# Accelerate Decarbonisation of Your Enterprise with Digital Technologies

## A Wipro Point of View

# Decarbonisation – The Field of Endeavour

The science is clear. Since the first industrial revolution over 200 years ago, and accelerating from the 1950s, energy consumed to enable industrialised human activity has increased the concentration of carbon dioxide and other greenhouse gases in the atmosphere*. These gases act as a blanket around the planet, trapping in heat that would otherwise escape back into the solar system. Average temperatures globally have therefore been rising.

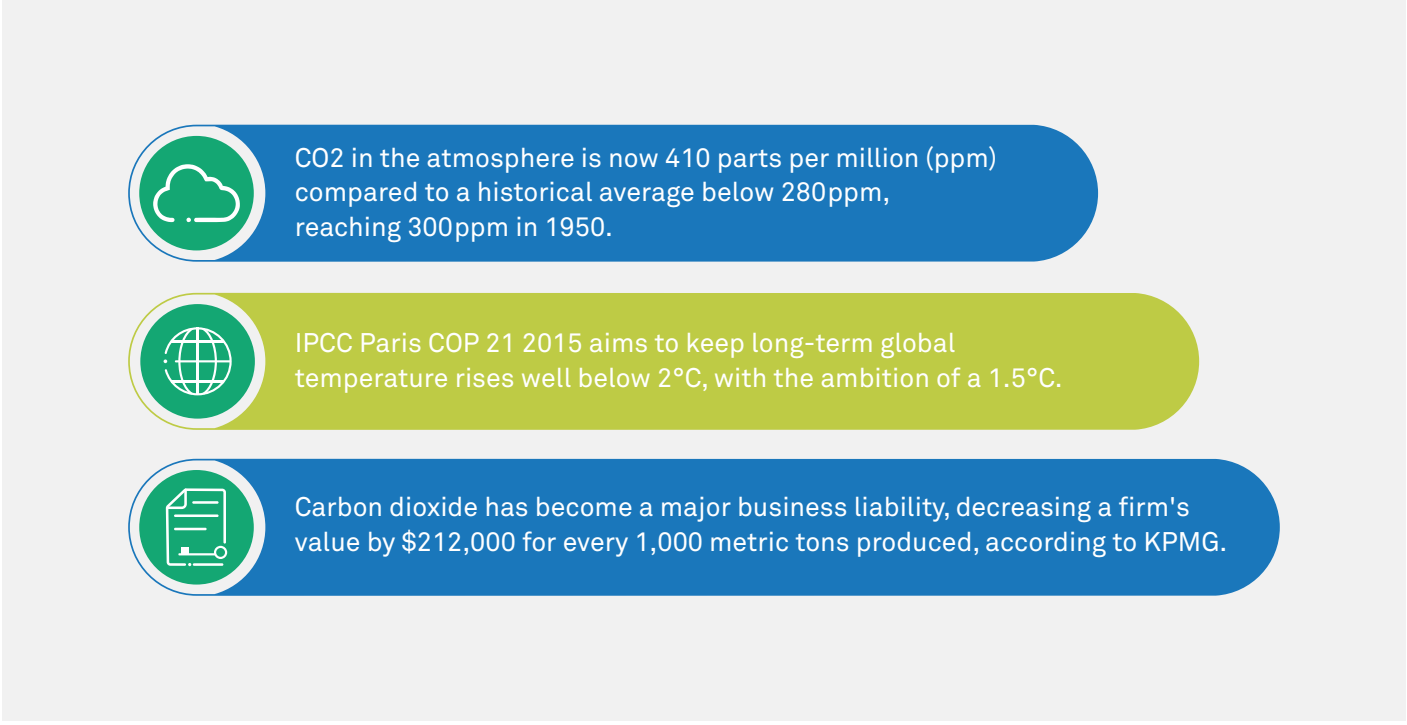
This is evident in the number of severe weather and other climate change events, which disrupt business and life in general. Even more concerning are the forecasts of what runaway climate change could do to our daily lives, if the point of no return was reached. A consensus has emerged on what needs to be done. The IPCC Paris COP 22 treaty (2015) was a key inflection point, articulating an ambition to limit rises in average temperature to 1.5 degrees Celsius. Government policies around the world are evolving at various speeds to support climate-related objectives.

