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The Value of 'Planetary Facts'

science-based product data and disclosures beyond carbon

Abstract

A system that enables businesses to quantify the environmental impacts of products, contextualise this data with scientifically determined limits (planetary boundaries), and communicate it with buyers in a way that is easy to understand has the potential to drive significant pro-environmental decision making and outcomes. An immense proportion of global decisions occur through a product lens. There is evidence of both business and purchaser demand for a system that supports easy-to-understand environmental data about products with scientific context. Governments and policymakers have a pivotal role to play in the successful implementation of such a system.

Keywords Planetary Facts, planetary boundaries, eco-labels, sustainability labels, product environmental performance, product disclosures, environmental disclosures

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The climate is changing before our eyes. Impacts are now evident in every region of the world, some already irreversible (Skea et al., 2022). The past decade has witnessed an uprising of grassroots initiatives – such as Extinction Rebellion and School Strike for Climate – demanding climate action. There has been a notable increase in commitment by governments to reduce greenhouse gas emissions, from declarations of a climate emergency to the establishment of carbon taxes, emissions trading schemes and decarbonisation funds. Many businesses have also brought climate change to the forefront of their strategies and decision making, setting and meeting emissions reduction targets they have established based on what is scientifically needed to limit global warming to 1.5°C.

However, climate change is not the only global environmental crisis facing humanity. Human activity has pushed global ecosystems beyond at least six of nine critical environmental limits known as the 'planetary boundaries' (Steffen et al., 2015). Exceeding such boundaries is the single greatest threat to humanity (Behlert et al., 2020). Returning to and remaining within the planet's environmental limits will require effort at every scale of human activity, from individual lifestyle choices to

business activity and government investment. Yet, most people are not even aware of the nature and implications of planetary limits. Those who are lack the information and tools they need to make decisions that align with a future within these limits.

A significant proportion of the global decisions that drive market behaviour occur through a product lens. For many businesses, scope 3 emissions – i.e., emissions associated with the goods and services purchased by businesses – account for over 70% of their total carbon footprint (Deloitte, n.d.). Globally, household consumption contributes significantly to human impacts on planetary boundaries. For example, household consumption is linked to over 60% of greenhouse gas emissions and between 50% and 80% of total land, material and water use (Ivanova et al., 2016).

In our view, a key, yet underutilised, lever for change is a system that makes it easy for businesses to quantify the impacts of their products and services on the planetary boundaries, and to disclose this data in a way that is credible and easy for the general public to understand.

Planetary Accounting is a scientifically peer-reviewed framework that links existing environmental accounting systems (such as life-cycle assessments) with the planetary boundaries (Meyer and Newman, 2018). The Planetary Accounting Network (PAN), a New Zealand-based charitable trust founded by Kate Meyer (creator of Planetary Accounting and a co-author of this article), has established a new system they call 'Planetary Facts', which comprises two key components. First, they have developed a methodology that enables businesses to use Planetary Accounting consistently and robustly to quantify the impacts of their products and services on the planetary boundaries. Second, they have worked with focus groups to establish a concept design for a new generation of eco-labels which communicate this data in a way that is easy to understand.

The purpose of this article is to demonstrate the need for a system like Planetary Facts – one which makes it easy for businesses and their customers to access and understand the environmental impacts of products and services in the context of planetary boundaries. We begin by demonstrating the value of scientific context in accelerating environmental action by providing examples from the carbon and climate change space. We then show the need to extend this approach beyond carbon and introduce the planetary boundaries and Planetary Accounting Framework. We draw on historical evidence from the use of existing eco-labels and nutritional labels, combined with consumer engagement studies, to set out the potential outcomes of a system like Planetary Facts. Finally, we present the key opportunities and challenges in implementing such a system and highlight the important role of policy in actualising such a system to leverage change.

Understanding the scale of environmental change needed through setting science-based targets encourages decision makers to shift away from incremental solutions and towards innovation and systemic change.

