

FUTURE
AT HEART

WHITE PAPER

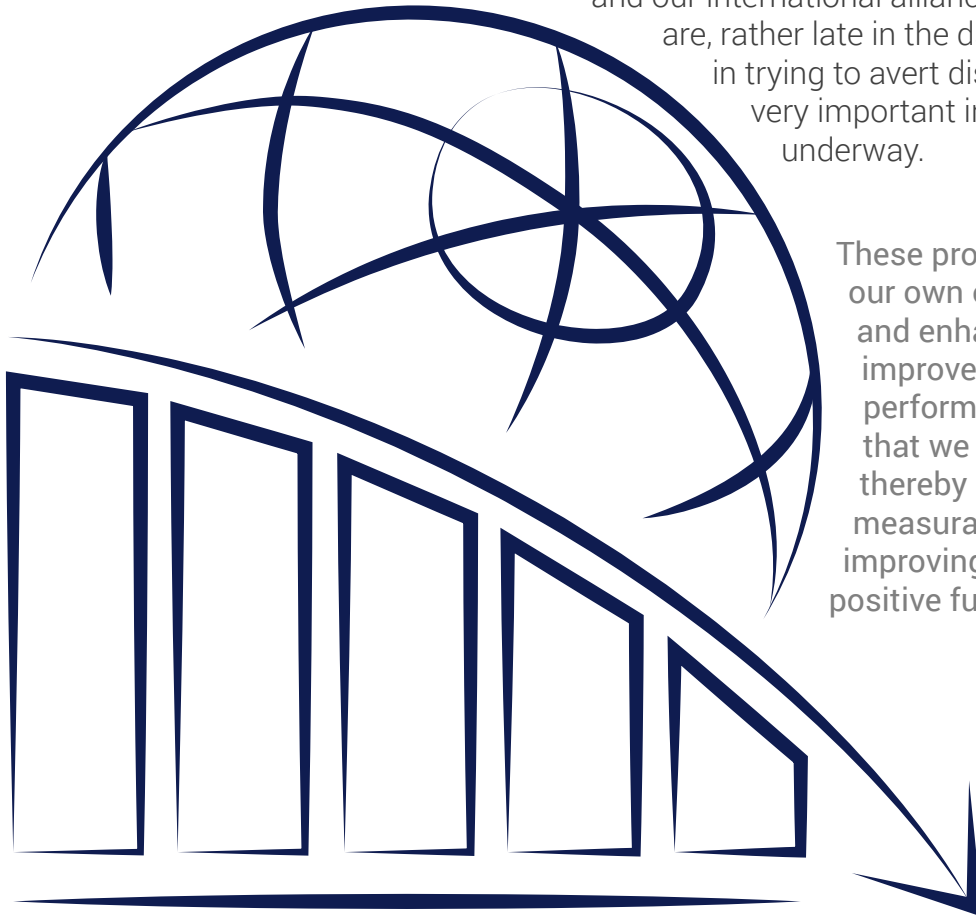
TOWARDS A SUSTAINABLE FUTURE

MOVING TO A NEW ECONOMIC MODEL

A WORLD AT CRISIS POINT

The climate crisis has been developing slowly and steadily, not just for the past few decades but ever since the first industrial revolution, which is now close to 250 years old. The human race has been in denial about its fundamental importance and also about the potentially lethal impact this will have on the ecosystems of our planet. Our collective will

and our international alliances and agencies are, rather late in the day, heavily engaged in trying to avert disaster, and some very important initiatives are now underway.



These provide the context for our own efforts to support and enhance the drive to improve sustainability performance in everything that we and our clients do, thereby making a measurable contribution to improving our chances of a positive future.

In this paper we give an overview of current developments, together with insights into how NTT DATA is building its own practical, client-focused solutions, designed to help businesses in all industry sectors make their organisations and business models more sustainable.



Let's start with a short overview of the context, covering aspirations, regulations and relevant international agreements.



UNITED NATIONS 2030 AGENDA

The UN agreed in 2015 on an interconnected set of 17 Sustainable Development Goals (SDGs), which define broad strategic areas for focused action on an international basis. The UN wants nations to ratify and commit to a series of actions based on the SDGs, backed by targets that measure progress towards goals to be reached by 2030.

The UN vision has set broad limits for sustainability as a concept, covering the more obvious aspects of environmental behaviour (carbon emissions, plastic pollution of the oceans, responsible consumption...) but also recognising the social factors that affect and, ideally, foster more responsible behaviours. These include such matters as gender equality, access to education and elimination of hunger, as the UN believes (correctly, for sure) that it is pointless to ask people to regulate environmental behaviour if they have no food, clean water or are afraid for their lives.

The 2030 Agenda is an ambitious strategy that can best be seen as a way to set a broad context for other, more localised or sector-based actions, ensuring that positive ideas from all quarters will fit into this common strategic framework.



