

Changing Gear

Alignment of major auto manufacturers
with the goals of the Paris Agreement



The Institutional Investors
Group on Climate Change

About the authors



The Institutional Investors
Group on Climate Change

The Institutional Investors Group on Climate Change (IIGCC) is the European membership body for investor collaboration on climate change and the voice of investors taking action for a prosperous, low-carbon future. IIGCC has more than 230 members, mainly pension funds and asset managers, across 15 countries, with over €30 trillion in assets under management.

Our mission is to mobilise capital for the low carbon transition and to ensure resilience to the impacts of a changing climate by collaborating with business, policy makers and fellow investors. IIGCC works to support and help define the public policies, investment practices and corporate behaviours that address the long-term risks and opportunities associated with climate change.

For more information visit www.iigcc.org and [@iigccnews](https://twitter.com/iigccnews).



The 2° Investing Initiative (2°ii) is an international, non-profit think tank working to align financial markets and regulations with the Paris Agreement goals.

Working globally with offices in Paris, New York, Berlin, and London, we coordinate the world's largest research projects on climate metrics in financial markets. In order to ensure our independence and the intellectual integrity of our work, we have a multi-stakeholder governance and funding structure, with representatives from a diverse array of financial institutions, regulators, policymakers, universities, and NGOs.

2°ii developed the first scenario analysis tool linking financial portfolios with the 2°C climate goal – which has been applied by nearly 1,000 financial institutions with over \$61tn of assets under management in addition to a number of financial supervisors (www.transitionmonitor.org). 2°ii also helped co-design the first climate-related financial regulation in the world (Article 173 of the French Energy Transition Law).

In addition, 2°ii carries out a wide range of research, policy and incubation work, ranging from developing climate alignment tools for banks; to devising target-setting and stress testing tools; to performing research on retail investors' preferences.

More information can be found at www.2degrees-investing.org and [@2degreesinvest](https://twitter.com/2degreesinvest).

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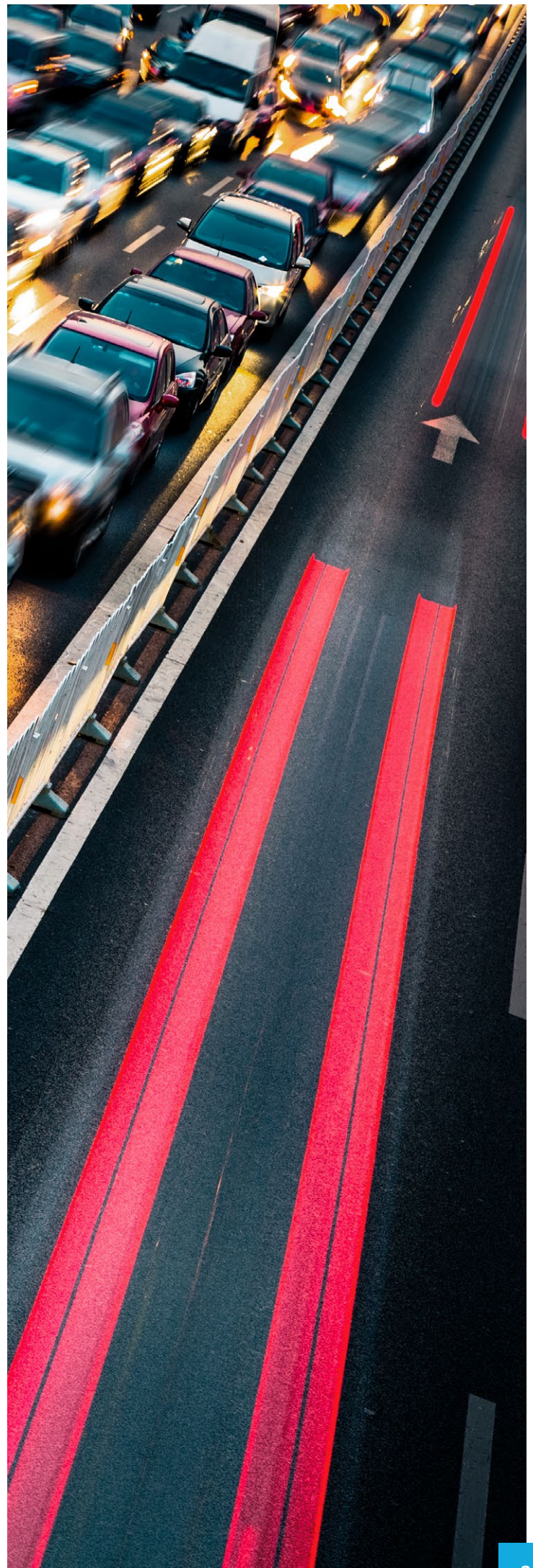
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Executive summary

This report presents an analysis of the alignment of 14 major auto manufacturers' global production plans for three technologies – electric (EV), hybrid and internal combustion engine (ICE) vehicles – with the goals of the Paris Agreement. It has been prepared with the aim of shedding light on a range of new carbon neutrality targets from companies in the industry, to inform investor engagement and to contribute to the design of Paris-aligned investment portfolios during 2020 and beyond.

At the individual level, the analysis indicates that none of the 14 major manufacturers have future production plans that are entirely aligned with climate scenarios consistent with limiting warming to less than 2°C, indicating that despite some new commitments, the industry needs to change gear. Only two manufacturers (Daimler and Geely) have production plans that are at least partially aligned with a scenario consistent with limiting global average temperature increase to significantly less than 2°C, but only for one of three technologies: EVs. Three other manufacturers are on track for an EV production pathway compatible to warming of 2°C and only one (Geely) for ICEs.

Aggregated together, the analysis indicates that the production plans of the 14 manufacturers for ICEs and EVs are aligned with a global warming scenario of more than 2°C, with production plans for hybrid vehicles aligned with significantly more than 2°C. The analysis has found that over the five year timeframe assessed (2019–2024), the 14 manufacturers are on course to produce 43 million more ICE vehicles than are needed in a scenario consistent with limiting warming to less than 2°C, while underproducing both EV and hybrid vehicles.