The value of science for accelerated climate action

The quantification and disclosure of organisations' carbon footprint – i.e., the greenhouse gas emissions associated with business operations and associated reduction targets – has become common practice over the past couple of decades. Initially, organisations typically set emissions reduction targets based on what they felt was achievable, or that aligned with industry benchmarks or 'best practice'. While this approach did often lead to emissions reductions, the scale of these did not relate the scale of the environmental challenge, and the short-term view comprising year-to-year reductions promoted incremental changes, such as energy efficiency initiatives and the establishment of travel policies, rather than the systemic-level change that is needed to avoid catastrophic environmental outcomes.

Since 2015, in response to the Paris Agreement, there has been a global shift by businesses and governments to underpin decarbonisation efforts with scientifically determined goals or 'science-based targets'. For example, many businesses are now setting targets for greenhouse gas emissions based on the pace of emissions reductions needed to limit global warming to 1.5°C above pre-industrial levels. Governments are also incorporating scientifically derived budgets into emission management tools.

The link between science and activity is important because it highlights the magnitude of change needed, and because it provides a mechanism to align ambition levels – promoting a sense of confidence that others are working to the same end.

Understanding the scale of environmental change needed through setting science-based targets encourages decision makers to shift away from incremental solutions and towards innovation and systemic change. Specific science-based targets vary by target, sector, methodology and geography. However, committing to a 1.5°C-aligned target means roughly halving greenhouse gas emissions between 2020 and 2030, and then reaching net-zero emissions by or before 2050.[1] This scale of emissions reductions will not be achievable for most organisations, regions or countries through incremental change. Armed with this insight, government officials and business executives can see more clearly that many business-as-usual activities (such as the use of fossil-based energy) will need to be

fundamentally altered. There is already evidence of positive environmental outcomes stemming from science-based targets. Many businesses are making significant investments to systemically change their operations, from global giants such as Microsoft, which is committed to using renewable energy to run its data centres (Shoemaker, 2022), to New Zealand firms such as tourism operator RealNZ, which has committed to retrofitting the iconic *Earnslaw's* coal steam engine to use wood chips, biofuels or hydrogen (Roxburgh, 2022).

Before the advent of science-based targets, there was a reluctance to 'over-commit' compared to one's competitors. Businesses and national governments were nervous that committing to targets that were more ambitious than others' would result in a market disadvantage because of the costs associated with meeting these targets. The movement towards setting science-based targets has levelled the playing field. It promotes a sense of trust that others are committing to similar levels of ambition, which is in turn enabling better collaboration for industry change. For example, in New Zealand, over 100 companies have now joined the Climate Leaders Coalition, committing to setting and disclosing science-based targets for their operations (Climate Leaders Coalition, 2023). This constitutes commitments that align with what is scientifically necessary to limit warming to 1.5°C for nearly half of New Zealand's gross emissions. In their latest review of signatory achievements, the Climate Leaders Coalition found that 57 of their signatories had reduced emissions in 2022 despite the challenging economic environment, and that almost all signatories had reaffirmed or increased their planned investment for emissions reductions (Climate Leaders Coalition, 2022). While it is too early to say with certainty whether signatories will achieve their targets, the market risks associated with failure to meet disclosed targets are high – i.e., companies are unlikely to disclose such targets unless they have every intention of meeting them.

Beyond carbon

The connection between science and climate action to date has led to increased greenhouse gas emissions reductions. However, as noted earlier, climate change is not the only global environmental crisis. There are eight other critical planetary boundaries, and we are exceeding at least six of these (Steffen et al., 2015; Persson et al., 2022; Wang-Erlandsson et al., 2022).

The terms 'planetary boundaries' and 'planetary limits' are somewhat misleading. The planet will not cease to exist if global warming exceeds 1.5°C, or even 15°C. A better way to describe what is meant by these terms would be 'acceptable environmental limits for humanity'. The idea of planetary limits can be traced back to as early as the 1600s and estimates of Earth's 'carrying capacity' – the number of people the planet could support (Cohen, 1995). The problem with this, and with other early approaches to defining planetary limits, is that the results depended on assumptions regarding what constitutes an acceptable lifestyle and the level of technological advancement (Meyer and Newman, 2020).