EU GREEN DEAL

Other national and pan-national bodies have developed their own initiatives that follow in broad terms the same kind of thinking and actions defined in Agenda 2030. The EU, in particular, has committed its own member states to reaching complete carbon neutrality by 2050. The goal is to make sure that all economic and social activities will result in net zero emissions, and requires action across a wide range of areas.

These include (but are not limited to) growth in use of renewable energy, sustainable transport policies, better management of the food supply chain (Farm2Fork), higher sustainability levels in all industrial sectors, reduction in pollution levels and enhanced biodiversity.

These goals are challenging enough, and there are some opt-outs on a national level that risk diluting the generally positive approach being taken across the continent. Nevertheless, the green Deal is a strong statement of intent by the most powerful trading bloc in the world. The European Commission has called this “Europe’s ‘Moonshot’ moment”, and NTT DATA as a leading European business, has taken the initiative to partner actively in the strategy.



PARIS CLIMATE AGREEMENT

The most significant of all these global strategic action plans is the Paris Agreement, finalised in 2015, and which is the successor to the Kyoto protocols of 1997. In Paris, almost the entire world came together to turn the declarations of intent, defined at Kyoto, into stronger, more ambitious and fully binding actions, focusing on measurable progress and national commitments that reflect the much greater urgency of the situation, compared with 18 years earlier.

It is too soon to assess how successful or not this unprecedented global agreement will be, but its importance is not in question. This marks the only time in history that virtually every country on Earth came together to reach agreement on a vital issue and commit to practical actions.

The strength of the Paris Agreement is the simplicity of its core goal, which is to hold warming of the planet due to carbon emissions down to an average of less than 20 C. In support of this, the Paris strategy aims to channel finance towards climate neutral, sustainable and low carbon activities, while also fostering resilience to the inevitable impact of climate change, some of which cannot now be avoided.

Later in this paper we will look at how major financial institutions have responded, and in some cases anticipated this aspect of the UN climate strategy, demonstrating that business will respond to the emergency in an innovative and positive way, if engaged early enough and challenged to be creative.



OUR APPROACH

NTT DATA is one of many businesses across the world to have started rethinking in a fundamental way all aspects of our organisational structures, processes, methods and investments in order to align with the key strategies set out by the UN and other bodies.

As part of this change process, we have built our own specialist Green Deal industry with the mission to identify ways that IT and consultancy can help businesses rethink processes, make better use of data analytics to monitor and enhance performance, while testing future options to improve strategic decision-making and enhance sustainability. We follow the “dual material business model”, based on evaluating how climate change impacts on a business and then also how the business impacts on climate change.

Once we have a clear picture of these two operations, it is possible to start work on developing carbon-neutral strategies and action plans, which are, at the same time, designed to help a business become less vulnerable to climate impacts while ensuring that the footprint of the business on the environment becomes smaller and lighter.

In this paper we give a top-level introduction to our thinking, and suggest ways in which organisations of every kind can build better roadmaps to a sustainable future.

HOW SHOULD WE RESPOND?

First of all, there is no right or wrong way to begin improving management of environmental, social and governance issues within an enterprise. The priority must always be to start taking effective action as soon as possible, monitor progress accurately and refine our policies as a result of clear, accurate measurements.

ECONOMIC AND FINANCIAL CONTEXT

In developing our own strategic vision, we have been substantially influenced by leading economic and business theories designed by strategists, economists and financial experts worldwide. Some of these are analysed in greater depth within our “manifesto” for the NTT DATA approach: “Green Deal Industry Value Proposition”.

Without covering the same ground, we will highlight the thinking produced by the Capital Coalition, which defines the six kinds of capital relevant to business planning and execution, and defines the “Infinity Loop” model, which shows how partnership between Business, Finance and Government can lead to more positive and integrated policy-making.

We are also informed and influenced by the ground-breaking work, led by Kate Raworth in the UK, into “Doughnut Economics”. This combines 9 “stress factors” defined by planetary boundaries, which allows us to establish a “carrying capacity” in our ecosystem, with twelve social foundations needed to provide everyone with the necessities of life. By doing this, we can identify the space for growth and development that does not exhaust the life support systems of the Earth.

This, combined with fresh thinking from bodies such as TCFD (to be covered in more depth later in this paper), establishes a space in which environmental, technology and finance/investment related thinking can be combined to generate new insights, innovative thinking and potential opportunities.

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NTT DATA FOCUS

The Green Deal Industry business unit within NTT DATA focuses on the “art of the possible”, which means those areas of activity where we have useful and relevant expertise, knowledge and capabilities. This is where we are competent to advise our own clients about their priorities and help them to develop practical action plans.

We have identified six key areas of activity where it is possible to act now, and where we already have solutions that are proven to make a positive difference. Apart from climate change, itself, which is the overriding concern that impacts on everything we do, these priorities are:

01

Primary Sector

02

Smart Cities

03

**Sustainable
Mobility**

04

**Energy
Efficiency
and Renewable
Energy**

05

**Corporate
Sustainability**

06

Natural Capital

Let's take a look at each of them in a little more detail.