If all 14 of the auto manufacturers studied were to align their production plans with a below 2°C scenario every year between now and 2024, then the vehicles produced would emit 1.5 billion fewer tonnes of CO₂ over their lifetimes.

Investors should seek:

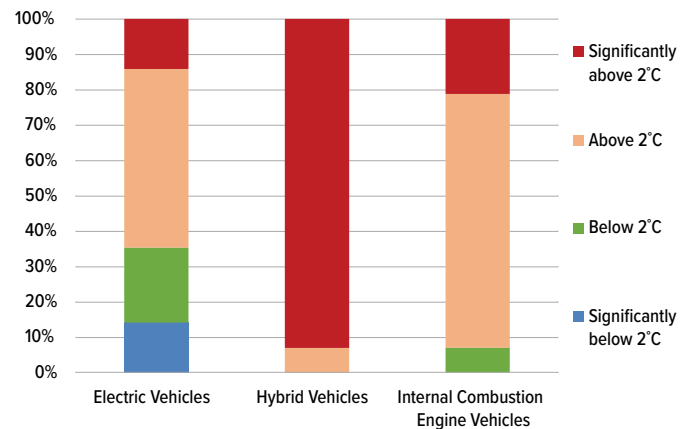
1. Long-term commitments to achieve zero-carbon vehicle fleets covering all product technologies by 2050 or sooner;
2. Short-term objectives translating long-term commitments into operationally meaningful metrics for different product technologies (e.g. 2–5-year targets);
3. Disclosures regarding how investments and forward-looking regional production plans support the achievement of these targets and objectives;
4. A remuneration plan that incentivises the achievement of the company's climate strategy;
5. A clear framework to ensure alignment of climate advocacy, consistent with the IIGCC *Investor Expectations on Corporate Lobbying on Climate Policy*¹.

The potential reductions achievable are massive, representing the annual emissions of Canada and Mexico combined, and reflect the scale of the industry's impact on the climate.

It is likely that the impacts of the coronavirus pandemic will be significant for the car industry. As production lines restart, the sector should use the opportunity to focus on climate change challenges and not miss opportunities to transform their business models.

The conclusions within this report need to be taken on board to ensure that automotive companies start their new era of vehicle production in a way that will ensure that the goals of the Paris Agreement are achieved and satisfy investor demand.

Figure 1. Percentage of manufacturers aligned to each scenario, according to technology type



Source: 2°ii, based on AutoForecast Solutions LLC (AFS) data and IEA scenarios

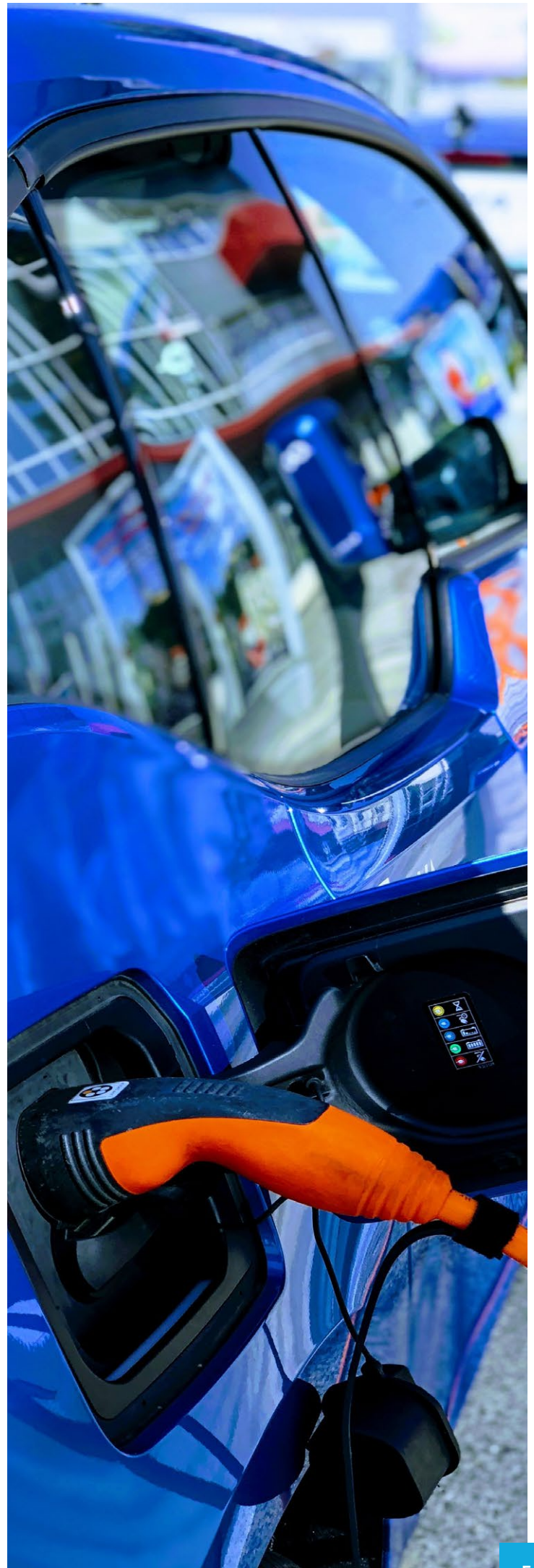
Implications of Covid-19

The coronavirus pandemic has cost countless lives, disrupted livelihoods and communities, and poses unprecedented challenges for the global economy. Investors recognise the immediate priority of automotive companies must be protecting their workers, stabilising businesses and curbing economic disruption.

Analysis underpinning this report was produced shortly prior to the onset of the pandemic. As such, the conclusions do not attempt to reflect the short-term instability faced by the sector. Production plans of automotive manufacturers at the time of publication will likewise understandably be under assessment.

Companies have an opportunity to reassess their approach to future growth and align production with the uplift in cleaner technologies necessary in the face of climate change. This is increasingly expected and supported by institutional investors, who are increasingly integrating sustainability considerations in their investment decisions.