Since the COVID-19 pandemic started, even greater focus has been placed on achieving net zero emissions. Economic recovery packages, for example, have been tied to reductions in greenhouse gases and there has been some recalibration to the strategic thinking within the business community.

Businesses are increasingly seeing the business case benefit and understand the need to act. For some, decarbonisation is a way to remove an existential threat to their business. For others, it is a case of responding to customer and shareholder pressure; decarbonisation is also a way to align to new regulations, to generate good will through public relations and marketing, or to reduce costs.

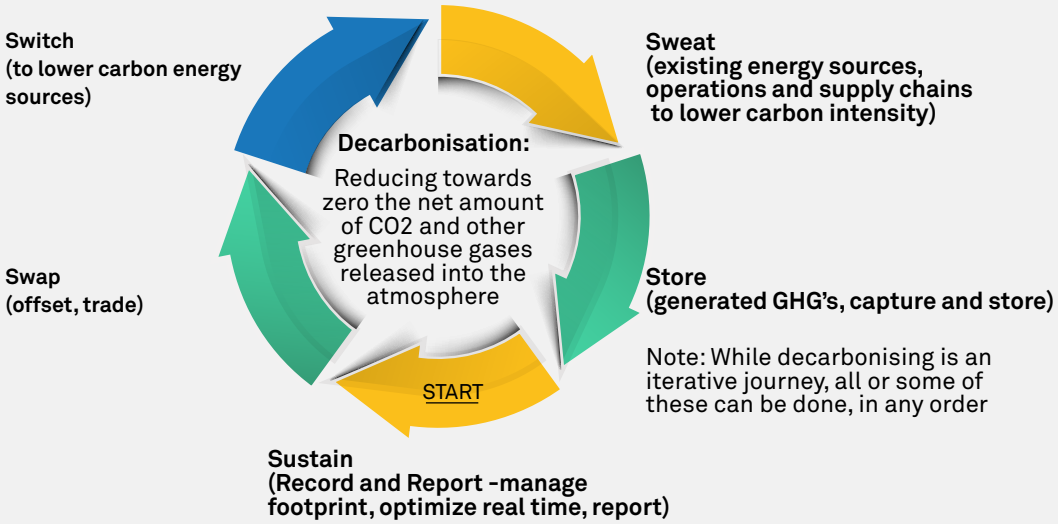
Decarbonisation, reducing greenhouse gas intensity to address climate change, is a huge field of human endeavor that will consume much effort globally over the coming years. Within this huge field, the intelligent use of digital technologies can help organisations decarbonise their footprint in faster, less expensive, and more effective ways.

***For the rest of this article, decarbonisation and carbon refers to the removal of all greenhouse gases.**



# Decarbonisation – A Framework

Decarbonising any enterprise can be pursued in multiple ways. This high-level mind map of the problem can aid understanding and help stakeholders decide on practical action.




To manage the greenhouse gas footprint, the organisation first needs to be able to measure and report current emissions. Once the baseline is established, targets are set and this becomes an ongoing set of management processes (called Sustain here). There are then many avenues to meet the targets, discussed via four pillars:

- **Switch:** An enterprise can switch to lower carbon energy sources, either directly (for example, installing solar arrays on their facilities) or indirectly from energy suppliers.
- **Sweat:** To reduce greenhouse gas emissions, the company can sweat existing operations and supply chains to reduce carbon intensity associated with existing energy sources, in much the same way as sweating cost from operations and supply chains.
- **Store:** The organisation can capture and permanently store greenhouse gases produced.
- **Swap:** There is hard-to-mitigate carbon in any supply chain, so there are a range of actions that can be taken to offset, or swap, carbon produced, for example via trading, buying carbon offsets, and through other paper-based instruments to get to net zero emissions.

It's important to recognise there are overlaps among these four approaches; moreover, they do not have to happen in any particular order. Each of these areas will now be explored in more detail, with a focus on the benefits that can be derived by using digital technologies.

## Sustain: Footprint Management; Record & Report

As noted above, step one must be to have a strong understanding of the current footprint of emissions, and then use that baseline to decide on targets and strategies. There are a large range of techniques and solutions to understand the carbon footprint.