PRIMARY SECTOR

It is possible to argue that the primary sector is more closely connected to environmental health than any other. This is where we grow our food, decide which chemicals can safely be used for promoting crops and killing pests, and where the very concept of the Circular Economy has been developed.

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Effective new policies in this sector are being adopted by individual farmers, major food producers and retailers, aimed at conserving resources, safeguarding soil health and cutting down on waste. New bio-technologies are reducing the need for water in growing crops, replacing heavy use of fertiliser and weedkiller by fostering pest resistant variants, and, by monitoring soil health, to reduce or even reverse degradation and loss in fertility.

Other initiatives in major production businesses, from brewers to large scale processors (for potatoes, as just one example) are helping to turn waste products into reusable ingredients. Grains from beer production, for example, can be processed to separate proteins and lubricants, while water used for washing potatoes in production of French fries is now reclaimed so that the starch can be used for industrial purposes.

Across the primary sector value chain, strategic actions are being taken to reduce logistics costs, ensuring that the total number of road movements for materials of every kind are cut down, systematically eliminating release of carbon dioxide into the environment. In this way, through many thousands of individual actions, the primary sector is becoming more environmentally responsible and is succeeding in reducing its carbon footprint.

We in the IT industry have a specific part to play in this widespread, strategic process of change, which is affecting every developed country. IoT based monitoring, for example, makes it possible to track changes to existing processes, which can certify the effectiveness of new initiatives focused on environmental change. Core business systems should also not be underestimated as a driver for positive change, as this is where organisations produce audit-quality data to certify execution of carbon reduction policies.

This is the only way to achieve both the reputation and brand improvement goals, and the financial gains that environmental responsibility are now able to deliver. As more industry sectors become intensely climate aware, so the importance of reporting in encouraging change will grow.

Consumers have their own part to play in the “Farm2Fork” movement, and there is every sign this additional focus on food transport costs, local produce and so-called “food miles” is having an effect. Consumers are choosing organic foods where available and are pushing retailers to improve their own levels of responsibility in how they move, stock and present the food we eat.

The growing awareness of traceability is a key factor in this generally positive development. It is becoming increasingly possible for consumers (and retailers) to scan a QR code and be offered all relevant information about a product as an easy to view

“package” of data. That can include such factors as environmental footprint of the product, logistics information (distance travelled, perhaps even methods of transport...), best before date, plus other certifications related to organic production and appellation.

Traceability is a vital tool to help consumers make rational decisions about what they buy and eat. Change in this sector is a huge collective effort, and the more we are all engaged as citizens, the more effective this process will be.

NTT DATA has developed easily configurable standard products to assist in driving positive change in the primary sector. To give one example, IoTTrace uses blockchain technology to ensure the integrity and traceability of products as they move through the supply chain. This approach is increasingly used in the food sector to ensure that priority is given to responsibly-sourced and transported food items.

SMART CITIES

There are few “hotter” topics than this. Cities of very different kinds, in different parts of the world are developing strategic initiatives that are designed to improve their “liveability”, to make them attractive to potential new citizens and to reduce environmental problems, while also cutting costs.

These initiatives are focused largely on a range of policy areas, including transportation, pollution and key services, while also in many cases covering urban regeneration and financial management. Let’s look at some key headings:

Transportation means using advanced machine learning systems and high levels of automation to enable better integration between different forms of transport (road, bus, rail, urban mass transit) to make city movements both relatively pleasant and affordable, while also cutting unnecessary movements and emissions.

Successful solutions in this area use sensors and IoT devices to gather real time information, and analytics to identify potential issues and dynamically apply solutions. Motorists can be directed to parking spaces without the need to drive around looking for them. Road pricing and public transport subsidies can be applied in variable ways to encourage take up of mass transit systems, and pedestrian safety can also be enabled through emission monitoring.

In all such cases, the use of analytics is vital for ensuring that the entire transport system of the urban centre can be seen as an integrated whole and managed for maximum efficiency.

■ **Pollution** is an increasingly important factor in keeping cities viable and in discouraging an alarming trend, accelerated by Covid, to depopulation, as families seek higher quality of life outside large urban centres.

Clearly traffic management has a big impact on air quality, but this is by no means the only factor. We also need systems that manage quality of water, waste, recycling and street cleaning. All these activities play a big part in making cities remain good places to live, work and bring up families.

Once again, sensor and IoT-based systems can be used to identify problems, optimise cleaning processes and manage air quality, especially in very sensitive areas, such as schools and hospitals. Analytics and smart algorithms can be used to prioritise rapid interventions, while optimising core processes for cleaning and recycling.