Modern humans evolved during a geological epoch called the Pleistocene (Rightmire, 2008). The climate in this epoch was highly variable, oscillating between short periods as warm as or warmer than recent history, and long glacial periods (Pisias and Moore Jr, 1981). During this time, human survival depended on hunting and gathering for food (Dillehay, 2008). Approximately 11,500 years ago a new geological epoch began, the Holocene (Roberts, 2014). The Holocene has seen an unusually stable global climate, with average global temperature ranges of only ±1°C (Marcott, 2013). With these stable temperatures came the advent of agriculture and a period of rapid development from hunter-gatherers to modern settled societies. The Holocene is the only state we know humanity can thrive in (Rockström et al., 2009). It follows that humanity should aim for the future to remain in a similar Holocene-like state.

The planetary boundaries framework, first published in 2009 (Rockström et al., 2009), is a breakthrough in defining planetary limits because it avoids making any assumptions regarding population, lifestyle or technology. Rather, the planetary boundaries are environmental limits derived from the underlying assumption that we ought to try to maintain a 'Holocene-like' state. They are now widely viewed as the non-negotiable scientifically determined global limits for the environment.

> Decisions made through a climate-only lens can result in perverse outcomes through impact shifting – the reduction of one environmental impact at the cost of increases in others.

The planetary boundaries set out the 'safe' limits for:

- climate change;
- freshwater change;
- stratospheric ozone depletion;
- atmospheric aerosol loading;
- ocean acidification;
- biogeochemical flows;
- novel entities;
- land system change;
- biosphere integrity.

We are beyond the limits for climate change, biogeochemical flows (nitrogen and phosphorus run-off into waterways), land system change (deforestation), biosphere integrity (biodiversity loss) (Steffen et al., 2015), freshwater change (Wang-Erlandsson et al., 2022) and novel entities (the release of man-made substances such as chemicals and plastics into the environment) (Persson et al., 2015). Atmospheric aerosol loading (air pollution) is not measured at a global scale,

but the limit is exceeded in many regions (Steffen et al., 2015). Exceeding even one planetary boundary puts the future of humanity at risk (idid.).

Many organisations that are aware of the need to look beyond carbon have taken the position that they will first get their emissions in order and then focus on other environmental impacts. This is not a scientifically valid approach. Decisions made through a climate-only lens can result in perverse outcomes through impact shifting – the reduction of one environmental impact at the cost of increases in others. We are dangerously beyond the limits for biosphere integrity, land use change and biogeochemical flows; delaying our response in addressing these limits while we work on reducing emissions reductions does not address the underlying risk that we fundamentally and irrevocably change the biophysical state of the planet. Continued impacts such as deforestation or biodiversity loss could lead to catastrophic environmental collapse even in the absence of greenhouse gas emissions.

A carbon-only or carbon-first approach is also inefficient and presents significant market and governance risks in addition to environmental risks. Market and policy drivers are already moving towards a wider environmental perspective. For example, in 2020 an initiative was announced to establish a Taskforce on Nature-related Financial Disclosures (TNFD, 2022), with the aim of creating a set of guidelines to assist organisations to be transparent and disclose nature-related financial risks and opportunities. The Science Based Targets Network is working to support citizens, cities, companies and countries to underpin targets relating to biodiversity and natural systems with science (Science Based Targets Network, 2020). A recent consumer study which asked 32 respondents about their greatest environmental concerns found that deforestation was a greater concern than global warming, which was closely followed by waste (Hay et al., n.d.). When asked which environmental impacts they consider in their purchasing decisions, respondents ranked waste the highest.

Incorporating a planetary boundary lens into decision making mitigates market and governance risks as it is unlikely that either market or policy drivers will demand a greater response than scientists, and it is essential to the long-term future of humanity. However, the planetary boundaries were not intended to be used for decision making; they set out environmental limits at a global scale, but do not answer the question of what needs to be done to return to and stay within these. Planetary Accounting is a framework that translates these global limits into metrics and budgets that make sense at the scales we make decisions, enabling us to link these decisions with what is scientifically necessary at a global scale (Meyer and Newman, 2020, 2018).

Global grassroots movements such as School Strike for Climate and Extinction Rebellion are disrupting business-as-usual activities to demand change.

