LOW CARBON SOLUTIONS

FOR

A SUSTAINABLE CONSUMER GOODS SECTOR

DECEMBER 2017

The Consumer Goods FORUM

ecoact

Action on climate change is extremely urgent. We only have three years left, to stay in line with the 2° trajectory, as laid out in the Paris Agreement. Three years to inverse the emissions curve of global GHG emissions. However, after several years of stagnation, global GHG emissions have gone up again in 2017.

The climate challenge requires a global change from all of us. Distancing ourselves from fossil fuels in favor of renewable energies is not the only focus: we are facing an urgent need to globally reinvent the way we produce, consume, travel, work and live together. I therefore commend the collective effort of The Consumer Goods Forum to work towards putting itself on the 2° trajectory. I am even more pleased to introduce this report, as it is an international initiative led by a sector that, despite its strong impact on the climate, is rarely highlighted. I hope this initiative will result in an unwavering action for the transition of the sector.

Jean Jouzel, Glaciologist and Climatologist

This booklet represents another important milestone for our industry as it continues to make considerable progress in tackling climate change. Our member companies have long been committed to positive change and I am happy to see them lead the way, implementing a low carbon, circular economy and sharing their experiences for the benefit of all.

The climate challenge is one we all need to take up. The time for talk is over. If global temperatures increase more than 2°C, the consumer industry – like everyone else – will face increased business risks, disruption of supply chains, volatility of commodity prices and increased operational costs. Our members are at the forefront of driving responsible business and are working individually and collectively to drive positive change globally. In September 2017, the CGF publicly reaffirmed our commitment to helping members do their part to tackle climate change in recognition of the risks that it poses to our businesses, our supply chains and our consumers. Our Board-approved resolutions on achieving zero-net deforestation by 2020, phasing out HFCs and halving food waste by 2025 demonstrate our commitment and have paved the way for concrete, positive actions by our members. Our 400 members are actively engaged in this collaborative effort through working groups, where they share best practices and drive collective solutions to key challenges.

Only through collaboration and collective action can we expect to see the lasting impact that we need to achieve. We thank the leaders in the industry that have contributed their stories to this report and we hope that other companies can be encouraged to take action and begin sharing their success stories. Our industry has made a good start. Now we need to use this momentum to accelerate progress.

Peter Freedman, Managing Director of The Consumer Goods Forum

Given its central role in the daily life of the majority of people on the planet, the Consumer Goods sector must contribute to the emergence of collective solutions in the fight against climate change.

As a major actor in the sector, Carrefour put in place its low-carbon strategy in 2015 with the aim to reduce its emissions by 40% by 2025 and 70% by 2050, compared to 2010. The implementation of this strategy consists of reducing energy consumption in our stores, promoting natural refrigerants, developing low-carbon transport modes and progressively freeing ourselves from fossil fuels through the use of renewable energy. The implementation of an internal carbon price has enabled us to more quickly obtain results in line with our objectives.

However, the role of an international company like Carrefour does not stop at reducing its own carbon footprint. The climate change challenge calls for a global transition from all sectors, and all value chains in order to limit global warming between 1.5 and 2°. From this point of view, our competitors are also our partners with whom we must share the most relevant solutions. Carrefour's challenge is therefore twofold: we must further develop collaboration, while also supporting existing partnerships in this global transition. It is with this strong conviction that we participated in this study with The Consumer Goods Forum and its members. By gathering together the low-carbon solutions used in the Consumer Goods sector – from manufacturing to distribution to final consumers – we will be able to accelerate the implementation of efficient and proven technologies, thus increasing the sector's contribution to the climate transition.

This unprecedented approach is only a first step. We know more work still needs to be done, especially across the value chain – from the farmer that supplies raw materials, to the final consumer that we serve every day. Only by working with them to implement low-carbon solutions that will be considered as best-practice tomorrow will we be able to live up to the climate challenge. We are proud to have contributed to this movement.

Alexandre Bompard, Chairman and Chief Executive Officer of Carrefour

Glossary

(ACT) Initiative Assessing Low Carbon Transition
(ADEME) French Environment and Energy Management Agency
(CDP) Carbon Disclosure Project
(CFCs) chlorofluorocarbons
(CGF) The Consumer Goods Forum
(COP21) 2015 United Nations Climate Change Conference, 21st Conference of the Parties
(EDI) Electronic Data Interchange
(EP100) Energy Productivity 100
(ERP) Enterprise Resource Planning
(ETS) Nestlé's Energy Target Setting Programme
(EU) European Union
(EV100) Electric Vehicles 100
(F-Gas) Fluorinated greenhouse gases
(FMCG) Fast-Moving Consumer Goods
(GHG) Greenhouse Gas
(GOs) Guarantees of Origin
(GWP) Global Warming Potential
(HCFCs) hydrochlorofluorocarbons
(HFC) Hydrofluorocarbons
(HFOs) Hydrofluoroolefins
(HVACR) Heating, Ventilation, and Air Conditioning and Refrigeration
(ICP) Internal Carbon Pricing
(IEA) International Energy Agency
(INDCs) Intended Nationally Determined Contributions
(I-REC) International Renewable Energy Certificate
(LED) light-emitting diode
(LNG) Liquified Natural Gas
(NDC) Nationally Determined Contribution
(OECD) Organisation for Economic Co-operation and Development
(PERIFEM) French Retailers Association
(PPA) Power Purchase Agreement
(PV) Photovoltaic
(RE100) Renewable Energies 100
(REC) Renewable Energy Certificate
(RED) Renewable Energy Directive
(ROI) Return on Investment
(SBTi) Science Based Target Initiative
(SDG) Sustainable Development Goals
(TCFD) Task Force on Climate-related Financial Disclosures
(TEWI) Total Equivalent Warming Impact
(UNEP) United Nations Environment Program

Executive Summary

The Consumer Goods Forum ("the CGF") is a global, parity-based industry network that brings together the CEOs and senior management of some 400 retailers, manufacturers, service providers, and other stakeholders across 70 countries. It reflects the diversity of the Consumer Goods sector in geography, size and product category. The CGF defines its mission as "Bringing together our members in pursuit of business practices for efficiency and positive change across our industry benefiting shoppers, consumers and the world without impeding competition". Sustainability is one of the CGF strategic pillars: its work focused on activities that address climate change such as deforestation, refrigeration and waste.

The CGF has decided to bring together its members and produce a publication to share how they are addressing climate change through the implementation of low carbon solutions in their direct operations.

The Consumer Goods sector impacts climate change both directly (energy used in order to manufacture, carry and sell products) and indirectly (through the sourcing of materials and end-use of products). Today, the sector already addresses, in many ways, both direct and indirect emissions. The variety of existing actions implemented in the Consumer Goods sector is substantial and one publication would not be exhaustive enough to deal with all the solutions available across the value chain. For this reason, the CGF decided to only present the low carbon solutions in companies' direct operations. Nonetheless, the CGF recognises that, given the urgency for action, the sector must use all of the means available across its entire value chain to stay on a trajectory well-below 2°C[1].

In this publication, low carbon solutions are categorised into the three pillars of decarbonisation[2]: energy efficiency, renewable energy and fuel & technology switching. Energy efficiency is an important pillar in limiting warming to less than 2°C, and represents about 40 percent of the greenhouse gas (GHG) reduction potentials that can be realised across the globe by 2040. Members of the CGF have adopted this concept and have demonstrated the various ways in which a company can increase its energy efficiency and obtain monetary savings. Companies have undertaken specific programmes in order to reach energy performance through energy analyses. As a result of these energy audits, companies can focus on the largest sources of emissions, such as refrigerant leakage or lighting. Companies are then able to put in place simple but effective actions, such as retrofitting refrigerant machines with doors. Other solutions include sharing resources between companies to improve efficiency, such as a CGF member sharing a logistics centre with a partner to increase transport efficiency.

Companies are also increasingly committing to going 100% renewable, notably through the RE100 initiative. There are two ways to reach this goal: either by self-producing renewable energy or by procuring it. Most of the time, Consumer Goods companies can capitalise off their large roof and parking space to put in solar panels or wind turbines in areas where sunlight is abundant. A second option, which can be coupled with self-produced energy and is the most convenient, is the purchase of renewable energy "certificates" (RECs), in the form of unbundled (RECs), RECs conveyed through a power purchase agreement (PPA), or RECs conveyed to consumers via a supplier-specific programme. Through purchasing these certificates, corporates send a clear signal to the market and greater demand for certificates will eventually lead to an increased renewable energy generation capacity.

As demonstrated in this report, the adoption of new technologies and switching fuel sources are also an effective means for a company to reduce its emissions. For instance, switching from diesel and gasoline to alternative fuels can reduce a fleet's emissions. Another way to reduce emissions[3] is to shift to natural refrigerants technologies. Many CFG members rely heavily on refrigeration equipment for manufacturing processes, distribution in cold trucks and retail storage. Regulation has played a major role in changing the landscape of refrigerant use, notably with the adoption of the Kigali Amendment[4] in 2016 and the F-Gas regulation in Europe in 2014[5].

However, switching to natural refrigerants is also becoming an economic choice, with the increased availability of efficient technologies and associated energy savings.

This report illustrates the solutions that have worked for specific companies, in specific geographical and political contexts. These examples should not be interpreted as solutions that are universally applicable to other companies in the same industry. What we can say, however, is that collaboration—whether across departments or between companies—is an essential success factor for all types of solutions.

This publication exemplifies the message emanating from COP23 and the SDG framework on collaborative climate action, both at an organisational and sectoral basis. Although we find ourselves at the cusp of an era where low carbon solutions will be ubiquitous, mitigation efforts must go beyond what is operationally tangible. The urgency of climate change is clear: GHG emissions must peak by 2020 to maintain a trajectory 'well below 2°C', with the aim to be a carbon neutral world by 2050. This implies that each actor has the important responsibility to use all the available tools to mitigate and compensate its emissions and increase carbon sinks. As Mission 2020 indicates[6], the year 2020 is the climate turning point, and with the right amount of effort from all actors, milestones can be realistically achieved, with a world heading towards carbon neutrality.

> *"We have a collective responsibility to raise ambition, scale up our actions and move forward faster together to safeguard the sustainable development goals and protect the inalienable right to life of our and future generations. Let's not be late"*
>
> **Christiana Figueres**

Why do we need low and zero carbon solutions in the Consumer Goods sector?

Towards a world of net-zero emissions

The Paris Agreement was a historic achievement with its universal ambition across 197 countries (of which 170 have ratified the agreement), and with immediate implications for business around the world. Countries have committed to a world of net zero emissions in the second half of the century. This commitment not only affects domestic regulation, with direct impacts on the private sector, but has sent a strong market signal to non-state actors in the marketplace. The Paris Agreement explicitly calls on businesses and investors to seize on business opportunities to orient financial flows towards low and zero carbon technologies and emissions-neutral investments[7]. The Agreement commitment comprises three overarching long-term goals on temperature, financial and resilience goals, all of which require strong action from businesses.

The temperature goal commits to limiting "the increase in the global average temperature this century to well-below 2°C above pre-industrial levels, and to pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels." This implies a decline in emissions as soon as possible. This can only happen alongside the financial goal, which calls for directing investments towards the reduction of GHG impacts. Investments made now to reduce temperatures translate into less investment required in the future to increase resilience.

However, the climate has already warmed by more than 1°C compared to pre-industrial levels, and current emission trajectories mean we will likely reach 1.5°C in the next fifteen years, and 2°C by mid-century. Most worrying is the 50% probability of reaching 4°C of warming by the end of the century[8]. We have already consumed three quarters of the world's "carbon budget" since 1870, and are currently on a path to spend the remainder of this budget in three decades[9,10]. Although the window to decarbonise is rapidly closing and the carbon budget is diminishing, we still have just enough time to change the world's emission trajectories and limit warming to below 2°C. At the current rate of carbon budget expenditure, the world needs to be at net-zero emissions by mid-century.

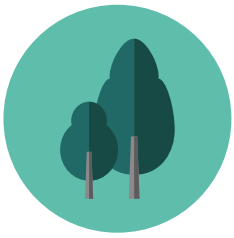
Decarbonising to achieve a world of net-zero emissions

There are four main pillars to achieve net-zero emissions and limit warming to below 2°C[11,12].