“The automotive issue holds a critical role in mitigating society’s impact on the climate: without a doubt, all major global manufacturers are currently failing to address the challenge with the level of urgency required.”



Context: change of gear needed?

When it comes to the energy transition, certain sectors have a critical role to play, and few more so than the automotive industry. The industry is huge – in the European Union (EU) alone, its turnover accounts for 7% of GDP while it employs over 14 million people². The industry's impact on the climate is also highly significant: in 2019, the sector represented 9% of global greenhouse gas (GHG) emissions³. Progress to date in mitigating the sector's climate impact has however been limited: **year-on-year GHG emissions associated with the industry have risen by 25% since 1990⁴**.

Against this backdrop of historically slow progress, **a range of policy measures have been announced to accelerate the transition by some countries, creating risks for slow movers in the industry**. A number of countries including France, Norway, India, the UK and China have indicated that they will exit the production of ICE vehicles in the next 20 years, while the EU has set out ambitious plans to be the world's first climate-neutral continent by 2050 under its European Green Deal⁵. To achieve its objective of carbon neutrality, it has been reported that the EU Commission will revise car and van standards by 2021, "to ensure a clear pathway from 2025 towards zero-emission mobility." Given these global developments, it is now critical that companies articulate how they will deliver zero-emission car fleets.

In 2019, **a set of new targets and investment commitments from major manufacturers signalled that the sector may be starting to make the energy transition a central part of business planning**. For example, Volkswagen set out an ambition to achieve a carbon neutral car fleet by 2050⁶ while Daimler is working to a target to ensure that by 2039, all new vehicle sales are carbon neutral⁷. Other companies have set emissions targets including Science Based Targets for their operational emissions. However, it remains unclear whether these commitments and targets are consistent with the rapid decarbonisation needed to meet the goals of the Paris Agreement, and whether the investment plans of companies are adequate to deliver them.

Simultaneously, **analysis of private lobbying contrasts strongly with public targets and commitments announced by major car manufacturers**. Recent research by InfluenceMap⁸ highlights strong lobbying against policies to accelerate the transition of the decarbonisation of transport. Moves such as these cast doubt on the ability and will of the industry to move towards rapid decarbonisation and underline the size of the gulf between high-level commitments and deliverable investment plans.

Investors are now looking to ensure that their portfolios (and companies within them) are aligned with the goals of the Paris Agreement. A group of over 60 investors with over €16 trillion in assets under management is working through IIGCC's Paris Aligned Investment Initiative⁹ to determine how this can be done. To retain the support of investors, the auto industry will now need to clearly demonstrate how it is shifting to achieve the goals of the Paris Agreement.

The challenge is big, the time horizon is small, the complexity is substantial, and progress to date has been slow. Time is running out. **How much longer before the industry changes gear?**

Daimler and Volkswagen stepped up their ambition in 2019, but are their announcements enough?

Volkswagen – zero emissions by 2050?

2019 saw Volkswagen announce a new group-wide investment in EVs of more than \$50 billion to be spent over the next four years. In addition, the company also announced its intention to reach carbon neutrality by 2050 with an interim goal to reduce car and light duty vehicle emissions by 30% by 2025 relative to a 2015 baseline¹⁰. The company suggests there are three avenues to achieving carbon neutrality: reducing emissions from vehicles, adopting renewables in its operations and using carbon offsetting to tackle emissions that can't be reduced. While these commitments are new and developing (the company recently indicated production of EVs will accelerate by two years), it is currently not possible to determine the extent to which the vehicle fleet will be decarbonised versus how carbon offsets will be used to reduce emissions. While investment levels are encouraging, it is also not clear how they will translate into changes in production.

Daimler – zero emissions by 2039?

In May 2019, Daimler followed a statement that it was investing \$11.7 billion in its EV range by announcing that "Mercedes-Benz Cars aims to have a carbon-neutral new passenger car fleet and aims to have plug-in hybrids or all-electric vehicles to make up more than 50% of its car sales by 2030"¹¹. While the aspiration is welcome, vital questions remain regarding the extent to which investment in the production of these technologies is at the pace required to achieve carbon neutrality on time.

“The challenge is big, the time horizon is small, the complexity is substantial, and progress to date has been poor. But time is running out. How much longer before the industry changes gear?”



Purpose of this report: a focus on investment in light-duty vehicles

In light of the range of targets and investment commitments that have been made by auto manufacturers, the purpose of this report is to equip investors with a detailed map of how company production plans compare with achieving transport decarbonisation at the rate required to limit the increase in global average temperature to a below 2°C scenario in a five-year time frame.

The analysis focuses on light-duty vehicles, but this does not mean that investors are not concerned with the decarbonisation of whole fleets and in particular heavy-duty vehicle fleets. Investors working through initiatives such as Climate Action 100+¹², of which IIGCC is a convener and 2° Investing Initiative a data partner, have clearly conveyed the message to companies that GHG emissions across the value chain should be reduced to a level that is consistent with the goals of the Paris Agreement.

Box A. What are the goals of the Paris Agreement?

The Paris Agreement is an agreement within the United Nations Framework Convention on Climate Change which was drafted and agreed to by 195 countries in Paris in late 2015. The Paris Agreement sets out a framework for limiting dangerous climate change and deals with GHG emissions mitigation, adaptation and finance.

The goals of the agreement include:

1. Article 2.1a which states: “Holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels.” Emissions must reach net zero in order to achieve this objective. The Intergovernmental Panel on Climate Change state that to limit warming to 1.5°C with limited or no temperature overshoot, emissions must fall 45% by 2030 relative to 2010 and reach net zero by 2050.
2. Article 4.1 states: “In order to achieve the long-term temperature goal set out in Article 2, Parties aim to reach global peaking of GHG emissions as soon as possible.”

Overview of analysis and methodology

Scope

This report’s analysis, conducted by 2° Investing Initiative, includes data covering 14 of the largest international automotive manufacturers¹³. Combined, the companies are estimated to have produced 61.5 million vehicles in 2019 across 53 countries; this is forecasted to increase to 64.5 million in 2024.