The value of a product lever

Given the scale of the environmental crisis, it may seem that decisions made by individual consumers are unlikely to drive significant change and that policy, regulation and other change mechanisms should target action at a business or government scale. There is no doubt that change at these scales is necessary.

However, the importance of consumer-level change as a lever for a global transition to human activity within the planet's limits should not be underestimated. Greta Thunberg's 'school strike for climate' is a prime example of how individuals can bring about a rise of collective action. Her first solitary protest in 2018 has led to a global movement with millions demanding climate action, described now at the 'Greta effect' (Morath, 2019).

A significant proportion of the global decisions that drive market behaviour and environmental outcomes occur through a product lens. As previously stated, household consumption contributes to over 60% of global greenhouse gas emissions and between 50% and 80% of total land, material and water use (Ivanova et al., 2016). In wealthier countries, the impacts of household consumption are even higher. Household consumption in New Zealand in 2020 had a carbon footprint of approximately 40 $MtCO_2e$ (Statistics New Zealand, 2020). To put that into context, New Zealand's 2020 national carbon footprint was 78 $MtCO_2e$ (ibid.). The national consumption of fossil fuels (from energy industries, manufacturing and construction, and transport combined) resulted in approximately 31 $MtCO_2e$ that year (Ministry for the Environment, 2020).

There is compelling evidence that many consumers want to make environmentally sustainable purchases. Global grassroots movements such as School Strike for Climate and Extinction Rebellion are disrupting business-as-usual activities to demand change. A recent IBM Institute for Business Value study of global consumer behaviour found that 57% reported they would change their purchasing habits to reduce negative environmental impact (Haller, Lee and Cheung, 2010).

Despite the increase in organisational-level reporting and disclosure, very little has been done to date to enable consumers to link their behaviour or purchasing decisions to the environmental outcomes they want. Eco-labels – discussed in detail in the following section – provide limited information with little context. More than 50% of consumers find the way businesses talk about their social and environmental commitments confusing (Colmar Brunton and Sustainable Business Council, 2021). Despite the growing motivation of consumers to make good choices, the purchasing decisions made by these same individuals are almost certainly sending

conflicting signals to the market – i.e., encouraging the continued development of products and services that are contributing to the degradation of the planet's ecosystems.

Further, it is not only consumers who are faced with making purchasing decisions through the lens of products and services. Businesses and governments are actively seeking to procure products and services that align with their organisational-level targets for environmental and social outcomes. While life-cycle assessments and enviromental product disclosures (see below) are sometimes used to provide environmental data to these corporate customers, this data lacks scientific context, is difficult to understand, and is only available for limited products and sectors.

Eco-labels, life-cycle assessments and environmental product disclosures

With increasing purchaser motivation to buy sustainable products, there is growing demand for eco-labels (i.e., labels which communicate the environmental performance of a product) (Yokassa and Marette, 2019) and the disclosure of environmental product data. Eco-labels date back to 1978, when the Federal Republic of Germany launched the Blue Angel eco-label scheme to differentiate environmentally sustainable products. The scheme was launched with 100 products and grew to over 12,000 by 2016 (Prieto-Sandoval et al., 2016). The widely acclaimed Brundtland Report in 1987 (World Commission on Environment and Development, 1987) highlighted the potential for eco-labels to drive better consumer choices, particularly regarding energy efficiency and limiting chemical use.

Now, in 2023, there are 456 labels used in 199 countries and across 25 sectors (Ecolabel Index, 2023). There are several international agencies that provide guidance and regulation for eco-labels, including the Global Ecolabelling Network, the ISEAL Alliance and the International Organization for Standardization (ISO). However, there is no requirement for companies to align their labels with any of these standards or guidelines. Eco-labels can be generally categorised as:

- multi-criteria eco-labels which indicate the overall environmental preferability of a product: for example, New Zealand's 'Environmental Choice';
- self-declared environmental claims which communicate a particular aspect of the product: for example, the recycling symbol;
- quantified product information labels, which disclose the magnitude of environmental impact across one or more metrics: for example, carbon footprint labels.

The advantage of multi-criteria eco-labels is their relative simplicity: they provide a mechanism to communicate compliance with broad and potentially complex criteria. However, the quality of the criteria behind these labels is variable.