Decarbonisation of electricity generation, I.e.,renewable nuclear, and/for CCS

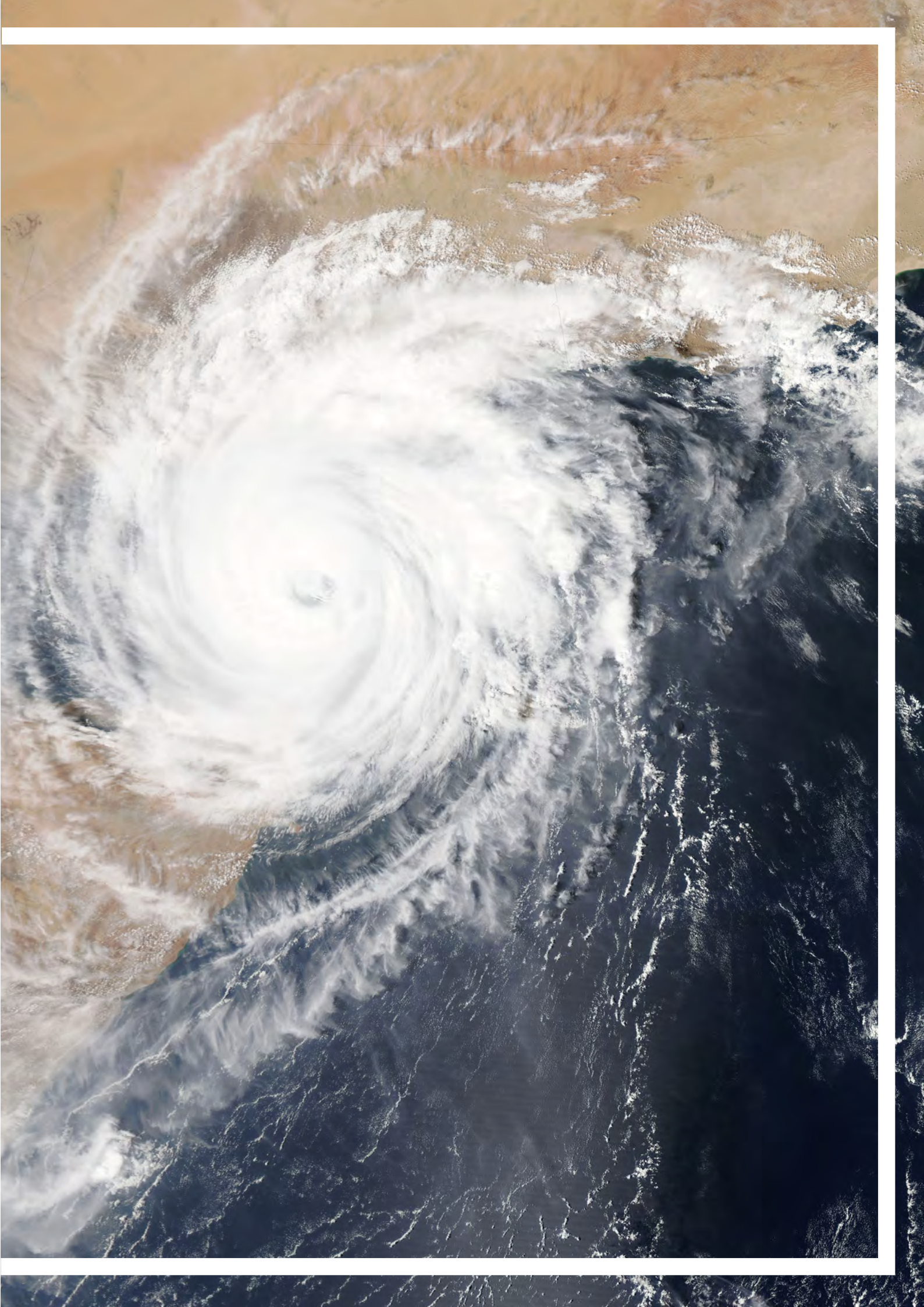
Efficiency in all sectors, including building, transport, and agriculture

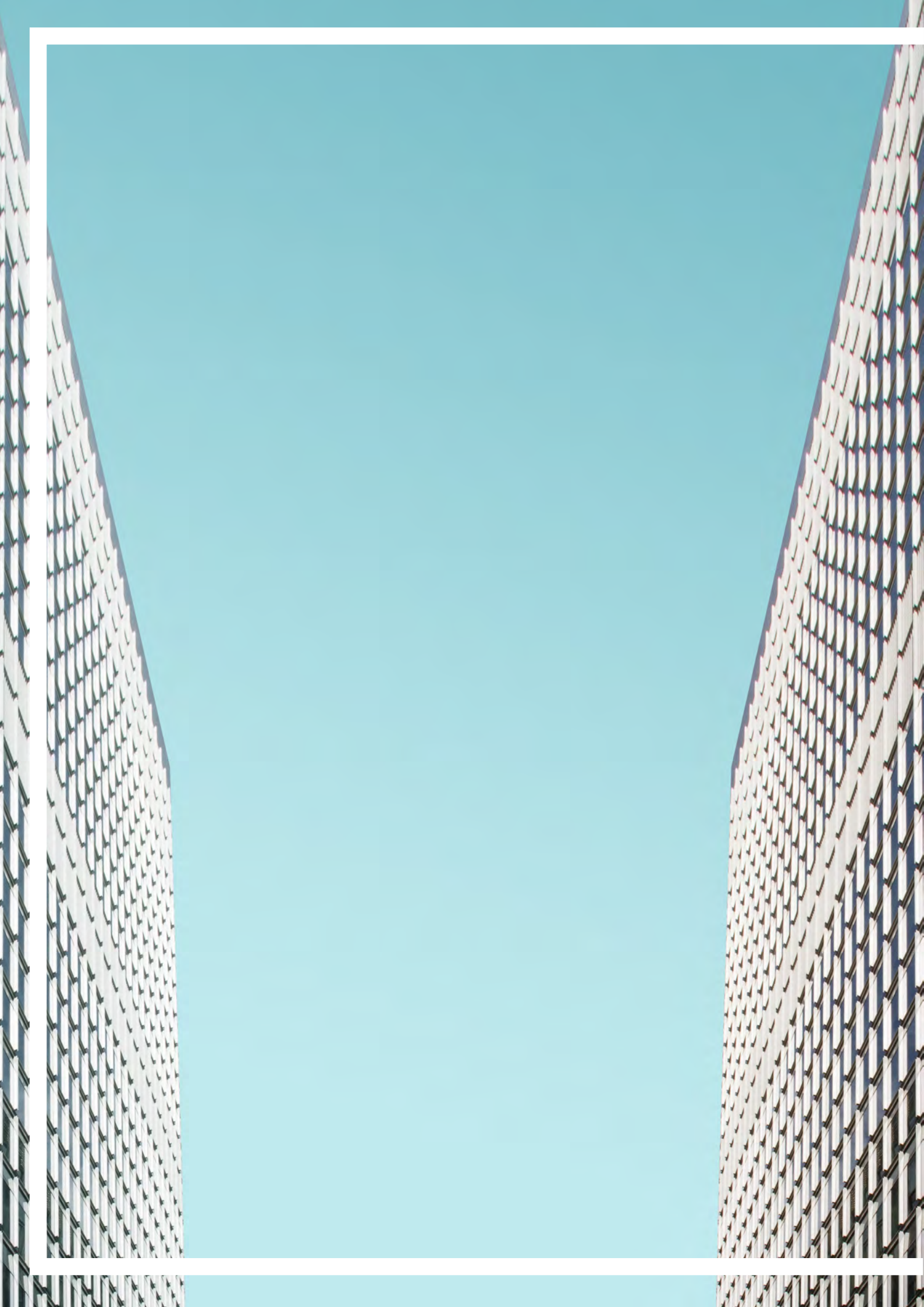
Fuel Shifting in transport, heating and industries



Preservation and increase of natural carbon sinks

Source: "Decarbonizing Development: Three steps to a Zero Carbon Future" World Bank Climate Change and Development Series, 2015





Organising these measures into four pillars is a useful way for policy makers and business leaders alike to translate the goal of zero emissions into operational objectives. Work on these pillars can proceed at various speeds depending on the political and economic realities of a country or a company. What is clear though, is that significant progress will be required on all four pillars in all countries and at all levels (company, regional, national).

Each of the pillars can be translated into a sector-specific context: for example, a manufacturer can both shift energy processes to decarbonised electricity, and/or aim to increase energy efficiency in its industrial processes (pillars 1, 2 & 3). Further, sourcing raw materials from suppliers who ensure zero deforestation, sustainable agriculture and soil management practices, could contribute to the fourth pillar.

The next five years will be a litmus test for global leaders to abide with the promise of the Paris Agreement and the Kigali amendment to the Montreal Protocol to keep global warming in manageable boundaries for Planet and Humanity. Now is the time for nations, businesses and local governments leaders to step up to accelerate their energy transition and the decarbonisation of their activities, beyond the climate pledges communicated in 2015 by countries which are still too low. Business leaders can seize 2018 special attention on global climate action to align their own commitments with science and a well-below 2°C future, sector by sector, with new collaborations and opportunities in mind

Pierre Cannet, Head, Climate, Energy & Cities Programs, WWF France

The emissions gap left by state actors

Although policy makers are actively using these four pillars to decarbonise their economies, the emission trajectories detailed in Nationally Determined Contributions (NDCs) are not in line with ensuring a "well-below" 2°C trajectory. In fact, the emissions gap[13] is about 11 to 13.5 $GtCO_2e$ compared to least-cost pathways limiting global warming to below 2°C. To give an idea of the magnitude of the gap of these emissions, 13.5 $GtCO_2e$ represents about a quarter of 2015 global emission. The emissions trajectory implied by the current NDCs would mean that we will overspend the 1.5°C budget by 2030...with the carbon budget for 2°C almost depleted[14].

According to the 2016 UNEP Emissions Gap Report, non-state actor initiatives could provide a significant contribution to closing the gap left by the NDCs by 2030. An analysis of five business initiatives (Science Based Targets, EP100, RE100, Zero Deforestation, Low Carbon Technology Partnership Initiative) showed that if these initiatives were to achieve their 2030 goals, business could cut its greenhouse gas emissions by 3.2 to 4.2 billion tonnes per year below current trends, and by up to 10 billion tonnes if the right government policies are put in place[15].

International collaborative initiatives

In recent years, non-state actors have taken matters into their own hands and have pushed for a grassroots approach to fighting climate change by developing and implementing emission reduction strategies and actions. This was especially noticeable following US President Trump's announcement to leave the Paris Agreement, when non-state actors responded with the creation of the US Climate Alliance.

Private sector initiatives such as the UN Global Compact, CDP, SBTi (Science Based Target Initiative), the Global Energy Efficiency Accelerator Platform, RE100, Global Green Freight Action Plan, The Business End of Climate Change, The B-Team, and Caring for Climate, have engaged corporates and encouraged collaborative decarbonisation beyond the traditional top-down approach. Such initiatives are driving progress towards a decarbonised world, with a record number of companies disclosing their impacts and reduction commitments and aligning them to the Paris Agreement.

For example, Kellogg Company commits to reduce its direct GHG emissions by 15 percent (per metric tonne of food produced) by 2020 and 65 percent by 2050 from a 2015 base-year (Scope1&2); Tetra Pak commits to a 42% reduction in Scope 1 and 2 emissions by 2030, and 58% by 2040 from a 2015 base-year; PepsiCo commits to reduce its absolute greenhouse gas emissions across its value chain by at least 20% by 2030

> *The CGF helps our member companies to amplify the impact of these solutions. For example, we seek to encourage and enable more sustainable production and consumption by involving all stakeholders, including those outside our industry such as upstream suppliers, consumers and the public sector*
>
> **The Consumer Goods Forum**

Having a science-based emission reduction target is ambitious enough to ensure that a company's emission reductions are in line with a global 2°C trajectory.

Moreover, as Jim Yong Kim, President of the World Bank said, «To deliver bold solutions on climate change, we need to listen to and engage broader and more diverse audiences." Managing and engaging with climate change requires businesses to include and cooperate with various stakeholder groups to both mitigate uncertainty and to gain access to new capabilities and resources. For this reason, the United Nations has called for a commitment to global partnership and cooperation in the form of Sustainable Development Goal (SDG) 17: Partnerships for the Goals. This idea of partnership is also present in the SDG 13, which encourages discussion of climate change and the sharing of solutions for it – whether through joint commitments or shared insights, involving stakeholders throughout the value chain.

It is within this context that The Consumer Goods Forum (CGF) launched three collaborative work streams on Deforestation, Refrigeration and Waste, with an overarching goal to define common objectives on climate change for its members. These joint resolutions have the objectives of achieving zero net deforestation by 2020, starting to phase out HFC refrigerants in 2015, and halving the amount of food wasted within members operations by 2025. This confirms that collaboration, even between competitors, can be very fruitful.

The means to an end, the need for financing

It is not surprising that Article 2 of the Paris Agreement reiterates the role that finance and financial institutions will play in decarbonisation[16] -- transitioning to a decarbonised economy will require significant up-front investments in clean capital, as well as a redirection of financial flows to low-emission investments. Investment flows are essential for the transition to a low-carbon, climate-resilient future. There is an urgent need for such investments: for example, energy efficiency investments need to rise 8 times from today's level of investment, to $1,100 billion in 2035[17].

Economic, institutional, technical and political barriers exist, that inhibit the optimal flow of finance to low carbon investments. Regulation, policy interventions and innovative financial instruments are needed to overcome such barriers and to reorient capital flows, incentivising investments in R&D for clean technology to be upscaled and commercialized. Such policy interventions can include carbon pricing, tax incentives (i.e. for solar panel installation, R&D investment) and climate disclosures on financial investments such as Article 173 in France[18] or the Task Force on Climate-related Financial Disclosures (TCFD) initiatives for companies. In June 2017, the TCFD developed guidance on climate-related financial risk disclosures to be used by companies to provide information to investors and other stakeholders. This initiative encourages companies to better account for the physical risks associated with

climate change. In September 2017, ten major companies, including Marks and Spencer, pledged to implement the TCFD Guidance within the next three years.

From their side, institutional investors have committed to gradually decarbonise $600bn worth of portfolio out of $3.2 trillion in assets under management[19] as part of the Portfolio Decarbonisation Coalition (PDC). Innovative instruments such as CDP's Climetrics will allow accelerated investment in the low-carbon economy by enabling professional and individual investors to further integrate climate change in their investment decisions[20].

Today, energy efficiency investments are mainly self-financed. In the transport, industry and commercial buildings sectors, companies finance their activities primarily through cash flow from business operations, which can be a heavy burden[21].

To overcome this, companies are working collaboratively more than ever. For example, to tackle barriers and to facilitate energy efficiency investments, public-private partnerships such as the Global Energy Efficiency Accelerator Platform[22] have been launched. Other initiatives such as Tesco's Low Energy Lighting and LED Buying Club, help Tesco suppliers reduce investment costs in LED lighting[23].

To find the means to invest in low-carbon technologies, some companies are turning to alternative sources of finance as well as internal carbon pricing (ICP), or financial instruments such as green bonds[24], funds and credits. In the last two years, green bonds have experienced strong growth, allowing more direct investments in renewable energy, low-carbon transport, buildings and industry. ***For instance, Marks and Spencer's launched an initiative inviting community members of***

> *The Paris Accord has a specific objective of making financial flows compatible with sustainable development. The idea is to go beyond just a few lines of investment in favour of climate-friendly investments, and to reorient the existing financial flows towards low or zero carbon investments with an objective to align economic decisions with the international climate trajectory. As financial actors increase their awareness on climate issues, we can expect that investments that are not aligned with the well-below 2° trajectory will ultimately become irrelevant, and considered too risky for investors. All sectors are therefore called upon to review and restructure their business model. For example, how will large retail stores that lie on the outskirts of cities, consume a lot of space and energy and are rarely accessible via public transport, adapt to a zero-carbon world?*
>
> **Benoît Leguet, Managing director of I4CE**

the M&S Energy Society to invest in solar panels on the rooftops of 9 of its stores.