■ **Key services** cover all those interactions between citizens and their city management and governance systems which help to keep services operating successfully and to a high standard. Partly, of course, this relates to the democratic processes of government, but we are also seeing a dramatic rise in citizen-driven initiatives based on the most advanced consumer technology. This ranges from online billing and forums, through to immediate use of handheld devices to report failures and other issues, through to active participation in activities designed to improve planning and raise quality of life.

City governments are finding that it is essential keep their own citizens engaged actively in improving quality of life, as that is the only way to attract newcomers and maintain growth. This kind of active feedback is also essential for effective strategic planning and regeneration, aiming to address the factors that cause deprivation and make it less likely that environmental degradation will take place in the future.

NTT DATA's Smart City in a Box is an instantly available communication solution designed to connect citizens and service providers, providing complete end to end visibility over developing events, issues and concerns. Standards-based and ready for fast deployment, this is rapid way to mobilise the whole citizen body in keeping government informed in real time.



SUSTAINABLE MOBILITY

A key driver for climate change is the use of fossil fuels for transportation, and especially for road and air travel. Given that our entire economic value chains depend on efficient, often “just in time” transportation, this makes mobility a key area for environmental concern, and a priority for change.

We have already touched on some of these in connection with smart cities and primary sector, but it is worth emphasising the importance of real time sensor-based monitoring, rapid access to analytical insights enabled by machine intelligence and fast intervention to ensure most efficient use is made of mobility assets. We can make rapid, positive changes by:



Better planning, making sure that logistics movements are as efficient as possible, reducing the number of road movements, cutting unnecessary duplication, ensuring that several part loads are replaced by a much smaller number of full loads, and by planning movements to reduce the probability of holdups that cause emissions and excessive use of fuel.



Electric vehicle use, accelerating the move from fossil fuel dependency to cleaner energy options, which will mean rolling-out a new network of charging points, addressing issues in the battery value chain, and investigating autonomous or assisted systems for further efficiency gains.



Behavioural change, which is already being driven by use of insurance solutions to monitor the efficiency of driving habits and matching costs to improvements that lead to emission reduction. This is one of the easiest areas in which IT systems and analytics can influence fast change, not just by encouraging individuals to behave better but by making road use in general more integrated and better managed.

NTT DATA has developed Moverick and Zentro, which are solutions designed to simplify and enhance the environmental performance of transport systems, making them more sustainable. Moverick is an integrated solution for urban and interurban transport management that enables electronic payment for journeys and provides real-time information to users. Zentro is an urban low emission zone (LEZ) management tool that uses cameras and internet of things sensors to automatically control and monitor access and manage permits and fines.

ENERGY EFFICIENCY AND RENEWABLE ENERGY

The rise of renewable energy sources is one of the good news stories of the past two decades, as we have seen the contribution of renewables grow much faster than most of us would have predicted. In some developed economies, in particular, a high proportion of daily energy needs are supplied from wind and solar energy, and this trend is likely to grow in the immediate future.

There is absolutely no room for complacency, however, as grids remain under pressure, requiring significant technical changes (how to repurpose low voltage transformers, for example, to manage the more intermittent energy flow from renewables? And how to foster safe very large-scale battery development for load balancing).

Even in the “greenest” grids there is a need for fossil fuel “top up” power, using combined heat and power or natural gas turbines, while other areas of concern still remain undeveloped. Once again, we will use IoT based systems to help optimise energy usage, enabling rapid climate control in the house from remote sites, and identifying ways in which remedial action can be taken to improve insulation characteristics.

The rise of smart grids has led to development of new business models (the “virtual power plant” for example) but can also make a huge contribution to optimizing energy usage. In the end, however, we also need to see a rise in improved building techniques (such as the “passivhaus” zero energy approach pioneered in Germany) and here, as well, advanced monitoring techniques are of the greatest importance.

In supporting this goal we are seeing governments and regulators promoting new and much tougher standards for energy efficiency in the built environment. Across Europe the BREEAM standard, originally developed in the UK, is driving higher levels of sustainability in materials and methods used for new buildings of every kind. In North America the LEED standard, though it uses different methods, has similar goals and is playing its part in raising sustainability standards in the entire construction industry.

Energy efficiency is connected to a combination of production, transmission, grid management and on-site usage. This is a very complex system that need to be seen as being interconnected, interoperable and manageable in an holistic way. NTT DATA's energy management solutions are playing a part in helping make the change to renewables faster and smoother than before.



CORPORATE SUSTAINABILITY

A large and growing number of enterprises are now coming to understand that sustainability goes beyond CSR, or Corporate Social Responsibility. This has in the past been seen as something of a “box ticking” exercise: a way of safeguarding the corporate brand rather than transforming environmental performance.

At last true Corporate Sustainability has become a real Boardroom issue, and change is being driven by financial levers (cost of financing related to improved sustainability); regulatory pressure (from central banks, government and industry-specific bodies), with penalties for not meeting increasingly tough environmental targets; and business strategy (more companies are realising that there are huge opportunities for early movers in sustainability).