> … there are increasing concerns that companies are using eco-labels to make unsubstantiated or misleading claims, often referred to as 'greenwashing' …

Without considerable further investigation, it is difficult for purchasers to establish what is behind these labels and whether a given label demonstrates high performance or not. Environmental claims are a useful mechanism to communicate specific information, such as the recyclability of a product or its packaging. However, there are increasing concerns that companies are using eco-labels to make unsubstantiated or misleading claims, often referred to as 'greenwashing', as so many existing eco-labels do not provide a holistic, easy-to-understand view of environmental performance (Cobbing, Wohlgemuth and Vicaire, 2023; Consumer, 2023).

These limitations have led to an increased demand for quantified product information which discloses environmental impact data about products and services and leaves the consumer to draw their own conclusions from this. Environmental impact data is typically based on life-cycle assessments (LCA), an environmental accounting process that systematically quantifies and evaluates the environmental impact of a product or service through all life-cycle stages – from the extraction of raw materials, through manufacture and processing, to use and eventual disposal. The advantage of this approach is that results can be generated across a broad range of environmental metrics, providing a holistic view of environmental performance. The disadvantages are that these assessments are expensive and labour-intensive to complete; variations in assumptions and data quality mean results cannot be robustly used to compare different products; and the results are difficult for a layperson to understand.

LCAs are not generally used as the basis for consumer labels. However, they underpin environmental product disclosures (EPDs), independently verified and registered documents that communicate the results of an LCA according to a predefined set of rules. These are typically used for business-to-business communications to enable the direct comparison of similar products. EPDs have been widely used in the construction sector. However, while they provide a better basis for comparability than life-cycle assessments, they are also expensive to produce, difficult to understand, and lack scientific context.

Carbon labels are beginning to infiltrate the market: Unilever have announced that they will add carbon labels to all of their 70,000 products (Rathi, 2020). The European Commission has established new product environmental footprint (PEF) labels, based on LCAs, as a mechanism to provide robust and consistent labelling. These are currently in a pilot phase, but the expectation is that they will be formally launched in 2024. While PEF labels may address some of the major challenges of

eco-labels, by providing a credible and consistent calculation methodology, they do not support the comparison of different product categories and do not include any scientific context.

Eco-labels and purchasing decisions

There is much debate in the literature regarding whether eco-labels have been effective in changing consumer behaviour. Studies have reported high use across many countries (D'Souza, Taghian and Lamb, 2006; Langer and Eisend, 2007; Potter et al., 2021). An American study in the late 1990s reported that around half of all adult consumers search for eco-labels when shopping (American Demographics, 1999).

A more recent Australian study suggested that environmental labels influence 76% of consumers' purchase decisions (D'Souza, Taghian and Lamb, 2006). Sigurdsson et al. found that consumers were willing to pay 23.1% more for fish fillets with eco-labels (Sigurdsson et al., 2022). Another study showed that the positive emotions experienced by consumers when they purchase products that they perceive to be environmentally friendly encourages increased engagement with eco-labels (Prieto-Sandoval et al., 2016).

Unfortunately, consumers are often confused by eco-labels and are wary of the claims made (Langer and Eisend, 2007; Haller, Lee and Cheung, 2020). Several studies cite complexity, proliferation, and lack of clear credibility as barriers to eco-label use for purchasing decisions (Langer and Eisend, 2007; Yokessa and Marette, 2019; Nilsson, Tunçer and Thidell, 2004).

Meis-Harris et al. (2021) identified six characteristics that have an impact on whether eco-labels influence behaviour: trust, visibility, environmental credibility, values clarity, market penetration and policy integration. These findings are supported by Potter et al. (2021), who found that eco-labels need to be backed by certification schemes to earn consumers' trust. Another study cites five key aspects which help to make eco-labels credible: ownership, structure, stakeholder coverage, quality assurance traceability, marketing system and transparency (Nilsson, Tunçer and Thidell, 2004).