ICP has also been proven as a simple, fair and effective measure. An ICP can stimulate investments in a couple of ways: by reflecting the costs of carbon when making financial decisions on investments (shadow pricing), and therefore stimulating low-carbon investments, and by creating a fund (from an internal carbon 'tax') that essentially provides liquidity to then invest in low-carbon solutions within a company's different business units.

Carrefour decided to implement a shadow carbon price on CAPEX decisions for store assets in every country. The carbon price takes into account the national context and is referred to as the "total cost of ownership". This results in a price range of €20-70/tCO_2 depending on the country. Including the ICP as an additional investment criterion has a true impact on investment decisions. Carrefour's next steps will be to either apply an ICP to other assets or to introduce a carbon fee in order to strengthen the initiative.

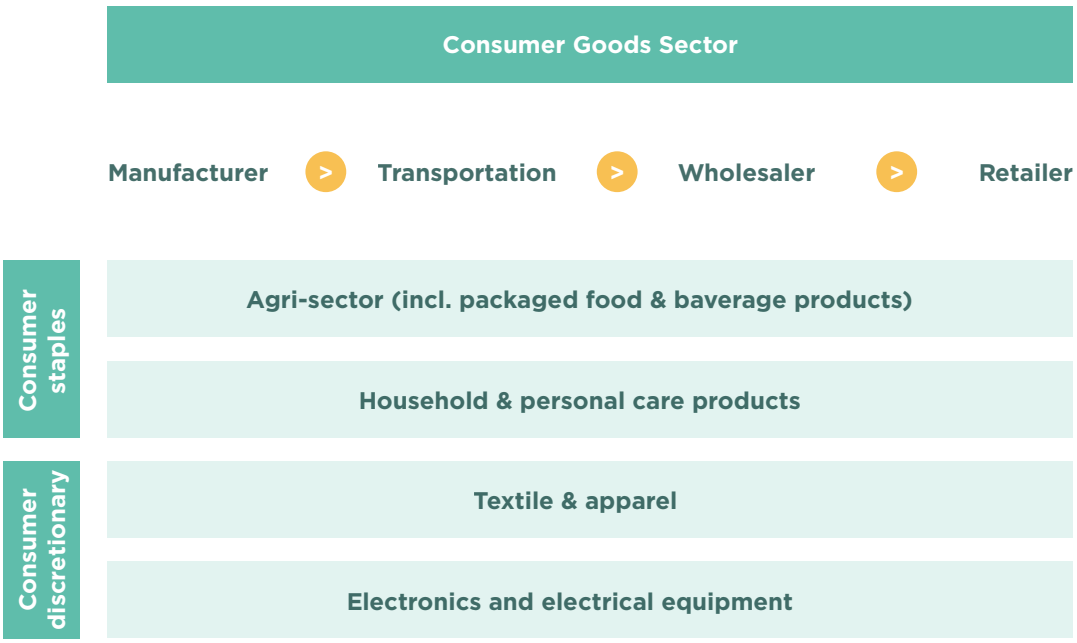
Internal carbon pricing is becoming more common, with over 1 300 companies planning to put one in place as a means to generate the funds needed to decarbonise their activities[25].

> *Climate change is already affecting companies – both through the direct impacts of steadily rising global temperatures and through the policies that governments around the world adopt in response. If markets are to operate efficiently we must be transparent, to help investors evaluate companies and make better decisions for the long term. Annual reports should always outline key risks to a business so it is only a matter of time before most investors are asking these questions – not to mention consumers and employees who increasingly want to understand a company's values. A third reason that it is in business' interest to report climate change in their financial filings, is that it encourages management teams and boards to properly assess the risks and opportunities their companies face.*
>
> **Graeme Pitkethly, Unilever CFO and Vice Chair of the TCFD**

Climate change and the Consumer Goods sector

General emission trends & the weight of the sector

"Consumer Goods" is an umbrella term which groups multiple sectors with different actors along the value chain. The Consumer Goods Forum, for example, is comprised of manufacturers, retailers, service providers and other industry stakeholders. For the purpose of this study, we will mainly provide an overview of the emission sources of food manufacturers, retailers, producers of household goods and personal products within the Consumer Goods sector.



Overview of the Consumer Goods sector value chain (dark green) and subsectors (light green) covered

Due to the size of this sector, the weight of its GHG emissions are estimated to be high. Some analysis suggests it is about 33 $GtCO_2e$[26], or about 60% of worldwide emissions[27].

GHG emissions are categorised into three 'Scopes' by the most widely-used international accounting tool, the Greenhouse Gas Protocol. While Scope 1 and 2 cover direct emissions sources (including equipment and buildings that are directly operated by companies), Scope 3 emissions cover all indirect emissions due to the activities of an organisation (such as raw material sourcing, waste, employee commuting, etc.).
According to CDP data for Europe, the consumer staples and consumer discretionary sectors jointly represent 2% of Scope 1 emissions and 20% of Scope 2 emissions reported in Europe. They also represent 19% of Scope 3 emissions reported across sectors in Europe, even though many companies currently report only a fraction of their Scope 3 emissions.

Scope 3 emissions account for the bulk of the impact in both the consumer staples and consumer discretionary sectors representing 88% and 97% of total emissions respectively[28].

SCOPE 1
Stationary combustion sources
Mobile combustion sources
Fugitive Electricty
SCOPE 2
Purchased Electricity
SCOPE 3
Purchased good and services
Capitals goods
Fuel and Energy related activities
Upstream transportation and distribution
Wastes generated in operation
Business travel
Employee commuting
Upstream leased assets
Downstream transportation and distribution
Processing of sold products
Use of sold products
End of life treatment of sold product
Downstream leased assests
Franchises
Investments

These sectors are heterogeneous groups so the data should be viewed with some caution. For example, the consumer discretionary sector includes the automotive sector which takes into account the fuel used in vehicles in its Scope 3 emissions.

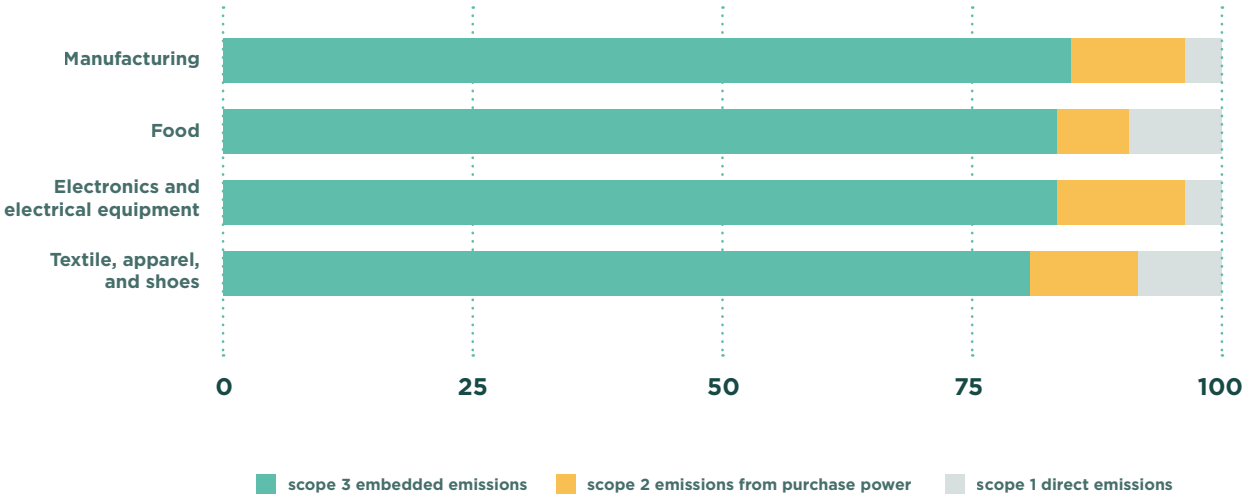
When looking at the sector emissions broken down by Scope, we can clearly see that Scope 3 emissions in the manufacturing, food, electronics and textile sectors dominate the emissions profile of all the listed sectors while Scope 1 and 2 emissions represent only 15-20% of the total carbon footprint.

In the agri-food segment (encompassing food production, processing/distribution, and retail), almost 70% of total greenhouse gas emissions come from food production due to the gases associated with farming (methane and nitrous oxide)[29]. Meanwhile, the retail and processing/distribution side account for about 30% of the sector emissions. For the retail sector, Scope 3 emissions are the largest source of emissions as well due to client commuting or purchased goods.

Energy and refrigerant consumption in the sector (Scope 1 & 2 emissions)

Estimates of Scope 1 & 2 emissions in the sector vary from 4% to upwards of 20% of companies' carbon footprint depending on the subsector concerned, which is an important share of global emissions.

For example, supermarkets on average consume 3-4 % of the total annual electricity production in industrialised countries[30]. The

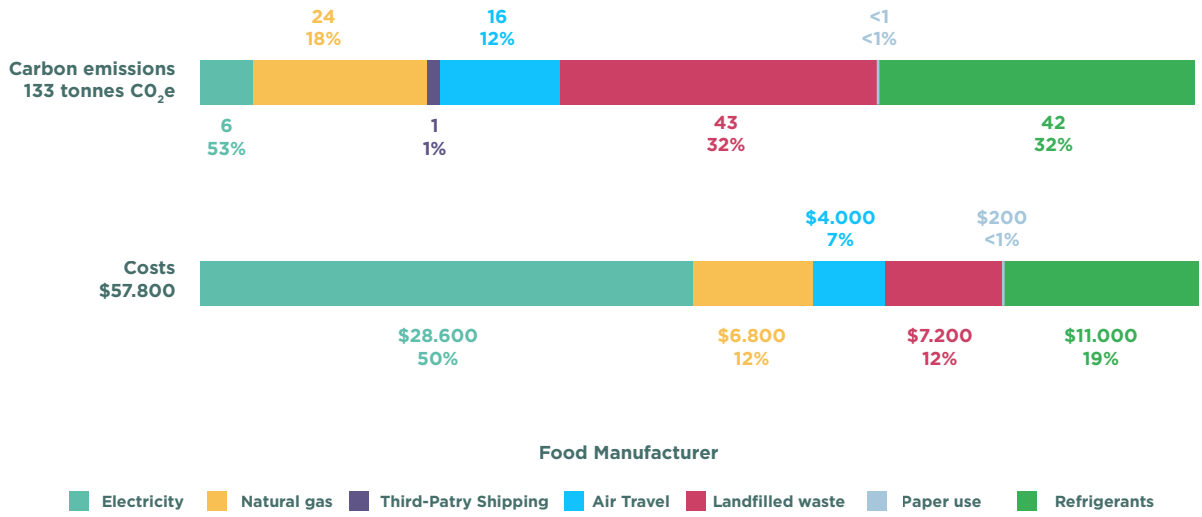


Breakdown of impact by scope
Source: « Starting at the source: Sustainability in supply chains » McKinsey, November 2016

energy demand in supermarkets comes from various end uses, with refrigeration systems alone taking a 35-50 % share of total energy use, typically being the largest electricity consuming system. As an example, Sainsbury's energy profile[31] illustrates that refrigeration accounts for 45% of energy demand use, followed by lighting (25%) and ventilation (15%).

Concerning food manufacturers, Climate Smart[32] provided an overview of the emission profiles of such companies, which reported on Scope 1, 2 and only part of Scope 3 (waste, commuting, and paper use). In terms of Scope 1 and 2 emissions, food manufacturers indicate that refrigerant leakage ranks as the largest source of emissions (42%) followed by energy use (about 25%). On average, 18-30% of annual GHG emissions of an EU supermarket is due to their choice of refrigerants with the most commonly used refrigerant in the EU being R404A.

Meanwhile, Food and Beverage Distributors state that their fleet is the largest source of emissions (56%) followed by refrigerants (30%) [33]. To address this, 10 companies including METRO AG and Unilever have committed to accelerate the transition to electric vehicles through the EV100 initiative of the We Mean Business Coalition[34].



The Consumer Goods Sector committed to fighting climate change

Regulation plays a large part in a company's strategy to fight climate change. We can see this with the phasing out of high-Global Warming Potential (GWP) refrigerants, which has been catalysed by the European F-Gas Regulation, the Kigali Amendment to the Montreal Protocol and other national regulations. But fighting climate change is no longer just an investor and regulatory issue, it has become an economic and consumer issue. Low and zero-carbon solutions can provide returns on investments as well as avoiding the reputational damage that comes with being seen as a "climate laggard". Almost 40 percent of CDP members report that they have realised financial savings from their emissions reduction activities; more than a third have benefited from new revenue streams or from savings gained as a result of their suppliers' carbon reduction activities[35].
Increasingly, companies are evaluated by investors, regulators and consumers on their sustainability.

In addition, low-carbon investments reduce climate risk exposure, whether regulatory, reputational, or even financial. As stated earlier, investing in low carbon solutions now means reducing the need for resilience investments later, which will encourage investors to orient their capital flows towards the companies that demonstrate proactive efforts on their physical climate-related risks, transition risks and liability risks[36].

If climate change proceeds unabated, the Consumer Goods sector will experience three key issues in its value chain.

- In **sourcing**, the Consumer Goods sector is likely to face shortages of raw materials as climatic changes affect production capacities and costs.
- **Manufacturing facilities** located in countries vulnerable to climate change are likely to experience increased water stress, while


Marchew
Jakość z Natury Carrefour
1 Słodka i soczysta dzięki specjalnie dobranej odmianie
2 Ograniczenie ilości stosowanych środków ochrony roślin
3 Kontrola jakości "od pola do talerza"
POMORZE
Paweł Gulczyński
Producent marchwi.
Tereny Nadmorskiego Parku Krajobrazowego.
Nasz partner od 2001 roku.
express
Ziemniaki białe

increased risks of natural disasters will likely impact the stability and continuity of company supply chains.

- And finally, a changing climate may very well **change consumer habits**: increased intensity and frequency of natural disasters will mean a fluctuation in the goods purchased by consumers before and after the disasters[37].