Comparison to International Energy Agency (IEA) scenarios

The companies’ forecasted production capacity is compared to technological pathways developed by the IEA. Alignment comparisons are made to three scenarios which represent varying levels of global warming by 2100, in comparison to pre-industrial levels:

- **Significantly below 2°C:** “Beyond 2°C Scenario” (B2DS) (<1.75°C)
- **Below 2°C:** Between a B2DS and a “2°C Scenario” (2DS) (1.75-2°C)
- **Above 2°C:** Between a 2DS and a “Reference Technology Scenario” (RTS) (>2°C)
- **Significantly above 2°C:** Significantly above RTS (>3°C)¹⁴

For each scenario, the IEA has forecasted the speed at which a technology must grow or decline for the world to meet different climate goals. For the automotive sector, the three technologies assessed are internal combustion, hybrid and electric engines. The baseline for the analysis is the total production of the 14 automotive manufacturers during the month of December 2019.

The PACTA methodology

PACTA was developed to address a gap in the analyses conducted by investors, who historically based their assessment of climate-related risk and impact on backward-looking carbon footprints, which has over recent years been accepted as an incomplete means to assess portfolios.

The PACTA methodology consolidates and aggregates global forward-looking asset-level data (i.e. what are the production plans of a specific manufacturing plant over the coming five years), based on third-party business intelligence providers up to the level of an ultimate parent company. For investors, the approach allows them to assess the overall alignment of their portfolios with climate scenarios and the Paris Agreement.

In 2019, as part of technical support provided to the Climate Action 100+ initiative, 2° Investing Initiative developed company-level assessments, allowing financial institutions and other investors to assess the alignment of individual companies within their portfolio with climate scenarios, which provides the basis for this report.

Overview of results

The analysis conducted by 2° Investing Initiative shows that, for all automotive-related engine technologies covered in this assessment, the ambition levels of the automotive industry are insufficient and do not match the urgency of change required in order to align with scenarios limiting warming to less than 2°C.

For all technologies, **the analysis indicates that the 14 manufacturers, on average, are aligned with changes in production which are reflective of a warming of more, or significantly more, than 2°C.** While increases in production levels are observed for both hybrid and electric engines, these are not assessed to be compatible with the growth rates required by the B2DS scenario, which equates to under 2°C of warming and matches the ambition of the Paris Agreement.

Box B. Alignment Charts (Figures 2–4) explained

The Y Axis represents the volume of vehicles produced annually.

The colours represent the production change rates required to meet different climate scenarios as defined by the IEA.

Each represents an increasing amount of global warming (commonly accepted as being between 1.75°C and 4+°C).

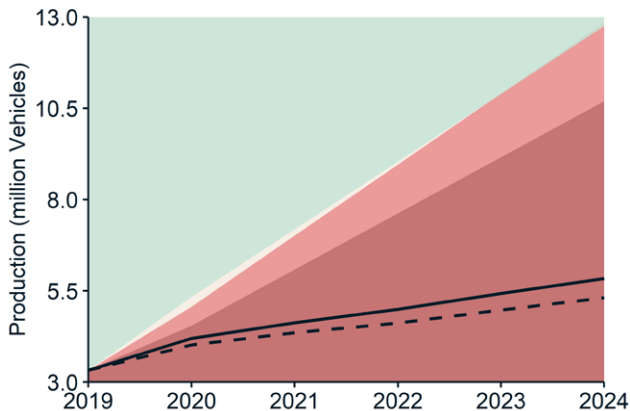
The thick line represents the production forecast for the population of 14 automotive manufacturers.

The dotted lines represents the forecasted annual market growth, which has been normalised to start at the same 2019 production level of the companies in the study.

Hybrid Vehicles

The number of hybrid vehicles is highlighted to increase from 3.3 million in 2019 to 5.8 million in 2024: while these are positive signals by the industry, the rate of change remains aligned with significantly more than 3°C of warming (RTS). **In order to be aligned with a B2DS, a further 20 million hybrid vehicles would need to be produced in the next five years.**

Figure 2. Production of hybrid vehicles between 2019–2024

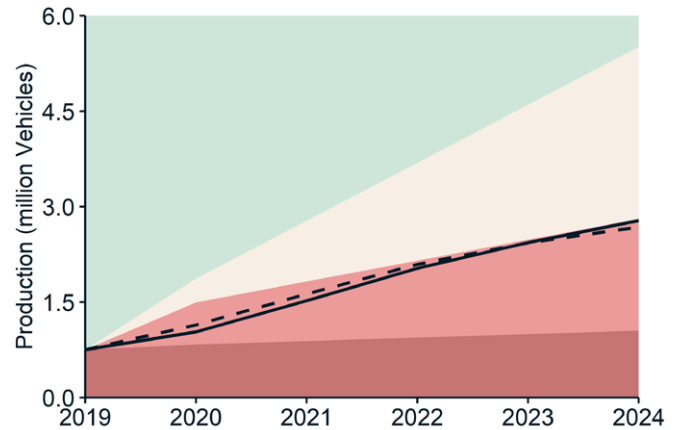


Source: 2°ii, based on AutoForecast Solutions LLC (AFS) data
Refer to the key at bottom of page 9.