Corporate bodies not only improve their own reputations by adopting and implementing sustainability policies, they also improve margins through cost reduction (lower energy use, more efficient building management, lower levels of travel), lower insurance costs, access to low interest funds and more efficient core processes.

As they develop their strategies for the future, corporations need to consider major issues, such as their supply chains, climate change mitigation and how to reduce carbon emissions as far as possible. We will look at all of these issues later in this paper.

Whatever their motivations, the fact that corporations are now more and more innovative in their own contributions to such priority topics as the circular economy, or reduced impact on natural resources is a major benefit to the planet. NTT DATA uses advanced IT solutions to give organisations, public and private, the tools they need to achieve higher sustainability levels.

NTT DATA's Swalert tool uses IoT technology to monitor water quality, rapidly identifying and reporting on possible contamination early, while intervention can still avoid serious problems. Umbiombu is a tool that helps companies to monitor, manage and report on Environmental, Social and Governance indicators. It matches outcomes to UN Sustainable Development Goals (SDGs) and Global Reporting Initiative (GRI) standards, while Habitat enables businesses to map their own building usage to make sure that utilization is efficient, safe and has lowest achievable carbon impact.

NATURAL CAPITAL

One of the most important and innovative changes of recent years has been the rise in understanding of and support for the Natural Capital concept. This is designed to foster care for the natural environment by analysing the contribution made to business activities and human wellbeing by the natural world, and by both renewable and non-renewable natural resources.

The Natural Capital Coalition has been formed to raise awareness of Natural Capital, and to formulate Protocols (both for Natural and Social Capital) that can be used as an aid for rational decision making at corporate level. The protocols define Natural Capital as “the stock of renewable and non-renewable natural resources (such as plants, animals, air, water, soils, minerals) that combine to yield a flow of benefits to people”.

They also attribute a market value to all such items of value, while enabling use of Natural Capital to be priced into balance sheets and investments. Finally, the protocols also note the “externalities” related to all actions that impact on or make use of Natural Capital. This means consequences, positive and negative, that affects anyone other than the agent taking the action.

By giving Natural Capital a defined and rational value, we ensure that it is worth something important to corporate decision-makers. That is the catalyst for more responsible use of nature, leading to reduced negative impact and a greater willingness to reinvest and safeguard the natural world. Examples already exist of how this approach to nature is leading to positive outcomes for the environment and for those businesses that are imaginative enough to make this approach work for them.

A major energy producer in South America has carried out a project to quantify the Natural Capital included in three of the country's most significant river and lake systems, all of which provide input for hydro electricity generation. Criteria included water flows, and the trends observed for diminution of flows over time, mineral resources, natural habitats and consequent biodiversity. The project includes three key phases: first, to identify Natural Capital in the ecosystem; second agree economic value for each ecosystem service; and third to use this definition of economic value to design management plans that improve the ecosystems, themselves and contribute to economic output.





CLIMATE CHANGE: PARIS AND BEYOND

The Inter-governmental Panel on Climate Change (IPCC) Report 2021 makes for sobering, in fact, disturbing reading. Delays in starting to address the problem of human-created climate change over the past several decades means that the world has missed the chance to avoid serious consequences, which are now certain to happen, whatever collective action we can take today and in the future.

A general raising of temperatures is leading to a dramatic increase in extreme weather events, degradation of the environment, water shortages in many countries, rapid rise in sea levels, leading to the disappearance of many small island nations, and loss of land in many others. Food supplies are under pressure, a mass extinction of species is now taking place and the refugee crisis will become more serious as a direct result.

Our task now is not to avoid these current problems but to prevent even worse catastrophes taking place in the future, if we can find the will and the methods for doing so. This will not be easy for many reasons: political, social, psychological and practical.

Yet businesses are not in the habit of giving up when faced with serious difficulties. The global economy has proved its resilience in the face of major crises in the past (recessions, resource shortages, trade disputes, even open warfare...), and we have confidence that most industry sectors will respond to the climate crisis with creativity and a real sense of responsibility.

There is no longer any lack of consensus around the issue of climate change: the IPCC report has been accepted by all world governments. It is now seen by business decision-makers and stakeholders, as well as by scientists and most of the world's population, as real. This is a huge and growing challenge that must be faced resolutely and with determination. The question being asked today is not do we need to act, but rather what can we do?

Businesses of every shape and size and in every sector are in search of practical, achievable strategies and policies. There is a growing sense of urgency, as enterprises seek ways to make their own contribution to combatting climate change, while also seeking new ways to open business opportunity from the growing Green economy.

SUPPLY CHAIN CARBON FOOTPRINT (SCOPE 3)

Businesses are now becoming much better at assessing the carbon emissions and other environmental factors (use of energy, potential for pollution...) in their own directly-controlled activities. It becomes much more difficult when they attempt to understand accurately, and then drive down, the levels of carbon emissions in what can be a very complex, global supply chain.