While climate change presents steep challenges for retail and consumer companies, it also offers significant opportunities. Helping communities prepare for and mitigate the impact of severe weather can go a long way toward enhancing a company's local reputation and even boosting sales through offering the right products at the right time.

For example, Walmart has an Emergency Operations Centre at its Bentonville, AR, headquarters as well as disaster-distribution centres in high-risk areas, positioned to provide a rapid response in the wake of climate events[38]. The retailer has strategically identified potential weather-related risks and has implemented business continuity plans for each store function. This builds resilience and helps the stores provide needed goods after natural disasters.

Leading retailers recognise their pivotal role in the supply chain. Own brands make up a significant proportion of products they sell, which enables them to directly influence the way these are sourced and manufactured. They also interact with millions of their consumers every day which means they know what customers want and can help them make better choices[39]. The CGF's resolution on deforestation and food waste illustrates this nexus, responding to civil society as well as influencing the behaviour of suppliers and consumers alike.

Consumers can find co-benefits when purchasing from a climate-sensitive company, whether that is through convenience (closer proximity to retail stores), comfort (adequate and efficient heating and cooling mechanisms), improved health (air quality improvement from the reduction of fossil fuel use in transport), or the "feel good" pay back (customers feeling like they are supporting the greater good).

What low-carbon solutions can help the sector decarbonise?

In The Consumer Goods sector, we see international and national sectoral organisations, such as The Consumer Goods Forum and the British Retail Consortium integrating environmental and climate commitments and associated action plans to reduce their direct and indirect impacts.

Although supply chains are complex, fast-changing and globally-dispersed, organisations are working more and more with their direct suppliers in order to reduce their Scope 3 impacts. Today, about 22% of reporting organisations to the CDP are actively working with suppliers to reduce their emissions. However, significant effort is required because in most supply chains, there are numerous small producers at one end and millions of consumers at the other. There is an enormous variety of products and sub-sectors, with a wide range of life cycles and product-specific challenges that can complicate inter-sector collaboration.

To improve sustainability across the sector, an actionable process for driving change across the entire global supply chain must be well-defined, with collaborative action between various actors. The Consumer Goods Forum resolutions on food waste and deforestation illustrate this capacity to work together, as well as the sector's recognition of the importance of Scope 3 emissions. These emission sources, although indirect, must be dealt today with urgency if we want to live in a world where temperature rise is maintained below 2°C. Although this report focuses on Scope 1 & 2 emissions of the sector, it adamantly supports the notion that carbon neutrality can only be achieved if all emissions are addressed.

The scope of this report, however, only covers solutions concerning the Scope 1 & 2 emissions of the three segments of the consumer goods value chain: manufacturing, logistics and retail. In the interest of balancing exhaustivity and scope, the CGF and its members have decided to keep this perimeter, while remaining firm in its position that Scope 3 emissions should be addressed in parallel.

ICA Gruppen helps its customers make sustainable choices

In 2015, ICA Gruppen carried out a project called Klimaträtt ('Climate Right') in cooperation with several partners. The heart of the project is an application that gives users automatic feedback on their carbon footprint of the food they buy, their housing, transportation, and other consumption.

The first step in the project was that users received clear feedback on the climate impact of their everyday consumption via the application. Then, the organisations involved developed a number of services and activities to make it easier for users to reduce their carbon footprint. For example, using a personal climate right shopper or attending a cooking evening with an ICA chef, learning how to grow their own vegetables on a balcony, etc. The project is expected to provide a basis for scale-up and further investments on a national scale.

The collaboration of a number of organisations in helping consumers to live a more climate right and healthy life was a key factor in the success of the project. It has shown that awareness about day to day choices has a significant effect on consumers' carbon footprints. At the end of the six-month project, the participants reduced their carbon footprint by 31% without experiencing any sacrifices in their lifestyle.

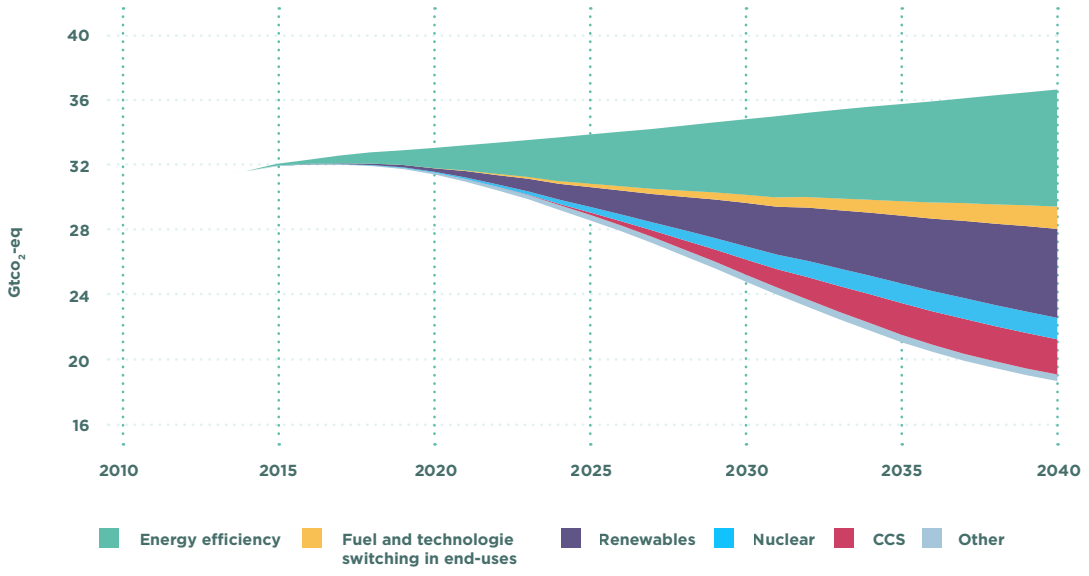
With upstream emissions being on average in excess of four times that of operational emissions, supply chain is the new frontier in environmental responsibility. CDP has seen leading companies, such as the supply chain members, harness the power of their procurement decisions to drive change and manage their environmental risks and opportunities through supplier engagement. In 2016, suppliers reported reducing over 3.5 million metric tons of carbon as a result of the expectation and engagement of their clients. This amount is equivalent to driving 8.3 billion miles.

Sonya Bhonsle – Director of the CDP Supply Chain Programme

In the following chapters, these solutions are presented using the first three pillars of decarbonisation. The following types of solutions are considered:

- Energy efficiency and conservation
- Production and financing of renewable energy
- Fuel and technology switching (including refrigerant switching)

According to the IEA, energy efficiency is the most important pillar in surpassing the current NDCs to limit warming to less than 2°C, as it represents about 40 percent of the greenhouse gas reduction potentials that can be realised across the globe by 2040 (see figure below). Energy efficiency is also an attractive investment as the upfront costs pay for themselves over time, while providing the real benefit of reducing the costs of energy and increasing energy productivity[40]. Renewable energy is the next contender to ensure the viable delivery of the NDCs, with fuel and technology switching also being a major contributor.



Measures needed to surpass current NDCs to reach 2°C trajectory (450 scenario), trough 2040
Source: IEA, Energy, Climate Change and Environment, 2016 Insights, http://www.iea.org/publications/freepublications/publication/ECCE2016.pdf

In 2017, 57% of European companies in the consumer staples sector reported to CDP that their Scope 1 and 2 emissions had reduced in 2016 compared to 2015 while 40% reported an increase in emissions. Realising emission reductions can also translate into financial savings. The companies reported emission reduction activities generating emission savings of 2.4 $MtCO_2e$ in 2016 and cost savings of € 70M. Energy efficiency measures represented 70% of expenditure in emission reduction activities and provided the highest portion of monetary and emission savings.

Companies in the sector are acting on the three pillars of decarbonisation through their GHG commitments. The following chapters will discuss these pillars of decarbonisation in the context of the Consumer Goods sector, illustrating them with real examples.

> *First, we need to lower energy consumption by improving efficiency and reducing waste across all our operations. And second, we need to find alternative and sustainable ways of meeting our energy needs, both now and for the future, by using renewable sources.*
>
> **Tetra pak**

> *Our three focus areas include improving energy efficiency, switching to cleaner fuels at our sites, and purchasing renewable electricity.*
>
> **Nestlé**

> *Our 2030 climate target to reduce 50% of the relevant specific corporate greenhouse gases per m^2 sales floor compared to 2011 will be achieved by: energy efficiency, low carbon or natural refrigerants, production and usage of renewable and green stores*
>
> **METRO**

Energy Efficiency and Conservation

Energy use in the processing industry

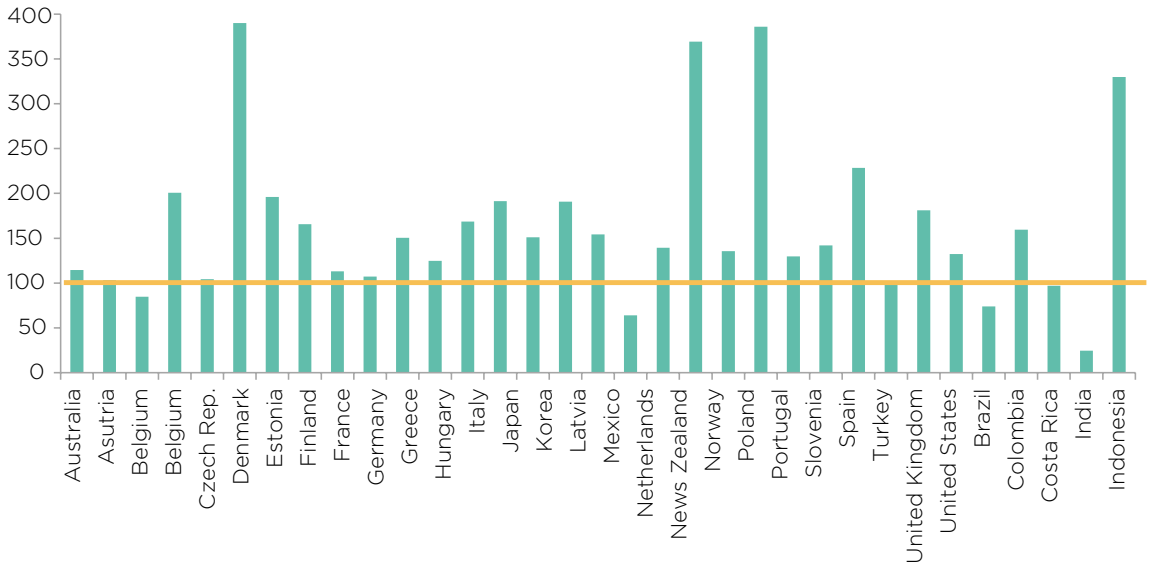
The processes that are energy intensive

Food processing requires a substantial amount of energy – on average, the food industry accounts for about 2% of final energy consumption in the OECD countries. However, there is a lot of variation between OECD countries, ranging from less than 1% to as much as 6% in New Zealand, Denmark, Ireland and Australia. In non-OECD countries it is also around 2%, but some countries such as Costa Rica use upwards of 14% of final energy on food processing[41].

The food and beverage sector in the EU uses about 10% of the total energy consumption of the industrial sector (which itself takes up about a quarter of final energy). Natural gas makes up almost half of the sector's final energy use followed by electricity (34%)[42]. Still, in the EU, food processing is responsible for about 28% of energy embedded in consumed foods. 59% of the energy used in food processing relates to thermal processes and dehydration, with refrigeration accounting for a further 16%. Whilst dehydration and drying processes are particularly energy intensive, they produce vapor which can be reused for other processes or for the cogeneration of electricity. For example, the cogeneration of steam and electricity has become a common practice in the international sugarcane industry.

Improved energy efficiency in the processing industry

In OECD countries, the sector has been improving energy efficiency since 1995. Defined as the ratio of food, beverages, and tobacco value added in constant 2010 USD per unit of energy use, the figure below indexes energy efficiency from a 1995-97 baseline (red line). In this, we can see that the Czech Republic doubled its efficiency between 1997 and 2011. Over the same period, the EU has reported increases in energy efficiency and decreases of energy GHG emissions per unit of production value[43].



Energy efficiency of the food processing sector is improving
Source: OECD, 'Improving energy efficiency in the agro-food chain' May

Nestlé improves energy efficiency in its operations

Nestlé's three focus areas include improving energy efficiency, switching to cleaner fuels at its sites, and purchasing renewable electricity. In line with its Science-Based Target, Nestlé aims to reduce its GHG emissions per tonne of product by 35% in its manufacturing operations by 2020, compared to 2010 levels. In this respect, Nestlé is actively improving its energy efficiency by implementing initiatives such as the Energy Target Setting programme (ETS).

The Nestlé ETS aims to issue a roadmap of energy improvement projects covering building, industrial services and processes. It is a thorough assessment of the energy and GHG emissions in Nestlé's sites and will be used to define an action plan of energy saving projects to be implemented. Each site assessment lasts for 10 days and aims to analyse its energy use in the factory, identifying and documenting energy saving opportunities, and establishing an action plan with clear accountabilities and timings. Example energy saving projects include improved lighting, heating, cooling and insulation and changes to internal operations in their warehouses.

When an ETS exercise took place at the Avanca plant (Portugal), energy savings projects identified included variable speed drives on electric motors, heat exchanger optimisation, water reuse and the closure of refrigeration cycles previously in open circuits. The programme resulted in potential annual energy reductions of 70 391 GJ, reduction in water withdrawal of 35 850 m3 and savings of 3 407 tCO_2eq. Financially, these results translate into savings of €1.2 million.

Energy use in transportation & distribution

The Consumer Goods industry is transport intensive, with ever-expanding food chains and increasing demands for out-of-season produce. Today, globally, around two thirds of local products and one third of exported products are shipped by road, the remainder being equally divided between rail, shipping and local waterways (with 1% being shipped by air)[44]. The demand for chilled and frozen goods is expected to increase by more than 25% between 2016 and 2020 due to changing lifestyles, increasing the energy needs of both the transport and retail sectors[45]. However, it is important to bear in mind that transportation represents 11% of the CO_2 footprint of the average U.S. household's food intake, compared to 83% for production.