Electric Vehicles

The number of EVs is highlighted to increase by 260% from 0.7 million in 2019 to 2.5 million in 2024. As for hybrid vehicles, this increase is a positive signal by the industry of its ability to shift technologies, but for this five-year period alone, the gap between what would be required to meet the Paris Agreement and what is being forecasted remains significant. **An additional 8.7 million vehicles would need to be produced in the timeframe to meet growth rates as outlined by the IEA's B2DS.**

Figure 3. Production of electric vehicles between 2019–2024



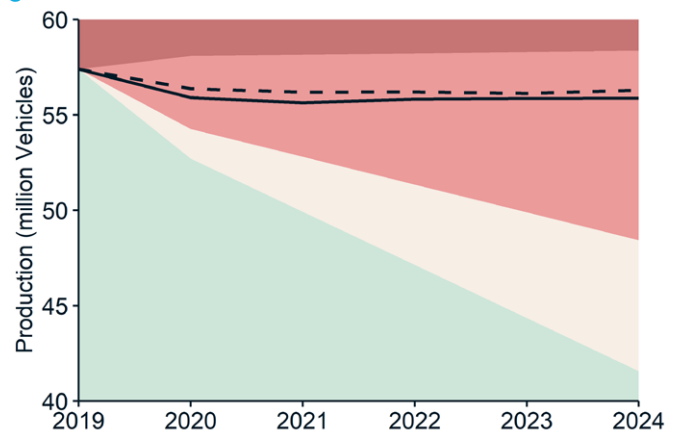
Source: 2°ii, based on AutoForecast Solutions LLC (AFS) data
Refer to the key at bottom of page 9.

Production of ICE Vehicles

The production of ICE vehicles decreases only slightly over the five-year period, with 56 million vehicles forecasted to be produced in 2024.

This stagnation equates to warming rates close to a 3°C scenario for ICE vehicles. In order for the production rates to be aligned with a B2DS, 43 million fewer ICE vehicles would need to be produced in total by 2024.

Figure 4. Production of ICE vehicles between 2019–2024



Source: 2°ii, based on AutoForecast Solutions LLC (AFS) data
Refer to the key at bottom of page 9.

Key for figures 2-4

B2DS	2DS	RTS	
■	■	■	B2DS: Beyond 2°C Scenario
			2DS: 2°C Scenario
			RTS: Reference Technology Scenario

“If production forecasts were aligned with a Beyond 2 Degrees Scenario for the next 5 years, 1.5 billion tonnes of CO₂e emissions would be avoided: this represents the annual emissions of Canada and Mexico combined.”

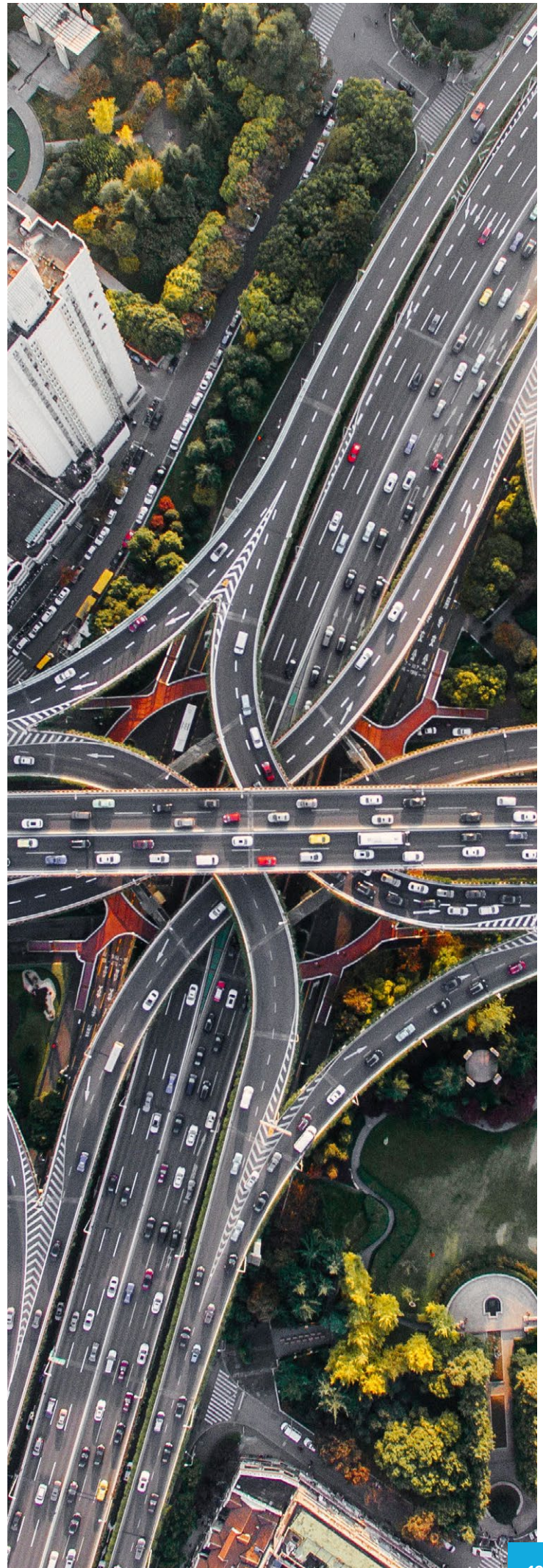
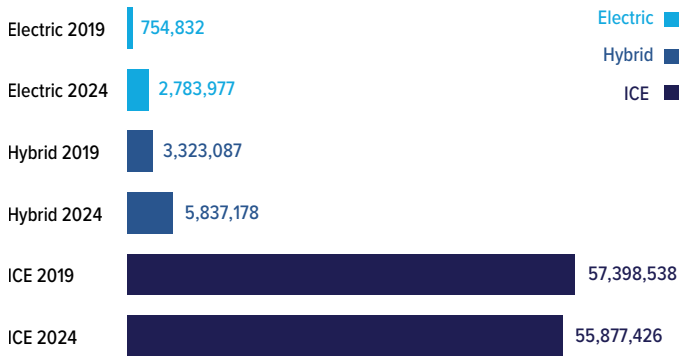


Figure 5. Production of all vehicle types between 2019–2024 to meet a B2DS scenario



Source: 2°ii, based on third party data

Over the course of the next five years, **were the 14 automotive producers to align their production plans with a B2DS scenario every year between now and 2024, then 1.5 billion fewer tonnes of CO₂e would be emitted over the course of the average lifetime of the vehicles¹⁵. This represents approximately the annual emissions of Canada and Mexico combined, or Russia alone¹⁶**, and reflects the scale of the impact of a misaligned automotive industry on the climate.