This is the significance of Scope 3 activities, defined as emissions that you cannot directly control, but that are related to activities you as a business request, invest in and pay for. A number of tools are being developed now to help businesses identify potential “hotspots” in their value chains and to advise on strategies for intervening and optimising performance.

This approach follows on from similar activities already now widely used for identifying social issues (such as modern slavery or other forms of exploitation), and applies the same attitudes to environmental matters. The goal is to move beyond the techniques common in social reporting, which includes declarations and self-assessment, followed up by spot checks, and implement a much more systematic, tool-based approach, which provides timely and accurate data to decision-makers, enabling them to change suppliers or provide guidance and incentives for positive change.

In the future we will see reporting on supply chain Scope 3 emissions as a fundamental part of corporate audits and reporting. This will impact on brand and reputation, for sure, but may also lead to intervention by regulators and even, in some cases, removal of products with dubious provenance from the market. Standardization bodies such as the International Standards Organisation (ISO) and the Greenhouse Gas Protocol are developing tools that fit naturally into corporate accounting practice, and it is here that financial pressure will play a major part in driving change.

CLIMATE CHANGE RISKS AND OPPORTUNITIES

The IPCC Report 2021, as we have already stated, fairly clearly demonstrates the risks to the human race of failing to control climate change. There is now a strong movement underway to use financial instruments to drive corporate change, using similar methods as those covered above for Scope 3 emissions.

- **Role of the TCFD.** The world’s financial institutions and large investors are taking a leading role in defining the corporate costs of what we may now see as “irresponsible” investment methods, following the very strong lead set by the Taskforce for Climate-related Financial Disclosures (TCFD). This international body was set up in 2015 by the Financial Stability Board (FSB), which was itself created by the G7 of industrialised nations and reports now to the G20 nations.

The establishment of the TCFD has provided a vitally important method for investigating, identifying and quantifying financial risks that relate to the impact of climate change. It is an objective and highly expert body, supported by 110 national regulators and governments. The TCFD produces its own detailed reports into specific aspects of how climate change affects business viability and health, while- perhaps even more important- driving large corporations to disclose climate related issues in their own activities and balance sheets.

The TCFD's work is stage by stage building a clearer picture of how different industry sectors worldwide are exposed to climate change, enabling mitigations to be put in place, informing investors as a way of encouraging more rational investment decisions, while also identifying new opportunities that could be opening up.

The TCFD, for example, has already demonstrated that in the period 2017 to 2019 inclusive, around \$640 billion of damage has been caused or intensified by climate change, and that up to \$43 trillion in manageable assets are exposed to climate damage by 2100. It is now clear that climate related risks have a clear and direct impact on financial health.

That makes them correctly and properly in the remit of financial institutions and central banks, which have a clear duty to regulate for environmentally responsible policies as a basic requirement for safeguarding all those exposed to loss, from major investors to employees and customers, to wider society. The active involvement of the financial community is a critical and necessary factor in changing business practices and improving environmental performance.

■ **New investment priorities.** Changes in risk assessments have driven the rapid move from fossil fuel powered to electric vehicles, and have also helped to push uptake of renewable power sources, as well. In the near future, a similar calculation of benefits versus risks will no doubt be taken to decide on how much to invest in lithium mining (for car batteries) and whether it is environmentally beneficial to promote deep sea mining for rare minerals.

There will always be difficult choices but at least the financial industry is clear about investment risks and is making sure that corporate decision-makers are also aware. This is not a new development. It was in 1995 that the CEO of Blackrock, the world's largest investment management firm, wrote to its customers and to the world at large to state that it was no longer willing to provide investment capital for what it considered to be unsustainable investments.

More financial bodies have followed the same path, reminding their clients that the ultimate climate change risk for businesses is not having a future owing to unsustainable strategies. It has at last become financially too risky for businesses to follow environmentally irresponsible policies. That is likely to help the environmental cause more than any amount of goodwill and idealism.

CARBON MARKETS

Carbon Trading was designed to use market tools as a way to encourage operational changes for the better in key industry sectors. Carbon markets were designed to finance implementation of clean technologies, not only by selling credits to polluting industries but to encourage changes for the better in investment patterns.

Concerns certainly existed related to the efficiency and clarity of carbon markets, although it was widely agreed that trading of carbon credits was a valuable tool in reducing global emissions. Article 6 of the Paris Agreement addressed existing issues by giving new emphasis to Monitoring, Reporting and Verification (MRV) as a way of validating achievements and building confidence in the system.

This approach may not reach the required levels of operational efficiency if manual record keeping and bureaucratic record keeping are employed. We believe that high levels of automation are needed to release the full potential of carbon trading, and that is why NTT DATA has developed a largely automated tool for supporting these vital trading markets: Meet Zero.