Ways to reduce emissions from transport in the Consumer Goods sector

Nonetheless, there are ways to reduce emissions from transport in The Consumer Goods sector, through value chain optimisation, reduction in goods transport intensity, modal shift, improved vehicle fuel efficiency, alternative refrigeration technologies, electrification of transport with zero or low-carbon electricity, developing better route optimisation models, and increasing driving efficiency and techniques[46]

Conventional food distribution has been found to be responsible for 5 to 17 times more CO_2 than regionally and locally produced food[47]. As a result, we expect to see increasing demand for local goods as consumers become more aware of food miles (however, it is important to note that the production process and seasonality must also be considered).

Tesco has implemented a number of initiatives in its distribution and transport operations to reduce its carbon footprint. These include: improving the centralised distribution network, using route scheduling to maximise delivery schedules, using 'double deck' trailers to carry almost 45% more goods than conventional trailers, using new vans that are 20% more efficient, reducing empty truck routes, and increasing the use of local suppliers to reduce food miles.

In the same vein, a US retail logistics centre (of about 67 000 m^2, with 14 000 m^2 of cold storage and 9 gigawatt hours of consumption) reduced its energy bill by 18% by optimising its HVAC systems, installing variable speed drivers, deploying high pressure controls for refrigeration applications, and measuring, monitoring and benchmarking site energy consumption. This energy management project reduced energy consumption of cold storage by 36% without sacrificing any level of service and took only 2 years to recoup the investment made.

Mondelēz International optimises its transport routes

Mondelēz International is committed to optimising its transport routes by increasing vehicle loadings and reducing kilometres travelled: this results in lower costs and enhanced sustainability benefits through a reduction in fuel costs and CO_2 emissions. Mondelēz is one of the few large Fast-Moving Consumer Goods (FMCG) companies to share a logistics control centre with another FMCG company for optimisation of daily transport operations.

Both companies have pan-European coverage and are seeking to reduce costs and GHG emissions to meet market, policy and stakeholder objectives. To date, around 200 loading and unloading locations all over Europe are using this system. This is supported by a transport management system which uses a sophisticated, algorithm-based route planning software to optimise transport routes.

The full implementation of the shared logistics control centre will take up to several years, but adding additional companies to the collaboration can be done in less than 6 months. Over 50 people are involved in the implementation of the system across various plants, business units and distribution centres. The next step would be to connect the company's Electronic Data Interchange (EDI) software with the Enterprise Resource Planning (ERP) systems.

The efficient collaboration between partners has been a key success factor for this project, along with the deep knowledge of the international transport market, a high-quality transport management system, and experienced employees. Achieving full benefits will take some time as the system 'learns' to optimise complex transport routes. Return on Investment (ROI) will accordingly depend on how quickly full optimisation is reached.

The optimisation of transport routes delivers an annual reduction of 3 000 tons of CO_2 for Mondelēz, representing a 3.5% CO_2 reduction for this section of operations. The effectiveness of the solution is monitored through the percentage of combined transport operations, reduction in transportation costs and saved kilometres travelled hence carbon emissions reduced. Mondelēz International refers to this combination of reduced costs and reduced environmental footprint as "Smart Sustainability".

Energy use in retail stores

Energy consumption in distribution and retail varies widely depending on the type and size of the store and the systems used. However, key energy intensive activities in distribution and retail are chilled storage (in transport, warehousing and retail), ventilation and air-conditioning, lighting and cooking (bakeries).

A study undertaken in Sweden and Germany showed that refrigeration is the largest consumer of energy (between 40 and 50%) in supermarkets, followed by lighting and heating, ventilation and air conditioning[48]. For non-food retailers, lighting can make up anywhere between 45 to 60% of energy consumption, followed by HVAC[49,50]. Energy use in supermarkets is significantly higher than any other type of commercial building due to the refrigeration needed for the preservation of chilled and frozen products[51].

Ways to increase energy efficiency in the retail industry

According to some estimates, large format stores with operational control over their heating, lighting, and refrigeration systems could reduce their energy consumption by between 20 and 30%[52]. A United States Environmental Protection Agency report even identified energy savings potential of up to 21% for supermarkets and up to 41% for retail stores[53]. Various solutions implemented by retailers since the mid 2000's which contribute to increased energy efficiency include: solutions for supermarket operations, solutions for energy use in buildings, and management solutions[54,55,56]

Supermarket operations

This solution improves operational efficiency by placing doors on fridges and chillers as well as improving energy monitoring and control systems to tackle waste energy consumption. Closed refrigeration doors, for example, seem to be the low hanging fruit of energy savings and cuts in a store's carbon emissions. Approximately 75 % of the cooling load in an open-air cabinet is due to air infiltration… in other words, the amount of heat energy that needs to be removed from the refrigerated area to maintain optimal temperature. Trials of this approach by the Co-operative Group UK confirm[57] that power needs could be reduced up to 20 % with this measure. Several other tests and trials sometimes resulted in even higher energy savings of up to 50 %[58]. The resulting carbon emission reductions are considerably higher than the additional environmental impact of manufacturing and managing the refrigeration doors. Financial savings can be as high as 60 000 EUR in larger supermarkets[59]. Where possible, the glass doors/lids should be coated with a thin metal layer to reflect heat (infrared) radiation, further reducing the energy consumption.

Food retailers in numerous European countries have already implemented closed refrigerators or plan to do so in the coming years. Retailers in France signed a Code of Conduct with the French Ministry of Ecology, Sustainable Development, Transport, and Housing and the French Retailers Association (PERIFEM) to install doors on refrigerators in all new or refurbished stores and to reach 75% of all stores by 2020[60]. In Switzerland, glass doors have been compulsory on 90% of all freezers in a store since 2007[61].

Many retailers are concerned that the introduction of glass doors will result in reduction in sales. There are no studies on the influence of glass doors on the turnover, however, based on observations from retailers, no losses in sales were documented after retrofitting of individual stores[67]. In fact, with glass doors, the air temperature in the aisle in front of the cabinets will be higher, incentivising customers to increase the time spent in front of refrigerated products and building confidence in the safety of the products.


ANTIDESPILFARRO
Luchamos contra el desperdicio alimentario
Aprovechamos la energía y el transporte
para emitir menos CO_2
Quesos
Quesos
Quesos
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Carrefour reduces energy losses from refrigeration units

Since 2014, Carrefour has been implementing a programme to retrofit its cabinet doors (for both positive and negative temperature cabinets), with a target of 75% of its cabinets retrofitted by 2020 in France. Retrofitted doors on positive and negative temperature cabinets can save energy as they dramatically reduce heat exchanges between ambient air and refrigerated air, significantly reducing cold losses.

Today, retrofitted doors on positive energy cabinets exist in at least one store in almost every country; this action is now a corporate standard for new stores and for remodelling stores in Spain, Italy, Belgium, and for Carrefour Market in France. In October 2016, more than 2 400 Carrefour stores have retrofitted doors on negative refrigeration cabinets and over 800 stores have doors on positive refrigeration cabinets.

Before implementing its action plan, Carrefour involved both the operational and commercial teams to discuss the implementation of the solution, in order to choose the best types of efficient cabinets. Before installing the doors, product reorganisation had to be considered, since the shopping experience would inevitably be impacted. With any changes in a store, the operational team must be trained on how to reorganise merchandise in the cabinets.

The retrofitting of doors provides an opportunity to invest in new equipment, and should therefore consider changes in regulation on refrigeration at the global level, (notably, the European F-gases Regulation) as well as the equipment's depreciation rate. The costs associated with the retrofitted doors are about 10% higher than for non-retrofitted doors. However, the pay-back period is short thanks to the dramatic reductions in energy consumption. For instance, the Alzira store in Spain saw a 19% reduction in electrical consumption just from the installation of cabinet doors.

Beyond the environmental benefits of retrofitting the refrigeration units, doors provide better protection of food (both in temperature and in sanitation) which results in less food waste, while also providing tidier cabinets. Customers and employees alike experience a higher level of comfort in the aisles. Carrefour's example demonstrates how a monetary investment in a low-carbon solution can provide multiple co-benefits.

Energy use in buildings

This solution implies up-scaling the deployment of energy-efficient technologies such as light-emitting diode (LED) lighting and trialling new and innovative technologies in refrigeration, heating and ventilation equipment.

LED technology may reduce electricity consumption for lighting by up to 66 % when compared to conventional fluorescent lamps[63]. LEDs have a negligible heat load, so they also reduce the energy demand for air conditioning. High-efficiency fluorescent lights, which are less expensive but also less efficient than LED lights, can still reduce energy consumption by up to 35 % when compared to standard fluorescents. Moreover, LED lamps have a longer operating life: up to 50 000 hours versus 18 000 hours for fluorescent lamps. LED lights thus provide the best cost-benefits in the long-term. The costs of this technology are expected to continue to fall in the near future[64].

Energy savings of around 20 to 50 % of the typical consumption of sporadically used zones can be achieved[65] through the use of presence detectors. These switch the lighting of any space on or off depending on the presence of people. These systems are not expensive, and they are easy to install and configure. However, their profitability is usually limited to certain zones such as toilets, corridors, and intermittent waiting room areas with low or medium people traffic.

Operational and Management changes

Operational and management measures represent low-cost and no-cost energy efficiency opportunities, such as optimising temperatures, lighting, HVAC scheduling, turning off registers and other plug loads at night, etc. These gestures, although simple, have been found to result in a 9% reduction in cost-effective energy savings for retail and 24% for supermarkets[66]

Store temperature, for example, has a major influence on the energy consumption of the HVAC and refrigeration systems. To reduce energy consumption, the store temperature can be reduced in winter and increased in summer. In winter, maintaining a low but comfortable store temperature reduces energy needed for heating and increases the refrigeration system efficiency. On the other hand, raising the store temperature by some degrees in the summer may produce considerable energy savings of the HVAC system, although it will increase the energy used by the refrigeration system. A detailed analysis should be performed to establish the most efficient store temperature in summer.

Carrefour switches to LED lighting in its stores

Carrefour have established a re-lamping strategy to switch to LED lighting in its stores, cutting energy consumption and reducing costs. LED lighting can be optimised using efficiency options such as gradation, zoning, lighting monitoring and light sensors, leading to energy savings throughout the day. An increasing number of companies in the market are now adopting this technology, as in addition to energy savings it has a longer lifetime, and requires less maintenance.

Carrefour started a trial in 2007, testing different generations of LED spotlights. After verifying energy savings, Carrefour started a large remodelling plan in 2011. Switching to LED lighting is now a corporate standard for remodelled stores. By October 2016, more than 1 000 Carrefour stores had switched to LED lighting technology for general lighting and over 1 400 for accent lighting.

Before switching over to LED lighting technology in its stores, Carrefour involves the technical and remodelling teams to discuss the switch. This includes determining which stores need to be remodelled and performing a lighting analysis, before identifying the appropriate lighting products and efficiency options. After installing the new lighting, relevant lighting schedules and a monitoring plan are defined. In a final step, energy checks are carried out.

Choosing the most efficient LED lighting products was key in ensuring the project's success. This involved careful consideration when benchmarking to evaluate the lifetime and long-term performance of LED lights. A Total Cost of Ownership analysis is used to select the supplier. Choosing the correct lumens and paying attention to lighting orientation during the installation contribute to its success.

For one average store, investing in LED lighting costs 116k€, whereas the investment for fluorescent lighting is 91k€. LED lighting is a larger investment, but depending on the situation and options added, such as gradation, zoning, monitoring and sensors based on natural light, it can save between 36% and 80% of energy dedicated to lighting. In Carrefour's case, this solution saves around 7% of total electricity consumption, and has a return on investment period of 1.4 years. In addition to reducing carbon emissions, the solution reduces electronic waste as these lighting systems break down less often.

METRO AG energy efficiency programme

In 2015, METRO set an ambitious target to reduce its carbon footprint by 50% compared to 2011 by 2030. In order to achieve this, METRO is implementing an energy saving programme (ESP) to invest in energy efficiency measures in its stores. The measures implemented through this programme are saving both operating expenditures and GHG emissions.
The ESP programme was first implemented in 2012 and represents today more than 800 projects across stores throughout Europe, as well as in China and Pakistan. The company's ESP investments are focused primarily on lighting and cooling equipment, such as LED illumination, closed cooling furniture and eco fans, as they account for a large proportion of METRO's energy and electric power demand. The objective is to achieve electricity and heating reductions in its operations. By 2030, METRO estimates the electricity and heating demand will be reduced by over 35% and 13% respectively. In 2016, the company consumed 2 200 000 MWh of electricity and more than 500 000 MWh of heating.

The efficiency measures implemented strongly contribute to METRO's energy target. To intensify and accelerate the deployment of ESP projects among the METRO countries, the company publishes best practices in so-called 'ESP one pagers'.

Producing and purchasing renewable energy

Producing renewable energy on-site

Companies in The Consumer Goods sector have a high-power demand. Some US retail companies, for example, report energy costs[67] as being their second most important operating cost . At the same time, retail stores often have the advantage of large surface areas on their rooftops, an ideal environment for both micro-wind turbines and photovoltaic (PV) systems. PV systems, in particular, are useful to retailers, as peak demand for energy in summer coincides with peak electricity generation. Some companies such as METRO AG have capitalised on this by putting PV systems on their properties.

Other companies such as Carrefour have invested in PV systems such as parking lot solar lights, independent from the electricity grid. This street lighting, autonomous for power generation, storage and illumination, has the benefit of reducing upfront installation costs, as no road trenching or power cabling is required.

However, solar and wind energy are not the only type of renewable energy sources available to retailers. As the SuperSmart report on how to refurbish a supermarket indicates[68], geothermal systems and biomass energy sources can also be used in both retail and manufacturing operations. Some agri-food companies already use the food waste generated across their value chain as a precious source of biogas and fuel for their operations.

Sainsbury's[69] in the United Kingdom, for example, partnered with ReFood to use its food waste to generate power for their own retail stores, the food is converted into gas, heat and fertiliser at ReFood's processing facilities, then exported to the national grid. Sainsbury's then uses an equivalent amount of certified green gas provided through a third party. The energy generated is equivalent to about 10% of Sainsbury's gas consumption for the year.