Individual Company Production Plans

In addition to the aggregated alignment, analysis reviews the production plans of the individual companies. In the table below, companies’ trajectories for each technology are assessed as being aligned with IEA scenarios explained on page 8, as follows: a B2DS, between a B2DS and a 2DS, between a 2DS and a RTS or significantly above a RTS.

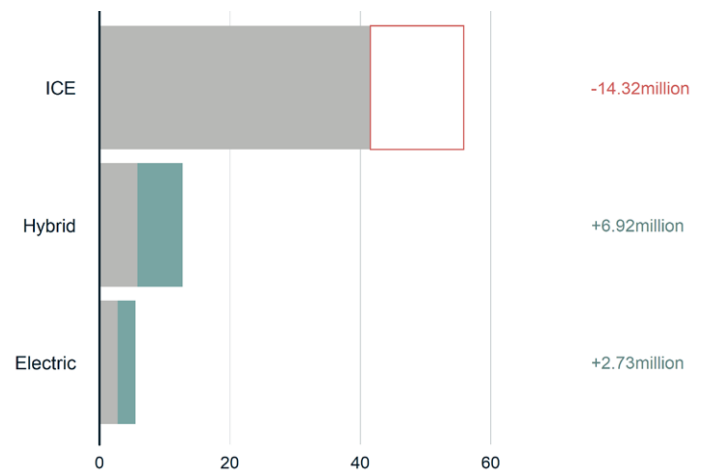
On an individual level, **the analysis shows 86% of the companies’ trajectories across the three technologies are aligned with warming above 2°C. More than 40% are aligned with warming significantly above 2°C.** Only one company is aligned with a 2°C scenario for two technologies (EV and ICE), and four companies for one technology (EV). The analysis also suggests that all

but one companies are aligned with significantly above 2°C for their production plans for hybrid engine vehicles, and above 2°C for internal combustion engine vehicles.

For all automotive manufacturers, changes in supply will, to some degree, follow consumer demand, strong policy signals and public investment in appropriate infrastructure. Nevertheless, the ability of these 14 automotive manufacturers to influence global production outside of their own, to influence policy-making and to create demand is not to be discounted: their role in shaping the future of the global economy is important, and signals they give today have the ability to shape overall market dynamics tomorrow. The gap, however, remains huge.

Just to be aligned with a B2DS scenario within five years, **this group of automotive manufacturers would be expected to decrease their annual production of vehicles with ICEs by 35%** (a difference that equates to a reduction of 14.3 million vehicles per year by 2024), increase their annual production of vehicles with hybrid engines by 125% (6.9 million vehicles per year by 2024) and increase their annual production of EVs by 110% (2.7 million vehicles per year by 2024).

Figure 6. Annual production change in 2024 required for alignment with a B2DS scenario



Source: 2°ii, based on AutoForecast Solutions LLC (AFS) data

Table 1. Individual company production plans

Company name	Electric	Hybrid	ICE	Key
Bayerische Motoren Werke AG	B2DS	RTS	RTS	B2DS: Beyond 2°C Scenario 2DS: 2 Degrees Scenario RTS: Reference Technology Scenario Source: 2°ii, based on AutoForecast Solutions LLC (AFS) data
Daimler AG	B2DS	RTS	RTS	
Fiat Chrysler Automobiles NV	2DS	RTS	RTS	
Ford Motor Company	2DS	RTS	RTS	
General Motors Company	RTS	RTS	RTS	
Honda Motor Company	RTS	RTS	RTS	
Nissan Motor Company	RTS	RTS	RTS	
Peugeot S.A.	2DS	RTS	RTS	
Renault S.A.	RTS	RTS	RTS	
SAIC Motor Corporation	RTS	RTS	RTS	
Suzuki Motor Corporation	RTS	RTS	RTS	
Toyota Motor Corporation	RTS	RTS	RTS	
Volkswagen AG	2DS	RTS	RTS	
Zhejiang Geely Holding Group	B2DS	RTS	2DS	



“86% of the companies’ trajectories across the three technologies are aligned with warming above 2°C. More than 40% are aligned with warming significantly above 2°C.”

Implications of this analysis

The analysis presented in this report indicates that automotive manufacturers may be, through limited action, both hindering global progress on combating climate change, and exposing themselves to significant financial risks linked to a potential disorderly transition to a low-carbon economy.

In terms of emissions, **the analysis indicates that current levels of planned output are locking decades of unnecessary emissions into their production capacity plans via direct emissions from produced vehicles over their lifetime.**

From an internal risk management perspective, recent research by an international consortium highlights a number of political, societal and technological reasons for a likely sudden global transition from a high-carbon to a low-carbon economy around 2023–2025¹⁷. Manufacturers that have not embedded sufficient agility in production plans risk being unable to react rapidly enough to reflect a sudden shift in demand away from emissions-intensive technologies.

For investors engaging with companies on their preparedness for the low-carbon transition or construction of portfolios consistent with the goals of the Paris Agreement, the analysis suggests that attention should be focused on not only ensuring high level climate change commitments and carbon targets are made by companies, but that they are also tied to short-term production planning across all technologies.

Finally, **policymakers wishing to meet their climate goals should be concerned by this analysis**, which suggests that no major automotive manufacturer has currently aligned its forecasted production capacity plans with the goals of the Paris Agreement and/or other national/supranational policies.

Progress to date has not been sufficient, while past and present inaction risks breeding future stagnation. The scale and pace of change required is undeniably a challenge. The disruption faced by the sector in coming months and years in responding to the impacts of the coronavirus pandemic, should also not be underestimated. However, the opportunity is clear and external drivers of the move to cleaner transport over the medium- and long-term remain strong.