Increasingly, environmentally conscious consumers and shareholders are demanding to know the carbon content of a product or service, and governments are placing more regulatory fences around this. We believe that footprint management will be analogous to financial management. Companies will create statements for greenhouse gases, audited and reported in standard ways (similar to profit and loss

statements and balance sheets). For this reason, some traditional accounting firms and software vendors like SAP have ventured into these processes and bodies such as the Sustainability Accounting Standards Board (SASB) have emerged.

However, knowing the carbon footprint for external reporting serves a different need from knowing the footprint for operational optimisation (just as there is a difference between financial reporting and cost accounting). Once the footprint is known and targets are set, operational footprint reporting can start to be used to drive down emissions. For example, a company may decide to delegate management to different parts of the business, hold staff to account, review supply chains and optimise emissions, even in real time.

To meet these objectives, many digital technologies can improve business outcomes when it comes to decarbonisation. Numerous software applications are available to analyse the existing footprint. Open architecture standards are being developed in this area, such as 'Open Footprint.' Big data, analytics and artificial intelligence can all help interrogate an organisation's data in order to optimise the carbon footprint. Within the wiring of an organisation, fully connected people and devices via the Internet of Things, fast networks (5G and Wifi), and data lakes can improve situational awareness, ensure rapid feedback loops, and lead to tighter optimisation of carbon emissions.

# Switch: To Lower Carbon Energy Sources

Switching to low carbon energy sources can reduce an organisation's carbon footprint directly (Scope 1 emissions) or indirectly through their energy suppliers (Scope 2 emissions).

There are many lower carbon energy sources in use. Wind, Solar, Dam Hydropower and Nuclear Fission all have significant market share today. Tidal hydropower, ground and air source heat pumps (as long as powered by low carbon electricity), biofuels, and geothermal also play a role in the lower carbon energy mix.

Hydrogen, batteries, gravity (water storage), compressed air, and other emerging technologies are not primary energy sources, but they are carriers to store and move energy in a more sustainable way. Nevertheless, they can play an important part in decarbonising a business.

Looking to the more distant future, nuclear fusion (replicating processes in the sun) may solve all of the world's energy needs in a zero carbon way by the next century. This will remain a hugely exciting field of experimental physics and engineering, and require huge investment over decades to commercialise.

Regardless of which energy sources are chosen, digital technologies can help the producers of these energies with carbon tracking (understanding the precise carbon provenance of the energy delivered to the customer, as low carbon does not mean no carbon), remote monitoring of facilities, predictive maintenance, downtime optimisation, power output optimisation, and modeling using digital twins. Technologies around drilling can add value for producers of geothermal. Production, pipeline, storage, and end user dispenser digitalisation can assist the hydrogen business. Other technologies can be applied to electricity grids to help balance the different types of power generated and transmitted, given the intermittency of wind and solar power, with more carbon-intensive baseload power.

For organisations trying to lower their Scope 2 emissions (indirect emissions from electricity, heat or steam purchased and consumed), artificial intelligence, machine learning, and real-time data management can be used to ensure the supply has the desired carbon intensity at the desired price, all the time.

# Sweat: Reduce Carbon Intensity

Another weapon in reducing carbon intensity is incremental: Sweating assets and supply chains to find small gains over time. This may be less eye catching, but many small, incremental improvements can take a company a long way towards net zero. It starts, as all of these efforts do, with a rigorous base line.

To address direct emissions from a company's operations (scope 1 emissions), for example, the internet of things can help by monitoring energy patterns and intervening and enabling, at one end of the spectrum, automated, intelligent light switching

to much more sophisticated operations like real-time switching of energy sources. Mobility applications can be used to optimise the footprint of business travel by putting the decision making of the carbon impact into the hands of the traveler. Product lifecycle assessments applied through digital technologies can help lower carbon intensity. SMART city solutions are another set of tools that can be used to reduce the carbon footprint of municipalities and buildings.

Reducing indirect emissions from a company's supply chain (scope 3 emissions) can also have a huge impact on the carbon footprint of the organization, in much the same way that supply chain optimisation has had a very positive effect on lowering cost, improving efficiency, optimizing waste, and allocating capital. Adjusting the objectives of supply chain optimisation to include greenhouse gas reduction is an incremental change, but a powerful one. Material-specific carbon evaluation can be applied to supply chain management in ways analogous to conflict materials tracking, for example. There are a range of digital technologies that can be harnessed to manage emissions from supply chains.