MeetZero is a platform that enables more efficient operation of all activities covered by carbon markets. That includes project registration, monitoring and reporting, certification and trading. It has been created to help both public administrations and private companies build and manage effective carbon markets that fully comply with the Paris Agreement rules. MeetZero uses tokens, issued only for proven emission reductions, together with a blockchain-enabled distributed ledger, to remove any possibility of carbon credit double counting.

■ **Role of automation.** As suggested earlier in this paper, NTT DATA has developed an automated monitoring, measurement and verification system for carbon emissions, using distributed sensors and IoT devices, with data collected and analysed in real time, via Cloud.

By automating this vital part of the process, we can remove the human obstacle (shortage of resources), which was restricting the number of projects that could be set up, managed and measured. We also ensure complete objectivity and accuracy in data, while placing individual projects in their national (and international) context).

Corporate bodies participating in this system will be able to monitor their own performance, be alerted to specific issues or areas of under-performance and then take practical steps to address these. The resulting objective measurements will feed into their CSR activities, help to inform corporate strategy and will have a transformational effect on their brands.

From now on, companies will no longer be making “claims” about performance: they will be able to demonstrate real progress, backed by real measurements.

■ **More effective trading.** The market for trading carbon credits will permit corporate bodies and other organisations to trade tokens earned through certified carbon reduction projects, earning a financial reward to offset the investments made to enhance their environmental performance.

The trading approach defined here will be different from the initial marketplace in several significant ways:

Designated authorities, both government agencies and banks, can monitor the status of tokenised emission reductions, enabling them to report fulfilment of Nationally Determined Contributions (NDCs), which in turn enables them to exchange ITMOs.

Project initiators or promoters can register their projects in a blockchain registry to ensure maximum security. Certification bodies can certify each individual project with the same level of security.

Carbon credit Monitoring, Reporting and Verification (MRV) are automated, using IoT systems. This enables certification bodies to verify and certify emission reductions achieved by each project.

Tokens are provided for CO₂ emission reductions, and third parties can search registered projects, with the option to buy tokens to offset their own carbon footprint.

Costs across the value chain are reduced due to improved efficiency in data collection and high levels of automation.

This approach is easier to use than in the past and delivers two key benefits.

First, higher levels of trust. Use of Blockchain technology avoids the potential for double counting. This means the market can guarantee that the value assigned to registered projects, in CO2 reductions, is accurate and can be traded securely and with full traceability.

Second, higher levels of efficiency. Use of IoT devices automates gathering and analysis of data, which makes the vital MRV process very much faster, using less energy (thus greener as a process) and delivers trusted outcomes efficiently. That will also help encourage rapid participation.

The design features of this carbon market will raise confidence in all participating groups, with the aim of providing a secure environment in which real achievements can be measured, captured permanently and used as a way of incentivising further progress.

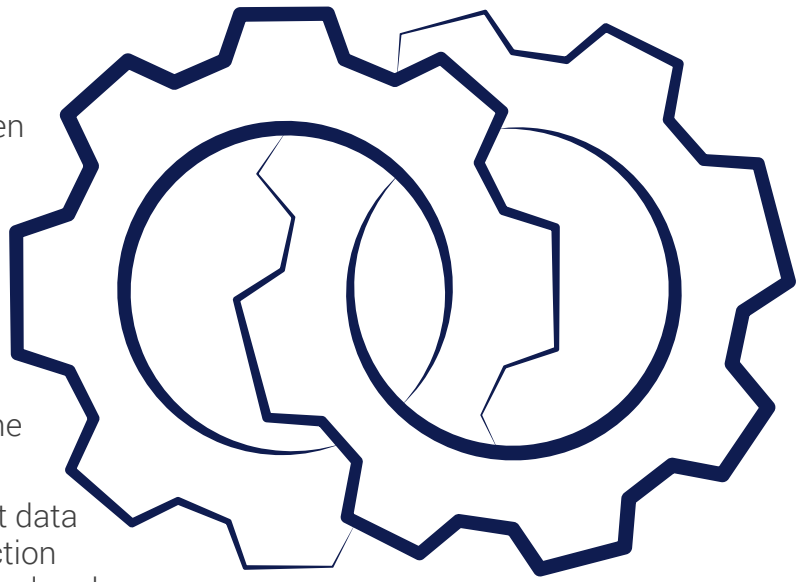
INDUSTRY COMMITMENT

Now we need to look at the ways in which IT and the wider technology world can play its part in driving the Green Deal transformation process. Today, we have more tools at our disposal than ever and also know a great deal more about how to make effective use of them.

Technology Tools. Industries as diverse as power generation, retail, pharma and discrete manufacturing have learned how to use sensor arrays and IoT devices to monitor, measure and proactively intervene whenever production assets move outside their normal tolerances, or when weak signals and trends are picked up in the wider market. These same tools and techniques can be, and are being applied to environmental performance monitoring, as well.