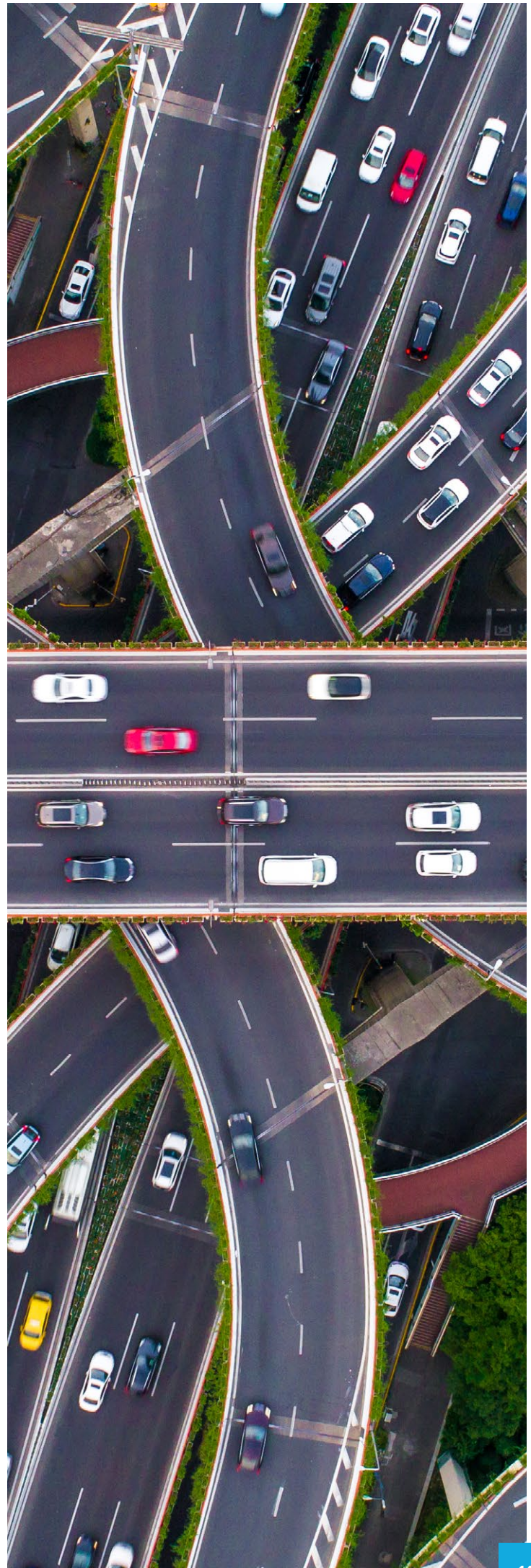
With support from policymakers, now is the time for a concerted transformation by the sector. The technologies exist, the policy mechanisms are in place, public awareness is rising and investors are increasingly engaging on this topic with manufacturers. Now is the time to change gear to secure a more sustainable future. Now is the time to change gear.

Investors should seek:

1. Long-term commitments to achieve zero-carbon vehicle fleets covering all product technologies by 2050 or sooner;
2. Short-term objectives translating long-term commitments into operationally meaningful metrics for different product technologies (two to five year targets) which are aligned with climate scenarios limiting warming to below 2°C;
3. Disclosures regarding how investments and forward-looking regional production plans support the achievement of these targets and objectives;
4. A remuneration plan that incentivises the achievement of the company's climate strategy;
5. A clear framework to ensure alignment of climate advocacy, consistent with the IIGCC Investor Expectations on Corporate Lobbying on Climate Policy.



“The current planned output is locking decades of unnecessary emissions into their production capacity plans via direct emissions from produced vehicles over their lifetime.”



Annex 1. PACTA information

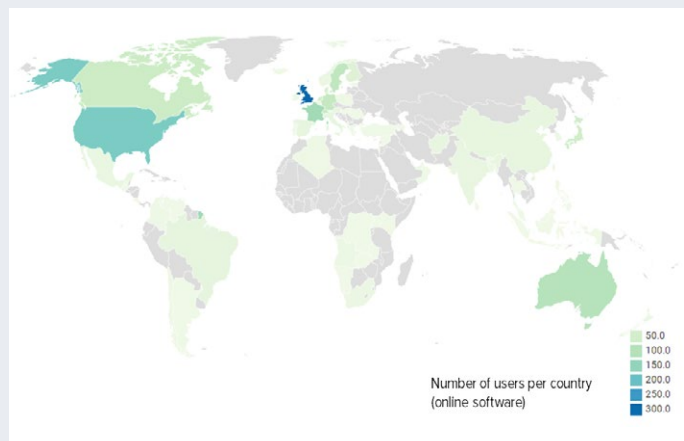
In September 2018, 2ⁱⁱ introduced the Paris Agreement Capital Transition Assessment (PACTA) tool: a free software available at www.transitionmonitor.org that calculates the extent to which corporate capital expenditures and industrial assets behind a given equity, bond, or lending portfolio are aligned with various climate scenarios. The first-of-its-kind software taps into a vast climate-related financial database, which covers more than 30,000 securities, 40,000 companies, and 230,000 energy-related physical assets.

Since the tool was launched, nearly 2,000 individuals from nearly 1,000 institutions have used it to conduct over 6,700 tests. Overall, the total assets under management (AUM) of financial institutions using the tools amounts to more than USD 61 trillion.

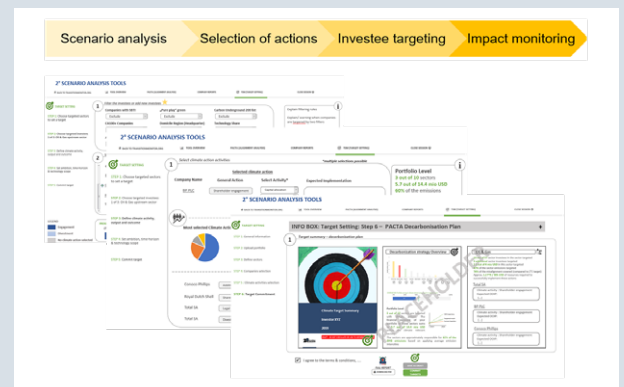
Key figures:

- **1,700+** individuals from **nearly 1,000** institutions have used the tool to conduct over **6,700 tests**
- **Nearly 900** FIs have used the tool to analyse more than **USD 61 trillion** in total Assets Under Management (AUM)
- Users from **69 countries** (including 36 developed and 33 developing countries)
- **30,000+** securities covered
- **40,000+** companies covered
- **230,000+** energy-related physical assets covered
- **17** major international banks with **AUM of \$18 trillion**

PACTA users by country (total)



Box C. PACTA in 2020



Investors can access the PACTA tool for free at www.transitionmonitor.org. They can use the tool to assess the alignment of their equity and bonds portfolio by technology and sector against different climate scenarios. Additionally, after running the PACTA analysis, they can stress test their portfolio against different transition scenarios in terms of orderliness.