Studies have also expressed concern over the potential for organisations to greenwash their customers, intentionally and unintentionally, by disclosing positive impacts and omitting negative impacts (Darnall and Aragón-Correa, 2014; Langer and Eisend, 2007; Potter et al., 2021). For example, a product could get a US Department of Agriculture Certified Organic eco-label to highlight that it does not use pesticides or chemical fertilisers without reporting on the carbon emissions it took to ship the product internationally (Darnall and Aragón-Correa, 2014).

There is evidence that, despite current limitations, eco-labels can have a positive impact on commercial activities by increasing the perceived value of environmentally friendly products ...

In 2022 the Planetary Accounting Network ran focus groups with 32 participants to obtain qualitative feedback regarding the demand for environmental data about products in the context of the planetary boundaries, and to better understand key opportunities for and barriers to the use of labels disclosing such data. Respondents were pre-qualified as having basic environmental awareness, and were then categorised via a self-assessment questionnaire into 'novice' and 'aware' groups, with approximately 50% of attendees in each group.

Respondents (particularly those in the 'environmentally aware' category) reported that they perceived a demand for labels that communicate environmental data related to planetary boundaries in some consumer groups (Hay et al., n.d.). Of note was that both groups highlighted the importance of product performance being linked to a scientific perspective rather than an industry comparison perspective – with comments such as 'put the safe limit on it', 'what does industry standard mean? It could be quite bad' and 'put the ideal limit, then you can see how far it is from the ideal'. The results supported the findings of other studies regarding the importance of independent certification, transparency, credibility and traceability. Additionally, respondents from both groups indicated that eco-labels were more likely to have an impact on purchasing decisions for some products than others: in particular, consumers would put more consideration into infrequent purchases (ranging from the example of a T-shirt to a cell phone or washing machine) or regular purchases (e.g., milk); in contrast, very few consumers felt that environmental information would affect their selection of a chocolate bar or other 'whim' purchases.

A key criterion highlighted by both groups was the amount of time they would be willing to spend to understand the label. For smaller purchases in particular, respondents indicated that if they were unable to understand the label 'at a glance' it would be unlikely to influence their decision. In contrast, for larger purchases they would hope to be able to interrogate the data in some detail – for example, by accessing information online to supplement an eco-label. Several respondents agreed that if a label had sufficient market saturation, they would spend some time to become familiar with the label to be able to understand it quickly in future.

Brown et al. (2020) argue that while eco-labels are not perfect, they are an important mechanism to get better sustainability data and metrics and equip organisations to understand and communicate the nuances and environmental trade-offs of products, with the ultimate goal of revolutionising industries to move towards a more circular economy. There is evidence that, despite current limitations, eco-labels can have a positive impact on commercial activities by increasing the perceived value of environmentally friendly products, and

driving an ongoing eco-innovation process where consumers' ever-growing environmental expectation of products works as a driving factor for organisations to continue developing and improving their products, production and supply chains (Thøgersen, Haugaard and Olesen, 2010; Prieto-Sandoval et al., 2016; Wagner, 2008).

In summary, while the evidence that existing eco-labels drive better purchasing decisions is mixed, there is convincing evidence to suggest that labels that provide a wholistic view of environmental performance, are easy and quick to understand, have substantial market penetration, and are independently certified would drive better purchasing decisions, influencing environmental performance of products, and ultimately leading to positive environmental outcomes.

Planetary Facts

The Planetary Accounting Network is working on a system called 'Planetary Facts' which aims to address some of the gaps in the existing spectrum of eco-labels identified above: i.e.,

- to create a methodology that enables a credible and consistent approach to quantifying environmental impacts of product systems on the planetary boundaries; and
- to establish a label and communication system that presents this data in context and that is easy and quick to understand.

Planetary Accounting is a framework that enables the outputs of existing environmental accounting standards, including life-cycle assessments, to be linked to the planetary boundaries. However, as previously discussed, LCAs are not suitable to be used to generate comparisons between products, unless they are produced following an identical protocol, EPDs, that are only suitable for comparison of products within a given product category, and both are prohibitively expensive for many companies. As such, there are several key challenges that need to be addressed before an approach like Planetary Facts could become a practical reality:

- acquiring robust data across a global spectrum of products and services, considering both
  (a) accuracy of data, and
  (b) cost of data acquisition;
- establishing a calculation methodology that provides sufficient consistency to enable robust comparisons between products;
- designing a labelling and communication strategy that conveys relatively complex data to consumers in an easy-to-digest format.