Matched with emerging supply chain management technologies, such as Blockchain, this enables us to build up a comprehensive picture of the truth, based on multiple data sources and smart analytics, so that we can deliver truly accurate, objective and incontrovertible evidence of corporate performance in any area we want to measure.

Regulatory bodies can measure when performance levels (for emissions, pollution, extraction...) go beyond agreed levels and rapidly intervene, by imposing fines, for example. Yet the best and more successful corporations need this “stick” aspect of the famous “carrot and stick” approach much less than in the past.



Just as a manufacturer will use alert data to monitor the health of their production assets, in order to avoid downtime and prolong their useful life, so the same businesses will track emissions data and potential safety hazards, in order to address them fast and amend working processes to engineer these problems permanently out of the system.

As noted earlier in this paper, a combination of smart transportation systems, IoT monitoring, road usage and available travel alternatives can be used at a strategic level AND on a day-to-day basis to reduce traffic levels, cut down on air pollution and make urban life more pleasant and efficient.

Thanks to IoT, analytics and practical social tools, such as road pricing, we collectively have a toolkit that enables us to identify environmental issues, plan to eliminate them for the long-term and mitigate their impacts in the short term. The rise of agile ecosystem working through DevOps is even playing its part in this action, as it reduces travel and familiarises businesses with the use of scenario planning tools, such as Digital Twins, to test and optimise options virtually before taking action in the physical world. In all these ways, the IT industry has a potentially transformational part to play in building a better future- but perhaps needs to be more proactive about how it operates!

■ **Implementation and investment.** Major consulting groups have been very active in recent years as they work with large corporations to improve governance and upgrade their governance and management processes. This is as important an indicator for the future as that initial letter from Blackrock nearly 30 years ago. They are becoming concerned about how corporations can evolve, develop and remain profitable in what will clearly be very different operating conditions, compared with the recent past.

As most large corporations become “digital native” organisations, living and working in the Cloud, so there is an urgent need to attract digital talent, which is a challenge in itself, while also transforming some aspects of organisational structures and working methods to drive sustainability into all aspects of their business.

As change projects need top level sponsorship to have any chance of success, we are seeing central teams set up to drive transformation, with different models for local ownership and accountability, and for rapid response from the centre wherever help and support are needed.

n other words, though policy is important, action and measurement are what really count. In our opinion, the move to Cloud is having an influence on all of these changes. Becoming digital native will lead to less travel, lower investment in permanent places of work and a greater need to manage interactions with partners, while strictly meeting regulatory compliance requirements and being accountable for projects in which non-employees will play key roles. Monitoring, measurement and reporting now have to become faster, more granular and easier to analyse, right across complex value chains. Key software companies, like SAP, are playing their own part in meeting these digital needs, but it will be a major challenge to a lot of organisations, nevertheless.

■ **Changing attitudes.** One of the most important issues facing all business leaders today is how to combine what is right: improved environmental performance, with what is profitable, ensuring business success at the same time. This will require a major change in mindset, together with a new set of business priorities, enabled by technology tools. Let's explore what this can mean in practice.

Large businesses have been obsessed with the concept of "stakeholders" for some decades now. We might date the rise of this concept to the mid 1970s, when Milton Friedman, the Nobel prize winning free market economist, defined the mission of any business as to make profits for its shareholders, nothing more, nothing less. From this brutally clear and focused sense of purpose came the concept that any business, any organisation can be defined by those that have a particular interest in it, as the English expression says: "those who have a stake in it".

they might also be suppliers, and might well be those directly affected by the actions of the business, so some members of the general public might also be included here.





It is clear that the concept pioneered by Friedman and his school essentially limits the responsibilities that any business possesses with regard to the outside world and wider environment. It is possible for corporate Directors to do their jobs meticulously without considering the wider welfare of the planet. And this is what needs to change.

Fortunately, we are now seeing a transformation of executive attitudes, at least to a certain extent. The days in which a corporation could rigidly insist on its sole duty being to shareholders are gradually passing. There is a context to all business activity and that context is the wider environment in which we all live.

AND FINALLY...

The global effort to combat climate change is led by the UNFCCC (United Nations Framework Convention on Climate Change). Regular meetings are held every few years, known as COP (Conference of the Parties), with the latest in the series, COP 26, due to be held in late 2021. This is where all players in the drive to combat climate change can come together to review progress, refine ideas, hear submissions from experts and lobby groups, and re-energise the next stage of activity.

This year we expect to hear that a major financial pledge: \$100 billion or more, will be offered to support decarbonisation efforts worldwide, especially for less developed countries. We will take the next steps in making carbon markets operate more effectively and share ideas on how corporations can safeguard their own long-term sustainable futures, and in doing so, help the planet, as well.

NTT DATA will be submitting ideas: so will many other interested parties. This is the greatest and most urgent challenge any of us face. We face our future with concern, yes, but with greater confidence that we are at last on the right path.