Other food waste produced in the manufacturing segment of the value chain can equally be repurposed for energy generation. For Nestlé, spent coffee grounds are a surprising source of fuel. The spent coffee is used as fuel in the very same factories that generates the waste (see box for more details).

METRO AG produces renewable and low-carbon energy

In addition to implementing energy efficiency measures and using natural refrigerants, METRO AG is implementing a robust renewable energy development strategy, which includes producing and using renewable energy to meet its needs.

METRO AG increasingly relies on rooftop photovoltaic installations to supply the electricity needed at its wholesale markets or delivery depots. Its first photovoltaic (PV) system was installed in 2007 in Düsseldorf, Germany, with a capacity of about 220 kWpeak. Currently, the company operates 7 000 kWpeak PV on stores in China, Turkey, Italy, Spain and Austria. Its objective is to establish more than 50 000 kWpeak of photovoltaic capacity by 2030. To accelerate development of renewable energy production, new systems are under construction in China and Germany.

Depending on local energy market conditions and the location, METRO AG also uses heat generated by low-emission, high-efficiency combined heat and power (CHP) plants. It generates the heat required in its wholesale stores using natural gas and, as a by-product, produces electricity. Currently, METRO AG has six CHP plants operating in Germany. Two other plants have been established in Russia; Nizhny Novgorod in 2016 and Ivanovo in 2017.

METRO tries to rely on renewable energy wherever possible and chooses its renewable strategy according to its local market. However, despite its efforts to produce renewable energy, METRO AG will still need to obtain the majority of its energy demand from the grid in the years to 2030. So, in addition to producing renewable energy, METRO AG also purchases renewable energy, when available, close to its stores. This includes electricity from a wind park in India for four of its stores, and electricity from a biomass power plant or heat from wood chip heating plant in Germany. In this way, METRO AG contributes to the greening of the electricity supply by increasing market demand for renewables.

Carrefour uses solar power for parking lots

Carrefour is seeking to reduce its dependence on fossil fuels by investing in renewables, and is researching and piloting various options available to increase its use of new and innovative solutions. As such, Carrefour has installed solar powered LED lamps in its parking lots. Thanks to solar energy and battery storage, these lights are illuminated every day and evening, independently of the grid. Installed to drive down energy consumption and bills, this project began as a pilot in 2016 on three supermarket parking lots in France. Carrefour involved several of its business units to discuss the implementation plan and to identify relevant parking lots and plan the installation process.

Although motivated by cost reductions through investment savings, the analysis of energy reductions and Return on Investment (ROI) are still ongoing.

The engagement of the company management with the project and the involvement of all business units contributed to its successful implementation. As well as reducing energy consumption and associated emissions, it communicates a positive environmental message directly to customers and shows Carrefour's commitment to sourcing power from renewable energy.

Nestlé uses coffee grounds as a renewable fuel

Nestlé uses spent coffee grounds as a renewable fuel. Spent coffee grounds has a high energy potential and provides a good source of energy for its factories. As of 2016, 22 Nestlé's factories use spent coffee grounds as a renewable fuel resulting in a reduction in more than 230,000 tonnes of CO_2 emissions in 2016. Spent coffee grounds represent 26.7% of Nestlé renewable energy mix, reducing the need for non-renewable fuels.

The process of recycling spent coffee grounds begins after the green coffee beans are roasted. The ground-roasted coffee is extracted with hot water inside the percolation batteries or extraction cells to produce the coffee extract. While the coffee extract undergoes spray-drying to produce Nestlé's coffee, the spent coffee grounds are sent to the disposal system to be used as fuel. In Cagayan de Oro Factory, Philippines, the heat produced from this process is then used to produce the steam requirements of the factory.

Recovering coffee grounds has environmental, social and economic benefits. The solution implemented in the Philippines allows for savings in waste hauling and dumping costs, a 99% reduction of particulate matter and 300 tonnes of avoided SOx emissions, 70 000 tonnes less waste a year (for Nestlé and nearby companies), and provides free organic fertiliser for 6 750 local farmers

Most often renewable energy self-production cannot cover all of an organisation's energy needs, due to operational, financial or technical constraints. This can be due to too high capital investment, or to the geographical context (lack of sunlight, wind, lack of roof space in city retail store...). A viable alternative is to purchase green tariffs from electricity distributors, purchase energy backed by unbundled renewables certificates (I-RECs, Go) or to sign a financial agreement with a privately-owned power producer (a Power Purchase Agreement, or PPA).

Purchasing renewable energy

Commitments within the RE100 initiative indicate increased support for renewable energy[70]. Launched in 2014 and supported by The Climate Group and the CDP, RE100 calls for a 100% renewable electricity commitment from companies in the private sector. RE100 means that companies commit to match 100% of the electricity used across their global operations with electricity produced from biomass (including biogas), geothermal, solar, water and wind, either self-produced or sourced from the market. The private sector accounts for about half of the world's energy consumption. Committing to renewable energy is a significant driver of demand for renewable generation capacity. Kellogg Company, Mars, The Coca-Cola Company, Johnson and Johnson, Marks and Spencer, Nestlé, Tesco, Unilever, and Walmart are among some of the companies in the CGF committed to the RE100 initiative. Procurement of renewable electricity ultimately supports the development of further renewable and sustainable developments, while reducing consumers' environmental impacts from electricity use.

Mainly used in the EU, a mechanism that can be used by companies are green tariffs, offered by energy suppliers. These tariffs are used to indicate that purchased electricity are 100% backed by energy certificates. Many energy suppliers have more than one energy product, however, and it is important to ensure that certificates have been allocated to each product without double counting, which can be done using certificate serial numbers or third-party assurance.

Another mechanism that a company can use to purchase renewable energy is through renewable Power Purchase Agreements (PPAs). In renewable PPAs, a contract is drawn up between a generator and prospective consumer of renewable energy. The electricity supplied under a renewable PPA can either come from existing renewable energy supply or a new project, providing corporate sponsors with the opportunity to support new energy generation capacity. With a renewable PPA, the consumer can negotiate and secure a stable electricity price over a long period and can demonstrate a direct contribution to additional renewable energy capacity on the grid. Many large companies, including Google, Facebook, Apple, Amazon and The Coca-Cola Company have negotiated PPAs. Smaller companies with less purchasing power can sometimes club together to collectively negotiate such an agreement. Nevertheless, the complexity of contracts and the legislative barriers that exist in some countries mean there are few cases of PPAs to date[71].

Kellogg Company, Mars, The Coca-Cola Company, Johnson and Johnson, Marks and Spencer, Nestlé, Tesco, Unilever, and Walmart are among some of the companies in the CGF committed to the RE100 initiative.

Kellogg Company generates monetary saving while going 100% renewable

Kellogg Company has committed to move towards 100% renewable energy through the RE100 initiative. The company is currently purchasing 20% green electricity globally and plans to achieve 100% renewable energy across its entire business by 2050.

Kellogg Company initiative takes the form of a partnership with local utility companies and third-party suppliers in Europe and the United States to purchase renewable electricity from the existing electrical grid.

Each individual location has converted to using 100% renewable electricity as part of contract negotiations with the local utilities and third-party suppliers. The energy managers were primarily responsible for these negotiations, working to gain the necessary agreement and approvals within their regional management structure. Empowered energy buyers within the company to purchase green electricity drives it success.

Even though renewable energy can sometimes have a premium, Kellogg Company has been able to purchase renewable electricity while still saving more than $ 1 million (USD) in Europe and the US. This negotiation helps drive down the cost of green power for everyone. Increased demand for renewable electricity encourages local utility companies and third-party suppliers to increase the amount of solar, wind, hydro and other renewable generation sources in their portfolio.

Kellogg Company expects a 10% reduction in its GHG emissions from purchasing 20% of its electricity from renewable sources. Kellogg Company claims that these results deliver a holistic solution that is good for the planet, their customers, and their shareholders.

Nestlé commits to going 100% renewable electricity

Nestlé has committed to move towards 100% renewable electricity through the RE100 initiative. In this context, Nestlé's share of green electricity will reach 25% by the end of 2017, compared to 3% in 2012. In order to reach this target, a Renewable Energy Task Force was set up at corporate level to share, coordinate and promote the renewable sourcing activities. The Renewable Energy Task Force provided general and specific guidance to the operating companies in terms of definitions, criteria, sourcing options, reporting, etc.
According to Nestlé, green electricity is now often cheaper than conventional electricity, which leads to financial savings and the Power Purchase Agreements (PPAs) provide a long-term view on energy prices.

In terms of environmental benefits, Nestlé has mitigated over 400 000 tCO_2e through the purchase of green electricity in 2016, compared to buying only conventional electricity. This represents 11% of their indirect GHG emissions (Scope 2).
By purchasing electricity from renewable sources, Nestlé is supporting the United Nations Sustainable Development Goal #13 to take urgent action to combat climate change and its impacts. Indeed, purchasing 100% green electricity increases demand for renewable energy, contributing to the energy transition by greening the grid.

Another alternative is to purchase renewable electricity in the form of unbundled Renewable Energy Certificates (REC) in North America, Guarantees of Origin (GO) in Europe, and International RECs (I-RECs). When RECs, I-RECS or GOs are "unbundled", it means that consumers buy electricity from their electricity service provider but purchase the renewable energy certificates from a separate supplier. RECs, GOs and I-RECs are issued when one megawatt-hour (MWh) of electricity is generated and delivered to the electricity grid from a renewable source. They can be bought and sold on various markets, and are "retired" when a purchaser makes a green energy claim[72]. It is worth noting that quality labels have been established in the market to ensure social and environmental benefits and are associated to each certificate (Ekoenergy, Greene-e, Naturemade, Gold Standard RE label).

> *Corporations can be powerful drivers for the transition to a low-carbon economy, including through the procurement of renewable energy. Among the options available, the acquisition of unbundled renewable energy attribute certificates is often the most convenient choice. Unbundled certificates can instantly reduce a company's carbon footprint, and are accessible due to the absence of legislative barriers. Various quality labels have been established in the market of renewable energy attribute certificates to guide companies in their choice. By acquiring renewable energy attribute certificates from power plants or devices, corporates can foster a more rapid displacement of fossil fuels, mitigate environmental and social risks, and contribute to the SDGs in a more meaningful way*
>
> **Meinrad Burer, Director – Research & Development, EcoAct**

Tetra Pak moves toward 100% renewable electricity

Tetra Pak has joined the RE100 initiative, and has committed to increase its use of renewable electricity throughout its operations around the world from over 22% at the time of commitment in 2016 to 100% by 2030. This commitment is part of Tetra Pak's wider pledge to tackle climate change and falls under their 2020 climate goal and their Science-Based Targets. Electricity represents around 80% of Tetra Pak's energy consumption. Hence, including renewable energy in its electricity consumption is an important focus area for the company.

Tetra Pak invests in renewable energy by generating renewable electricity at their plants, as well as through the purchase of offsite renewable energy. Currently, Tetra Pak has solar PV installations at 7 of its plants with an installed capacity of 1044 kW and an annual generation of 1 143 000 kWh. Regarding renewable electricity procurement, Tetra Pak sources renewables via its electricity suppliers or through separate contracts for renewable certificates. Tetra Pak is also looking into options to source renewable electricity from Power Purchase Agreements (PPAs).

For Tetra Pak, engaging senior management and getting their support, in addition to having a central coordination, were key factors of success so far. In terms of costs, renewable electricity has become more affordable over time, so the cost savings compared with the conventional alternatives will increase. Tetra Pak is already seeing improved opportunities for onsite Solar PV compared to five years ago.

As a result of its commitment to move toward 100% renewable electricity, Tetra Pak has had annual carbon savings of approximately 120 700 tCO_2. Through this commitment Tetra Pak is also driving the demand for renewable electricity and in turn stimulating its growth.

Fuel and techno switching

This section covers the decarbonisation pillar of "fuel and techno switching". In The Consumer Goods sector this encompasses the adoption of new technologies (techno switching), such as natural refrigerants, as well as the use of alternative fuels.

Adopting natural refrigerant gases in the sector

The Consumer Goods sector relies heavily on refrigeration equipment for food manufacturing processes, distribution in cold trucks and retail storage and sale. Without refrigeration, our food consumption habits would not be what they are today. For example, in the EU, commercial refrigeration accounts for about 40% of refrigerant-related GHG emissions, with the largest part of this (85%) from refrigeration systems in supermarkets[73]. The carbon footprints of European supermarkets are largely determined by their choice of refrigerants, which makes up 18 to 30% of overall store carbon emissions.

After scientific evidence demonstrated that the ozone layer was depleting due to a set of manmade substances, international agreement to phase out chlorofluorocarbons (CFCs) was reached with the Montreal Protocol in 1987. Since then, CFCs have been phased out completely, and following the Copenhagen Amendment of 2004 and an acceleration of the schedule in 2007, HCFCs (hydrochlorofluorocarbons) are due to be phased out by 2030.

As a result of these efforts, hydrofluorocarbons (HFCs) became widely used as replacements for many of the CFCs and HCFCs. HFCs do not damage the ozone layer, but do have an extremely potent global warming potential, up to 4000 times that of carbon dioxide. Alarm bells rang as studies showed that uncontrolled growth in the use of HFCs could contribute as much as 19% of total climate impacts by 2050, despite their contributing to about only 1% of global warming today[74]. This is due to expected substantial growth in HFC use in developing countries for reasons such as population growth, rapid urbanisation, and the changing of consumer habits, as well as their use as replacements for CFCs/HCFCs. Atmospheric observations show that HFCs are increasing 10-15% per year[75].

In 2014, the EU revised their F-Gas regulation[76] to significantly cut the use of HFCs by 79% between 2015 and 2030, with some bans on new equipment with various GWP levels (150, 750, 2 000). The Regulation helped to promote consensus on a broader international agreement under the Montreal Protocol. In 2016, the world's governments agreed the Kigali Amendment which mandates a phase down of HFCs in both developed and developing countries to around 15% by 2045. Developing countries will start to cap and reduce HFC consumption in 2024, while developed countries start to reduce their consumption by 10 percent in 2019 and 40 percent in 2024. The HFC phase down is expected to mitigate up to 0.5°C of global temperature rise by 2100[77].