PAN has been working with industry partners to build on existing LCA and EPD frameworks to establish a calculation methodology that addresses the challenges with the draft methodology now being piloted on products to test the sensitivity of key assumptions.

> There was no onus ... on organisations to disclose specific criteria, so many reports presented a glowing account of the efforts organisations were making ... and omitted the disclosure of any negative information.

The purpose of the Planetary Facts system is not only to enable communication of this information to customers, but also to enable businesses to improve the performance of their products and supply chains. By providing easy to understand environmental data in scientific context, businesses will have the same increased context for decision making that has been provided through the advent of science-based targets for carbon at an organisational level. For the first time businesses will be able to see how far from 'ideal' their products and services are.

There are many examples where products designed to be 'environmentally friendly' have achieved significantly lower environmental footprints than traditional products. For example, low-carbon blended cements have carbon footprints approximately 30% lower than traditional cements (CarbonCure, 2022). It follows that making environmental data easier and more affordable to access and contextualising this with science will enable better solutions based on holistic and systemic improvements to products and services.

PAN's Planetary Facts implementation pathway includes a pragmatic approach to addressing data gaps and improving data availability and affordability of assessments, as well as mechanisms for independent certification. In parallel with the establishment of the methodology and the implementation pathway, PAN has worked with consumers to co-design consumer communications that address the third challenge, including the establishment of a labelling system that scales (in size and complexity) according to product value and size and the establishment of supporting communication needs.

If a system such as Planetary Facts meant that even half of the 57% of consumers who report that they would purchase sustainable products opted for products and services with 25% lower impacts (a conservative level of improvement, given that this is a level of improvement already achieved on many products), the net result would be savings in the order of magnitude of 2.5 billion tonnes of greenhouse gas emissions and 380 billion litres of water – i.e., almost 5% of global impacts. The outcome of a successful implementation could be far greater than this as products shift from achieving less harmful to positive environmental outcomes, and as the proportion of consumers making pro-environmental purchasing decisions increases.

The role of policy

In the early days of sustainability reporting,

these reports were typically used to highlight positive environmental or social effort, in a similar way to many existing eco-labels today. There was no onus (regulatory or market-driven) on organisations to disclose specific criteria, so many reports presented a glowing account of the efforts organisations were making on one or two focus areas and omitted the disclosure of any negative information.

Over time formal standards emerged for sustainability reporting, such as the Global Reporting Initiative (GRI) standards (GRI Standards, 2021). These standards specify what should be disclosed, discouraging imbalanced reporting. For example, while it does not dictate a specific list of environmental impacts that should be disclosed, the GRI standards state that organisations should describe their performance against goals and targets on topics that represent the organisation's 'most significant impacts on the economy, environment, and people' (ibid., p.16). The Greenhouse Gas Protocol's Corporate Standard, which sets out the, now internationally recognised, methodology for assessing the carbon footprint of an organisation was published in 2001 (Greenhouse Gas Protocol, 2023).

However, the private sector movement towards carbon/sustainability disclosures and science-based targets has been a predominantly market-driven movement to date. As such, despite the existence of reporting and carbon accounting standards, the quality of the information presented by companies continues to vary significantly (De Stefano and Montes-Sancho, 2022; Ministry for the Environment, 2023). The New Zealand Productivity Commission observes that the inconsistency of reporting has resulted in 'an ongoing and systematic overvaluation of emissions-intensive activities' (Ministry for the Environment, 2023).