In 2020, an enhanced version of the platform will be launched which will include a target setting module, allowing investors to set targets in the real economy, develop a structured climate action plan, monitor progress and track the implementation of the strategy.

The updated platform will also allow a comparison of regional capital markets, climate-related scenario analysis of funds and markets, and customized reports, automatically produced for companies, portfolios and markets.

More info at www.transitionmonitor.org

Annex 2. Methodological technical information

Production allocation

The company level production is calculated based on a net ownership approach. A standardised allocation methodology is applied across all companies, in comparison to annual reports, where allocation rules can differ. The production allocation is then performed in two steps:

1. The production of a manufacturer is connected to the direct owner using the project participation (i.e. ownership in the manufacturer). This also applies to companies that are only set up to run a specific asset.
2. The production is then rolled up to the ultimate owner company along the company ownership tree based on AutoForecast Solutions LLC (AFS) information¹⁸:
 - a. Listed companies' production is rolled up allocating their non-free-float portion to the parent companies
 - b. Private companies' production is entirely rolled up to their parent company

Data sources & timelines

The model sources forward-looking asset level data for key technologies (e.g. future production plans) in order to provide geography-specific assessments for climate relevant sectors mapped to the company level.

It thus bypasses wherever possible backward-looking, corporate level reporting, although such reporting can be used for validating forward-looking parameters (e.g. GHG emissions).

The scenario analysis is based on forward-looking automotive asset-level data from AutoForecast Solutions LLC paired with company ownership information from Bloomberg.

- **Automotive sector: AutoForecast Solutions LLC (AFS).** Data covers light passenger duty vehicle globally including light trucks on model level with powertrain application level detail production forecasts for 2019–2024.

The data is updated quarterly for the automotive sector. It is based on a model created by AutoForecast Solutions LLC (AFS) for the production of vehicles. The data is provided by AutoForecast Solutions LLC (AFS) at the level of the brand nameplate of the vehicle for each company globally. The model considers a range of factors, including but not limited to, geopolitical, consumer preference, competition, and shareholder value, and is generally quite conservative in nature. The input data come from sources including original equipment manufacturers (OEM), industry associations, regional economic development agencies, suppliers, public/private data, industry experts, etc.

The model's goal is to have multiple views of data to corroborate and defend the outlook. The model makes predictions 8 years out. At a regional level, the model has proven to have reasonable accuracy levels, with error margins for a 5 year production within 5% of what has eventuated. At a nameplate level, there may be additional variability due to global market volatility.

The insights allow investors to start aligning their portfolios with the Paris Agreement by understanding the companies' relative positions to each other both now and in the future as well as understanding which climate scenario their planned activities are most aligned with.

This data provides a scenario analysis with a common framework for comparison which is independent of company disclosure. The forward-looking nature of the analysis provides the opportunity to understand the current plans of the company and engage where these plans are not aligned with an investor's expectations.

Caveats and data limitations

Analysis underpinning this report was produced shortly prior to the onset of the pandemic. As such, the conclusions do not attempt to reflect the short-term instability faced by the sector. Production plans of automotive manufacturers at the time of publication will likewise understandably be under assessment.

The forward-looking data is based on current 'revealed' plans from companies and is subject to change. The estimates should thus not be interpreted as final predictions, but rather as a reflection of current company plans if no changes occur.

To check the validity of the forward-looking data provided by AutoForecast Solutions LLC (AFS), company production estimates from the automotive companies themselves found in annual reports and on websites were compared to the data. However, company production estimates were available for only 3 companies. In addition, these figures did not include the breakdown by technology type and did not cover a 5 year time horizon. They could therefore not be compared directly to the forward-looking data provided by AutoForecast Solutions LLC (AFS). The closest to production forecast that companies made available is sales forecasts, which differ from production by the number of vehicles in stock that is then left over. The focus of each company differed as to whether they provided these numbers by technology or not. These numbers however are subjective themselves given that they are predictions and not binding plans. This was confirmed during discussions with a sample of the automotive companies. No company spoken to was able to provide us directly with any production information additional to what was available publicly. Two companies made qualitative comments indicating that their sales numbers matched fairly well with the predictions made by AutoForecast Solutions LLC (AFS).

Legal Disclaimer

This Report has been prepared by the 2° Investing Initiative (2°ii), a leading not-for-profit think-tank on climate related metrics and policies in financial markets, and the Institutional Investors Group on Climate Change (IIGCC), the European membership body for investor collaboration on climate change and the voice of investors taking action for a prosperous, low carbon future.

The Report summarises 2°ii's Company Climate Scenario Analysis (CCSA) in relation to BMW, Daimler, Fiat Chrysler, Ford, General Motors, Honda, Nissan, Peugeot, Renault, Saic Motor Corp, Suzuki, Toyota, Volkswagen and Zhejiang Geely Holding Group (the Companies). The CCSA is our limited 'point in time' estimate of the alignment between the Companies' revealed business plans for its light-duty vehicle production, including light trucks in the period 2019-2024, versus the economic trends embodied in the International Energy Agency's (IEA's) 'World Energy Outlook' and 'Energy Technology Perspective' scenarios. The methodology applied in the CCSA, its data inputs, assumptions and limitations, are set out in this Report and the Methodology Statement available at www.transition-monitor.org/company-reports/ (upcoming).

Limitations and assumptions:

The CCSA does not purport to analyse all risks, opportunities or issues associated with climate change that may be relevant to the Companies. Such issues may include (for example) physical or ecological impacts that may be caused by, or to, the assets and operations of the Companies, and any climate-related litigation exposures.

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Endnotes

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