> *The F-Gas Regulation is the most ambitious HFC legislation in the world, and will quickly reduce HFC consumption throughout Europe. Those companies that get ahead of the curve by installing state-of-the-art natural refrigerant systems in all new builds and refurbishments will avoid massive price hikes in HFCs and reap significant energy efficiency benefits as well. There is a huge gap between the Paris climate goals and current pledges from the world's governments. Eliminating HFCs in the near future is absolutely vital to get closer to the goal of limiting temperature rise to 1.5°C.*
>
> **Environmental Investigation Agency**

In November 2010, the CGF members agreed on a resolution to start to phase out HFC refrigerants and on an action plan to tackle the many challenges associated with hydrofluorocarbons (HFCs) and the shift to natural refrigeration alternatives. A second resolution was announced in 2016 to continue to phase out and called for the inclusion of HFCs in the Montreal Protocol. The CGF members took action in recognition of the major and increasing contribution to total greenhouse gas emissions from HFCs and derivative chemical refrigerants.

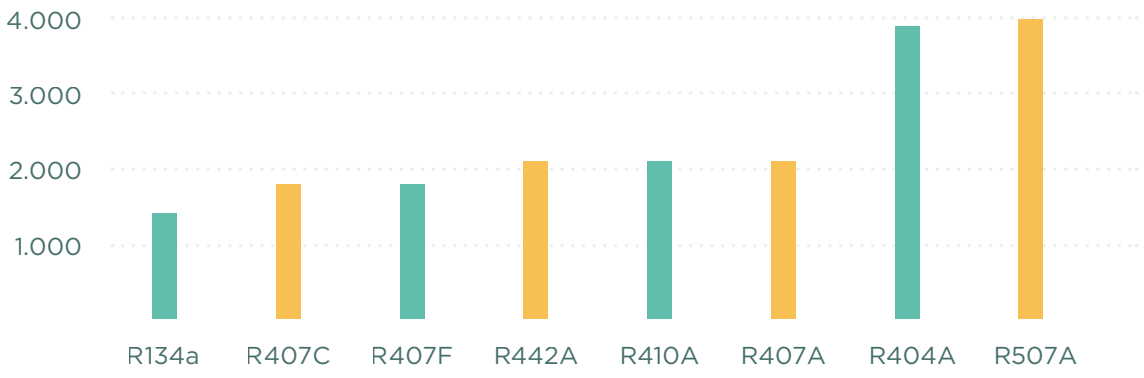
In Europe, R404A is the most widely used gas in stationary refrigeration systems[78,79]. It is commonly used in low-temperature commercial systems such as those in supermarkets. It is also among the most damaging, with a GWP of 3922, of all the commonly used refrigerants (R134a has a GWP of 1430 and R407F of 1850 (see graph).

In Europe, from 2020, HFCs with a GWP over 2500 cannot be used to service equipment. This means that the use of virgin HFC-404A will effectively be banned and only reclaimed or recycled gas can be used until 2030 (although it is highly unlikely that sufficient quantities will be available for any length of time). From 2022, all new commercial refrigeration and freezing equipment placed on the market using HFCs with a GWP of 150 or more will be banned. This includes large multipack centralised refrigeration systems with a rated capacity of 40 kW, other than in the primary circuit of a cascade system where HFCs with a GWP less than 1500 may be used.

There are therefore two main options for retailers with respect to new equipment:

- Switch to natural refrigerants (the ideal option) such as CO_2, ammonia and propane;
- Switch to new hydrofluoroolefins (HFOs) such as HFC-1234yf, or as yet unspecified HFO/HFC blends with a GWP less than 150.

In existing equipment, there is an option to replace HFC-404A with a drop-in medium-GWP replacement HFC such as HFC-407A or F but this is an interim solution and ultimately all systems will need to be low-GWP (under 150).



GWP of some common HFC refrigerants
Source: Black, J. 'EU f-gas regulations: impact on R404A and the opportunity of R422A (RS-50)' Linde Gas, May 2014

Carrefour reduces refrigerant gas leakage

Carrefour is currently implementing an indirect leakage detection system in its stores, based on the continuous measurement of refrigerant levels and refrigeration system working conditions. Such a system is capable of detecting leakage throughout the whole refrigeration system. This solution not only complies with the F-gas directive and other local policies, while staying a step ahead of fluorinated gases phase-out timing, but also contributes to the company's CO_2 reduction commitments. After running a successful pilot in 2015, the smart leakage detection system was implemented in over 80 stores and is being rolled out more widely today.

The pilot involved the installation and testing of the system in relevant stores according to their leakage strategy, using this to validate the system. A future step includes looking for equivalent alternative systems which are more competitive in terms of investment and installation facility.

The involvement of both the internal team (technical department) and suppliers was a key factor in the success of the project. The return on investment of this solution could be less than 3 years, depending on local refrigerant costs, installation costs and leakage rates.
Besides reducing leakage, this solution ensures optimal refrigerant levels, and can avoid cold chain breaks and system energy over-consumption. One of the main benefits of this system is its ease of installation due to its standalone nature.

Kellogg Company uses ultra-low GWP chillers

As part of The Consumer Goods Forum's second resolution on refrigeration in 2016, Kellogg Company is working to replace its HFC refrigerants with ultra-low GWP alternatives. In line with its commitment Kellogg Company installed the first R-514A ultra-low GWP chiller in its Cincinnati (Ohio) plant in April 2017, replacing a R123a refrigerant chiller. The introduction of the chiller was driven by the phase-out timing for HFC refrigerants, along with an expectation of increased efficiency.

In addition to having an ultra-low GWP, the new chiller is more energy efficient than other solutions evaluated. This serves as a pilot for Kellogg Company as it looks to install additional chillers using ultra-low GWP refrigerants in future projects. By working with commercial chiller manufacturers, Kellogg Company integrated its requirement for a new ultra-low GWP refrigerant in the design of the new chiller.

The involvement of both the Supply Chain team and the Cincinnati plant leadership was important to the success of the project as both supported the installation of the new chiller. The knowledge and expertise of Kellogg Company engineering and sustainability teams in this area enabled a successful partnership with the chiller supplier all the way through project completion. Due to the success of the new unit, Kellogg Company is installing three additional units as a total replacement of chilled water systems at their world Headquarters in Michigan.

The project has an internal rate of return of approximately 20%. The nature of the R514a refrigerant also drives energy savings, resulting in an electricity use reduction of approximately 500 000 kWh. This actually equates to a 50% reduction in energy used for the chilled water loop and a reduction of approximately 315 MT CO2e (1.5%).

Its increased use of the R514A chiller will enable Kellogg Company to deliver on its commitment of reducing GHG emissions through the use of ultra-low global warming potential refrigerants and reduce GHG emissions. Increased demand for ultra-low global warming potential refrigerant and associated chiller technology will continue to drive product development, resulting in increased availability for everyone.

Natural refrigerants all have very low GWP and if systems are carefully designed, provide efficiency and reliability in many applications. Some natural refrigerants have drawbacks (ammonia being toxic, for example), but these can be handled through the design of the system. CO_2 has emerged as the leading alternative to R404A systems in supermarkets, although investment costs are higher.

Natural refrigerants are not new to the industry: in fact, CO_2 is one of the oldest refrigerants but fell out of use when synthetic refrigerants were developed. Natural refrigerants have the obvious advantage of not harming the environment, with low GWPs and no ozone depleting potential. They provide viable and future proof alternatives to synthetic compounds, which are increasingly the focus of climate regulations. Given the regulatory context, the consumer goods industry will have to adapt its refrigeration operations to ensure its future viability.

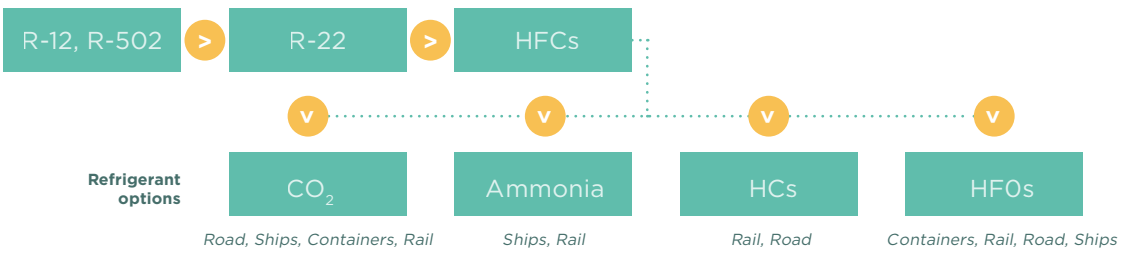
It is important to note that indirect emissions associated with refrigeration have a higher impact than refrigerant gas emissions themselves (80% of the climate impact of a refrigeration system comes from the energy use itself rather than refrigerant leakages) [80]. Therefore, to increase the environmental benefit, it is important to couple the transition to low and/or zero GWP refrigerants with further energy efficiency measures.

Refrigeration equipment has by far the biggest environmental impact of the food retail industry. When taking all emission factors of the refrigeration process into consideration (both direct and indirect), it accounts for 85 % of the total emissions per kg of frozen or chilled food product.

Low GWP transportation opportunities

The transport refrigeration sector primarily moves perishable goods by rail, road and ships. A typical charge of refrigerants for road vehicles can range from 4.5 to 7.5 kg, increasing to 100 to 500 kg for ships. Due to the increasing use of air-conditioned transport, mainly in developing countries, the HFC emissions are expected to rise if left unchecked. In 2010, transport accounted for about 9% of global HFC consumption in the refrigeration/AC sector, or about 80 million metric tons of CO_2e. Historically, the main refrigerant for the transport refrigeration sector was HCFC-22, but transporters converted to HFCs in the 1990s. By 2010, HFCs accounted for about 40% of refrigeration equipment for ships, 70% for road vehicles and 95% for intermodal carriers. More recently, low GWP natural refrigerant options such as ammonia and carbon dioxide[81] have been gaining favour in the market.

The figure below details the actual and potential alternatives in transport refrigeration applications.



Refrigerant Transition in the Transport Refrigeration End-Use
Source: EPA, "Transitioning to Low GWP Alternatives in Transport Refrigeration" October 2011

ICA Sweden switch to natural refrigerants

ICA Sweden is committed to leadership in the phasing out of its HFC refrigerants. Refrigeration is an essential part of their business, providing fresh, high-quality food to customers. Therefore, they are working hard to reduce the environmental impacts of their contribution from refrigerant use, in line with the resolution of The Consumer Goods Forum.

Early on, ICA began working to convert the use of CFC/HCFC to natural refrigeration systems. In 1995, it built the first store in Sweden with 100% natural refrigerants - ammonia and CO_2. At the beginning of 2000s, ICA installed propane/propylene and CO_2 systems in a number of stores, aiming to use natural refrigerants as standard in a few years' time. By 2010, ICA adopted natural refrigeration as standard in new installations.

ICA's collaboration with other actors such authorities, academic institutions and other commercial bodies was an important key factor. For example, ICA has a long tradition of increasing awareness of the climate impacts of refrigerants and energy consumption in stores by participating in national research programmes to evaluate new technologies (e.g. Klimat 21, EffSys). Many Swedish ICA stores have been involved in these programmes' important field studies. The open forums, often supported by the Swedish Energy Agency, independently show the performance of CO_2 systems compared to HFC systems and have been instrumental in their development. By being transparent about the studies with its competitors and contributing to system evaluations in its pilot stores, ICA's openness led to a strong consensus regarding the applicability of trans-critical CO_2 systems in refrigeration systems.

Another important driver for this work is that Sweden has had a favourable policy climate for the implementation of natural refrigerants, of which ICA has been a strong supporter. Replacement of HFCs with natural refrigerant solutions and the addition of lids and doors have been the strongest influences on reduced Total Equivalent Warming Impact (TEWI) in new and refurbished ICA stores. The TEWI reduction exceeds 40% on all new ICA store profiles since 2009. For the refrigeration systems themselves, the TEWI reduction was between 50-60%.

Adopting Natural Refrigeration has become a standard to Sainsbury's

Sainsbury's

Sainsbury's has a strategy to phase out HFCs by 2030 and to replace them with natural refrigerants (primarily R744) for new systems and R448A/R449A as a "drop in" replacement for existing assets. The decision was made after an in-depth analysis of government policy and the regulatory environment, including the Montreal Protocol, Kigali Amendment and the revised F-Gas regulation. In 2009 Sainsbury's decided to limit the amount of new R404A equipment installed and migrate straight from R22 assets to natural refrigerants. Dual temperature transcritical CO_2 booster plants were adopted as "business as usual" in 2010 for supermarkets and in 2017 for convenience stores. Today, 216 supermarkets and 8 convenience stores have converted to such plants, compared to 605 convenience stores and 806 supermarkets in total.

The convenience store systems deliver a combined mechanical, electrical and refrigeration system, making use of heat reclaim to avoid the use of HFC's in the refrigerant system and save energy. Trans-critical CO_2 cycles are an efficient choice in areas that need both heating and cooling as they reject a large proportion of cycle heat. This is particularly useful in countries with cooler temperatures.

The initial step in this process was to ensure that the correct technology was available and robust enough to pilot. Sainsbury's took a lead within the retail sector to adopt the new technology, as this was not prevalent within the industry. Sainsbury's invited multiple suppliers to offer designs for new systems, progressing from pilots with 3 suppliers over a period of 12 months before standardising one design. In addition, Sainsbury's invested in training for refrigeration technicians, requiring them to reach a proven working-level proficiency with CO_2. It continues to review and refine the designs to enhance performance.
The management of the company was won over by the fact that the original cost premium of 38% for CO_2 in supermarkets was reduced to cost neutrality in 18 months. Meanwhile, the original cost premium of 22% for CO_2 in convenience stores was reduced to cost neutrality in 24 months.

To date, there has been a 19% reduction in Sainsbury's F-Gas footprint since 2012 (-512 $ktCO_2e$), with an expectation that this will reach 30% by 2020 and 65% by 2030. There was minimal impact on energy consumption for supermarkets, despite many believing that the systems would perform far worse than HFC's. Heat reclaim delivered a 20% saving in convenience store energy consumption.

