

The predicament of having no regulations or policies in place aimed at reporting and eventually reducing the embodied carbon emissions of construction materials serves as an interesting opportunity for Arcadis Philippines to assist our clients in their sustainable aspirations. We foresee that multinational companies intending to invest and relocate in the Philippines will make carbon accounting a primary consideration in their planned developments. As this practice is already gaining traction in other countries, we expect the same driving force also applies to designers and consultants. Globally, Arcadis has teams and experts who can report embodied carbon values to clients, we can tap on our network of experts to set the practice in motion and generate interest in our clients. As mentioned above, the need to report embodied carbon values in the European region was driven by building regulations – landowners and developers are required to report the embodied carbon values of their proposed buildings before a building permit can be issued. This caused landowners and developers to put pressure on suppliers and manufacturers, to ensure that they could not only provide a monetary cost when asked for a quote, but could also report on the embodied carbon values for their products, which the European government regularly maintains and updates for all interested parties to use.



Arcadis Philippines could learn from our European counterparts. Our collaboration could pave the way in developing the necessary knowledge and skillset in our own quantity surveyors (QS) to appropriately report and present embodied carbon values to our clients. Alternatively, Arcadis Philippines can utilize pre-existing embodied carbon values as a proxy data in place of embodied carbon values for locally used materials, and upon reporting the findings to our client, we can springboard on this to have our local suppliers and manufacturers also accurately report the embodied carbon values for their materials despite the lack of a nationwide policy or law requiring it.



Conclusion

The looming climate crisis draws upon all sectors to contribute in any way possible to decarbonize and avert the potential and possibly irreversible effects brought by global average temperatures increasing. The building sector also plays a role in this, as every construction material used in the building has raw material extraction, transportation to the manufacturing plant, and the actual manufacturing process requiring fuel and energy which results in GHG emissions. Embodied carbon reporting aims to make clients and designers aware of the implications of choosing certain construction materials on the broader stage of the climate crisis. And despite the lack of regulations and policies in the Philippines, Arcadis Philippines can play a vital role in spearheading the initiative by reporting embodied carbon values to our clients, and possibly guide and assist our clients in choosing materials which are both economically and environmentally sustainable, effectively improving quality of life.

About Arcadis

Arcadis is the leading global Design & Consultancy firm for natural and built assets. Applying our deep market sector insights and collective design, consultancy, engineering, project and management services we work in partnership with our clients to deliver exceptional and sustainable outcomes throughout the lifecycle of their natural and built assets. We are 27,000 people, active in over 70 countries that generate €3.3 billion in revenues. We support UN-Habitat with knowledge and expertise to improve the quality of life in rapidly growing cities around the world.

www.arcadis.com

Contact us



Darneil V. Perez

Philippines Market Head

E darneil.perez@arcadis.com



Carla Cruz

Director, Environmental Sustainability

E carla.cruz@arcadis.com



Adrian L. Lamberte, CE Environmental Sustainability

Project Coordinator

E adrian.lamberte@arcadis.com

Arcadis. Improving quality of life

Connect with us