Carbon accounting is nuanced, so it lends itself to creative interpretation of standards. For example, some companies only report on greenhouse gas emissions associated with their assets (e.g., vehicle fleets, gas boilers) and purchased energy (including mains electricity and gas); these are known as their 'direct' emissions. Others include emissions across some or all of their supply chain (e.g., emissions from business flights), known as their 'indirect' emissions. A 1.5°C-aligned carbon target for direct emissions may appear more ambitious than a 2°C-aligned carbon target for indirect emissions. However, for many organisations, indirect emissions constitute over 70% of their total carbon footprint (Deloitte, n.d.). A 2°C-aligned carbon target across all emissions could entail more ambitious net carbon reductions than a 1.5°C-aligned carbon target for direct emissions. Some companies leverage these nuances to make their claims seem more impressive than they really are. Even where they don't, the complexity behind the standards makes the comparison of different organisations' greenhouse gas emissions and targets very challenging, rendering these disclosures of limited value to all but the savvy reader.

> … the disclosure of environmental information about products is currently piecemeal, confusing, and of limited value in driving pro-environmental market behaviours.

However, a global movement to legislate carbon disclosures has begun, with New Zealand at the forefront. A new framework has been developed by the Task Force on Climate-related Financial Disclosures (TCFD), which was created by the G20's Financial Stability Board in 2015 (Edwards, Yapp and Mackay, 2020). TCFD disclosures are structured around four core elements: governance, strategy, risk management, and metrics and targets, including organisations' carbon footprints and associated targets.

There were two key goals behind the TCFD framework. The first is to make the financial system more stable by improving stakeholder access to reliable and transparent information on organisations' exposure to climate risks and opportunities (TCFD, 2022). The second is to encourage a market-driven transition to a more sustainable economy by incorporating climate risks into pricing decisions, thus generating greater understanding amongst the collective market (Edwards, Yapp and Mackay, 2020).

By 2020 the TCFD had attracted 1,037 supporters among NGOs, other organisations and stock exchanges. TCFD reporting has now become part of the regulatory framework in many jurisdictions, in the European Union, Singapore, Canada, Japan and South Africa, with some countries introducing mandates based on the principles of the TCFD (Meyer, n.d.).

New Zealand's mandatory reporting requirements, which are based on the recommendations of the TCFD, apply to approximately 200 entities for financial years beginning on or after 1 January 2023 (Ministry for the Environment, 2023). The incorporation of the framework into legislation has driven the standardisation of reporting requirements for affected New Zealand organisations (including the level of inclusion of indirect greenhouse gas emissions). Time will tell how much impact this consistent approach to disclosure will have, but the intention is that it will increase stakeholders' ability to understand and contrast different organisations' approaches and commitments, generating market pressure to reduce emissions as well as climate-related risks (ibid.).

Lessons derived from corporate disclosures highlight the important role of policy in the eco-labelling space. While market drivers are already generating voluntary interest in such an approach, without supporting policy and legislation, the uptake of a system of science-based environmental disclosures for products – such as Planetary Facts – risks being ad hoc and slow, with a significantly reduced potential environmental benefit.

Conclusions

Human activity has led to the exceeding of at least six critical planetary boundaries. Contextualising climate-related decision making with science has accelerated emissions reductions. However, climate change is only one of the planetary boundaries. Further, this scientific context has not yet been applied to a product lens, through which a significant proportion of global decisions are made.

Market and regulatory pressures are already motivating businesses to invest in environmentally conscious practices. However, they don't currently have the tools they need to quantify the impacts of their products on planetary boundaries in order to improve product performance, or to disclose this to their customers. Many decision makers are already using environmental information, including eco-labels and EPDs, to decipher what they do and don't buy. However, the disclosure of environmental information about products is currently piecemeal, confusing, and of limited value in driving pro-environmental market behaviours.

There is compelling evidence that a system which provides businesses and customers with the tools and information they need to understand the environmental performance of products in a scientific context could lead to better purchasing decisions, improved product environmental performance, and an ongoing eco-innovation process that leads to globally significant positive environmental outcomes. To be successful, the system would need to include mechanisms to make data across all of the planetary boundaries easy and affordable for businesses to access. Data would need to be independently verified, and disclosed against scientific benchmarks in a way that is easy to understand and consistently presented across different types of products.

Market drivers are already leading to the creation of systems such as Planetary Facts that link science and environmental data at a product level. Governments have a key role to play for the successful implementation of a system that enables a product lever to drive change towards a future within the planet's limits.

1 The definition of 'net-zero' varies but best practice suggests this should not be achieved by paying for carbon offsets.

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