Fuel switching in transportation

Globally, transport is responsible for about 27% of global energy use and 23% of greenhouse gas emissions, with only about 3% of road transport using biofuels. While emissions in other sectors decrease, transport emissions continue to increase worldwide[82]. "Alternative fuels" refers to five major fuel types that are significantly different from traditional fuels: electricity, natural gases (Liquefied natural gas –LNG- and compressed natural gas –CNG), ethanol/ biodiesel (biofuels), propane, and hydrogen fuel cells. Although there is a vast array of different types of alternative fuels, this chapter will focus on biofuels and natural gases, specifically LNG.

Increasingly, we can see regulation heading towards imposed efficiency standards for medium and heavy-duty vehicles. In the United States, commercial transportation is starting to feel the heat of increased scrutiny and regulation. President Obama's Climate Action Plan put in place the first requirements for carbon or fuel efficiency for medium and heavy-duty vehicles. Phase 2 of this legislation (August 2016) covers model years 2012 to 2025, intensifying fuel efficiency and carbon standards. The expected results are significant: when the standards are fully phased in by 2025, tractors in a tractor-trailer should emit up to 25 percent fewer CO_2 emissions and fuel consumption than an equivalent tractor in 2018 . Only a handful of other countries, Canada, China, and Japan, have implemented efficiency and greenhouse gas emission standards. Of course, it must be noted that President Obama's Climate Action Plan may become irrelevant in the coming years, depending on whether the current US presidency revokes it.

Europe on the Move is a wide-ranging set of initiatives aimed to make transport safer, cleaner, and more socially equitable in the EU. One of the planned proposals will impose minimum emission standards on heavy duty vehicles after 2020[85] for the first time. For now, however, this has not been implemented. Also in the European Union, the Renewable Energy Directive (RED) requires 10% of all transport fuels to be delivered from renewable sources by 2020 in every Member State. More than 85% of the RED transport target is expected to come from biofuels, mainly biodiesel (with the rest coming from renewable electricity or from hydrogen and other sources) [86].

Bioethanol and biodiesel are the most common biofuels used in transport although some other biofuels are also in use, such as pure vegetable oil and compressed biomethane (biomethane accounts for about 0.5% of biofuels consumed globally). Although biomethane accounts for a small portion of transport fuels, it has a very promising source: food waste. Food waste is a highly desirable feedstock for anaerobic digestion, due to its high biodegradability, nutrient content and methane yield, providing an ideal source for biomethane[87], without putting stress on food sources, biodiversity, land or deforestation as other biofuels do (e.g. soybean, rapeseed, sunflower, palm and coconut oils for biodiesel production, or sugarcanes, maize and beets for bioethanol) [88]. Carrefour provides an example of how biomethane can be used to fuel delivery trucks.

Demand for waste-based biofuels is expected to grow because organic wastes and residues are widespread and relatively cheap, they do not compete with food production or other land uses and have low or no upstream GHG emissions . Furthermore, using organic waste as a source of energy builds energy independence and strengthens links between stakeholders – in this case, energy producers and the actors in the agriculture sector. The IEA suggests that biofuels will have an important role to play if the world is to make meaningful reductions in carbon dioxide emissions, and reduce its reliance on crude oil. Continued support to advance biofuels research, development and demonstration and provide support mechanisms can help them to reach full market deployment. The IEA Technology Roadmap predicts that biofuels will make up 27% of total transport fuel by 2050, responding to higher demand if coupled with the right policies[90].

Of course, costs are a big factor in choosing vehicles, but some companies claim that the extra costs are paid back in two to three years, depending on the mileage.

The John Lewis-owned company, Waitrose, announced the purchase of 10 new biomethane trucks in February 2017. The company states that each truck will pay for itself in three years by generating total savings of around £20 000 (when averaging 125 000 miles a year). According to the truck manufacturer, biomethane is about 40% cheaper than diesel and emissions from vehicles are 70% lower as a result[92].

Carrefour uses biomethane fuel to power its delivery trucks

Carrefour, committed to reducing its carbon emissions, fine particles and noise pollution, uses biomethane to power its delivery trucks. The fuel is from recovered bio-waste produced notably by stores, which is then processed in a digestion plant. This solution was developed before a decree imposed driving restrictions in Paris, prioritising alternative transportation modes for deliveries in inner-city areas for non-food and dry food products.

Biomethane is 75% less emissive, with the double advantage of eradicating almost all fine particles as well as reducing noise pollution by 50% (the sound level is less than 65 decibels). Within Carrefour, biomethane-powered transport was first tested several years ago in northern France. The company plans to deploy more than 200 trucks throughout the country this year, coinciding with its objective to reduce the CO_2 footprint of its downstream transportation by 5%. In 2012, pilot testing of various transport alternatives was followed by test comparisons of alternative solutions to diesel, before choosing the best solution, and identifying any improvements and corrective action plans before deployment.

Biomethane fuel delivers a higher return on investment than other alternatives to diesel, with a payback period of 6 years.

The project encourages a virtuous circle, benefitting multiple stakeholders from those who generate food waste to the biomethane industry. Working with such a diverse range of stakeholders provides co-benefits all along the value chain. In addition, Carrefour identifies and works with suppliers who produce food waste that can then be recovered, which provides the waste producer with another diversified source of income. The organic waste is used to create both biomethane gas and fertiliser for farmers. Finally, the emerging biomethane sector in France is supported by Carrefour's investment in the deployment of biomethane trucks.

Natural gas is another alternative fuel that can be used in transport. These vehicles work a lot like gasoline powered vehicles, with a spark-ignited internal combustion engine. Liquified natural gas (which is natural gas that has been converted to liquid) is most often used in heavy duty vehicles to meet range requirements (it has a high energy density, so more fuel can be stored on board). Inherently, natural gas, consisting largely of methane, contains about a quarter less carbon per energy unit than diesel[93], but caution should be used to minimise leakage throughout the value chain of LNG, so as not to offset the tank to wheel benefits (less emissions compared to diesel). Keeping well to wheel natural gas leaks at or below 1 percent through the supply chain is critical to ensuring that the fuel offers a climate benefit[94].

The US Energy Information Administration Annual Energy Outlook 2015 predicted that natural gas would be the fastest-growing fuel in the transportation sector, with an average annual demand increase of 10 percent and with heavy duty vehicles leading this expansion. Despite those high growth rates, natural gas vehicles are projected by the U.S. Energy Information Administration to account for just 0.5 percent of the overall heavy-duty vehicle fleet stock and 1 percent of new vehicle fleet sales by 2025 in the United States[95]. Although natural gas adoption is mainly driven by lower cost compared to diesel fuel, it faces several barriers such as limited fuelling station infrastructure, and the additional cost and weight of natural gas equipment, as well as additional maintenance facilities. Its future relies on policy choices in various countries financial mechanisms and incentives to invest in infrastructure and R&D.

Alternative gases such as LNG and biomethane are viewed by some as a ‘bridge’ until electric vehicles become a viable alternative for long-range heavy-duty trucks. Tesla, Daimler and Renault have all unveiled promising models -- certainly, the next few years will determine the future of heavy duty vehicle alternatives.

Barilla uses vehicles powered with liquefied natural gas (LNG) for greener logistics

Barilla
The Italian Food Company. Since 1877.

Barilla and its logistics partner Italtrans, are committed to reducing their carbon emissions and noise pollution, using the new LNG fuelled Iveco Stralis for the distribution of bakery and pasta products. This vehicle was developed by Iveco to promote LNG powered road-based transport services as an alternative to diesel and petrol vehicles. Barilla's commitment to the use of LNG-powered vehicles is in line with its corporate objectives to promote low-carbon technologies and initiatives in its supply chain and logistics.

In July 2017, Italtrans started a pilot project using three new LNG vehicles to deliver Barilla's products in some Northern Italian regions, which are the only area where LNG fuel stations are available. To deploy the project, Barilla's teams are working with their logistic partners to introduce other LNG powered vehicles concurrently with the opening of new LNG fuel stations in other Italian regions.

The cooperation between Barilla and its logistic partners will be a success factor for the project. For the first time, these new LNG powered vehicles have adequate power and an extended autonomy (up to 1 500 km) compared with those of other similar vehicles. National subsidies help to cover the higher cost of these vehicles and Iveco states that the new vehicles have the same total cost of ownership and payload as an equivalent diesel truck.

LNG vehicles reduce nitrogen oxide (NOX) emissions by 70%, particulate matter by 99% and CO_2 emissions by 15% below the Euro 6 vehicle emissions standard. Finally, these vehicles reduce noise by 3 Decibel Weighted, meaning that the noise is cut in half.

How companies approach carbon neutrality

Some companies have gone above and beyond in their implementation of low carbon solutions, and have put in place multiple solutions on the same site in an effort to reduce their carbon impact as much as possible. Experience shows that if companies carefully plan the design or renovation of a store, low carbon solutions can be combined to design and build 'green' or carbon-neural stores.

> *Do your part: it's feasible! This is what we are talking about here, and it is all the more important considering the importance of the sector, spanning from the cradle to the grave. The initiatives presented here are encouraging and create the credibility to call for even more structural change: to produce responsibly, to distribute and consume locally, to change diets, etc. These levers, involving all stakeholders, from the producer to the public authorities all the way to the consumers, are also to be put into action as quickly as possible if we want to give ourselves every chance to stay below the +2 ° C.*
>
> **Alain Grandjean – Carbone 4**

METRO AG launches a ZEUS - Zero Emissions Unit Store

METRO

METRO started to pilot a Greenstore initiative, and a ZEUS (Zero Emission Unit Store) initiative. Using natural lighting, natural refrigerants, heat recovery, closed cooling furniture, new alternative materials (wood, concrete fundament), and modern ventilation systems, METRO has changed the way they build and remodel their stores. The GREENSTORE initiative is a new standard for the company for refurbishing stores, using daylight bands, light sensors, high event A/C with ventilation, road lamps with windmills, solar panels, along with even charging carousel for bikes, as they did in their pilot Greenstore in Dongguan (China). The ZEUS initiative has strategically changed the way METRO designs and constructs their stores, considering the building shape, materials, technical equipment and operational processes. Their zero-emission pilot store in Austria has been designed and constructed in such a manner that despite having frigid winters, the store does not need a heating source, as the heat comes from the tubes in the foundations and from the heat recovery of the transcritical CO_2 cooling system. These zero-emission and green stores combine low or zero-carbon solutions, some of which were demonstrated in this publication

Conclusion

Working together, companies in the Consumer Goods sector can operate more efficiently and influence positive change across the industry without impeding competition. When sectoral actors share, communicate (and demonstrate the various ways in which they are combatting climate change), a robust signal is sent not only to other companies in the sector, but also to their customers, technology providers and to public institutions. The Consumer Goods Forum embodies this approach, providing a platform that fosters collaboration and the sharing of innovative best practices, while simultaneously addressing sustainability issues. The promising solutions implemented by CGF companies show that skills, common goals and collaboration are key success factors for corporate climate action. This publication exemplifies the message emanating from the COP23 and the SDG framework on collaborative climate actions. The co-benefits of low or zero carbon solutions on a global scale are clear: not only do they contribute to avoiding severe and irreversible impacts on climate change but they can also increase competitiveness, improve energy independence, bring energy savings and identify new business opportunities for corporates. Despite their demonstrated advantages, these solutions are not yet widely implemented in manufacturing sites or retail stores. The lack of a ubiquitous, widespread use of low carbon solutions in The Consumer Goods sector is a microcosm of the worldwide picture: there are economic and policy misalignments that must be corrected by all private and public actors in order to scale up low carbon finance and shift investments towards low carbon technologies.

Initiatives such as the Financial Stability Board's Task force on Climate-Related Financial Disclosures (TCFD) for example, provide a positive approach, developing of voluntary, consistent climate-related financial risk disclosures, encouraging companies to better manage their climate risks and to align themselves in a well-below 2°C pathway. Moreover, the TCFD builds awareness amongst investors and incentivises them to value the companies that go further in reducing their environmental footprint. This creates a virtuous circle: when investors value companies that address climate risk, it will spur more demand for standard climate disclosures, in turn facilitating investors to value 'greening' companies. The CDP adopting the TCFD recommendations illustrates the kind of partnership that can further bridge the gap between investors and companies, and favour an investment climate that rewards companies advancing low-carbon technologies.

> *Success on climate action requires deep collaboration by a broad coalition of stakeholders. We all have a role to play. If we are not part of the solution, we are part of the problem.*
>
> **Minister Inia Seruiratu, Fiji's Minister for Agriculture, Rural & Maritime Development, and National Disaster Management, High-Level Climate Champion**

The Consumer Goods Sector is eager and ready for new areas of collaboration and partnerships with the financial sector in an effort to bridge the gap, and promote low and zero-carbon solutions. Meanwhile, some companies within the CGF have taken matters into their own hands to find innovative ways to act. Some have implemented their own internal carbon price to spur investment in low carbon technologies, others have invited people to invest in their green projects through climate finance tool as green bonds.

As the Consumer Goods sector sits at the nexus between suppliers and consumers, reaching almost everyone on the planet, it contributes directly and indirectly to climate change through the sourcing of materials, as well as the way products are manufactured sold, and used. Given its position, the sector has a unique responsibility to align with a trajectory well-below 2°C, in all segments of the value chain. The urgency to act on climate change is clear: if we want to live in a world where temperature rise is maintained below 2°C, carbon emissions have to peak by 2020 and the world needs to be carbon neutral by 2050. If emissions peak beyond 2020, our chance to live in a world close to 1.5°C will be eliminated. Peaking at 2020 is not impossible, but it does imply radical transformation and efforts on the part of all public and private players[96]. To get there, climate change adaptation and carbon neutrality need to be the ultimate objectives for all activities, which can be achieved through mitigation (foremost) coupled with carbon sequestration and compensation. All actors have to be mobilised now and have to address the emissions not only under their operational control but throughout their value chain.

Continued efforts and concrete commitments will only grow in the coming years, as the ground of regulation and collaboration continues to be nourished. The CGF is committed to work in both the public and private spheres to encourage and foster collaboration between members, in the pursuit of positive change in the industry.

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