# Store: Capturing and Storing Carbon

Currently, there are around 20 operational facilities globally that capture carbon dioxide at scale, and the pipeline of new facilities grew 33% between 2019 and 2020 (GCCS Institute). Traditionally Carbon Capture Utilisation and Sequestration (CCUS) has also been used for reservoir injection as part of enhanced oil and gas recovery. Financially, the global carbon capture and sequestration market size was valued at $1.75 billion in 2019; it is projected to reach $6.13 billion 2027, at a 19.2% CAGR during the forecast period (Fortune Business Insights).

Operational facilities currently use geological features such as depleted oil and gas reservoirs and saline aquifers to capture and store carbon dioxide created from industrial processes. Another technology showing promise is direct air capture, where ambient C02 in the air is captured at facilities and locked away. Governments, for example, could invest in arrays of direct air capture machines to ensure carbon targets are met as a public good to address market failure and mop up carbon from decades gone by. Airlines could use it to capture equivalent emissions from flights. Other companies are experimenting with ways to lock away extra carbon dioxide permanently in concrete instead of underground.

These approaches can all benefit from the application of digital technologies. Subsurface digital applications, technologies, and techniques used to extract hydrocarbons from the earth can be harnessed to optimise putting greenhouse gases back into the earth and sequestering them for generations, such as reservoir modelling, real-time data management, and digital twins of the subsurface space. For direct air capture, technologies such as remote monitoring, uptime optimisation and predictive maintenance can be harnessed. Historian technology when coupled with the internet of things (sensors) can improve the operational outcomes.

# Swap: Offsetting and Trading Carbon towards Net Zero

Some carbon emissions are much harder to abate than others.

Rather than removing them, instruments can be used to offset emissions with carbon removed elsewhere from the atmosphere, arriving at net zero. Secondly, market-based mechanisms can help allocate resources more effectively than policies, processes and targets, in order to reduce carbon intensity.

Offsets work by buying suitably verified carbon credits to offset against your emissions, from a supplier who is running projects that remove carbon (or lower them compared to the levels which would otherwise have been emitted). Offsetting is quite controversial as there some projects where the carbon offset can be challenged.  For example, it is harder than it looks to calculate and verify how much carbon is removed. Some projects would have gone ahead anyway so are not removing additional carbon. Carbon needs to be locked away permanently (trees can be chopped down, etc.). And high altitude emissions are more harmful than low altitude ones. However, offsets will remain a part of the armory in this endeavour and will mature to become more of a trusted option; the market will grow.

The largest market mechanism is the European Union Emissions Trading System. A cap is set on the amount of carbon dioxide equivalent emitted overall, companies are allocated a number of credits within this cap (via an auction), and those who then need to emit more than they were allocated buy emissions allowances from those who need less, giving a carbon price.

An increasing number of companies are also using internal carbon markets to put a price on emissions to mirror that of external emissions, in order to either directly charge business units within the group as an incentive to reduce emissions, or for use in decision making, for example on capital project investment.

Various digital technologies can bring significant advantages, such as using Block Chain to track carbon credits, applications to more effectively manage the trading of carbon, big data, analytics and AI to optimise these processes.

# The Future

Many existing and some emerging digital technologies help organisations decarbonise in a faster, less expensive and smarter way and form a core part of their decarbonisation strategy. Digital technologies in our view are not just part of the wiring within the process of decarbonising a business. They are tools that can contribute a significant leap forward towards net zero. Some people worry that the technologies highlighted here also generate a substantial carbon footprint, and, accordingly, rightly argue that digital technologies need to be applied in a way that the digital carbon footprint sustainable, for example using a green cloud approach.

But the decarbonisation roadmap is clear, and the challenge is now. Between now and 2050 increasing maturity and new approaches will gain momentum – digital technologies will be in the thick of this endeavour.

# About the Author

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# About Wipro Ltd.

Within the area of sustainability, Wipro has a 10-year record of managing our own global carbon footprint. Details can be found in integrated annual reports (natural capital section):

**https://www.wipro.com/content/dam/nexus/en/investor/annual-reports/2019-2020/wipro-interactive-annual-report-2019-2020.pdf**

Wipro is a founding member of Transform to Net Zero (https://transformtonetzero.org) and a member of the open footprint forum (https://www.opengroup.org/openfootprint-forum).

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