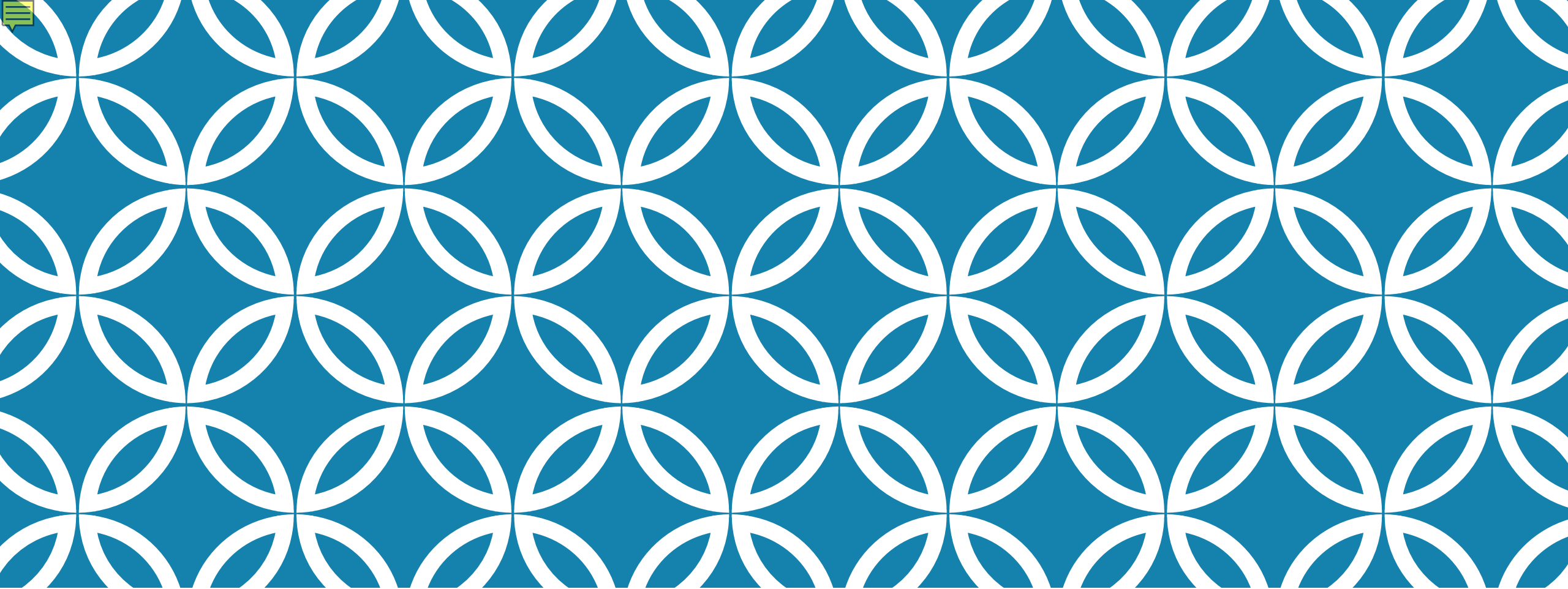




INNOVATIVE DEVELOPMENTS WITHIN THE AUTOMOTIVE SECTOR

Ricci
Tyra
Martin
Jon

MARKET/TECHNOLOGY DRIVERS



COP26

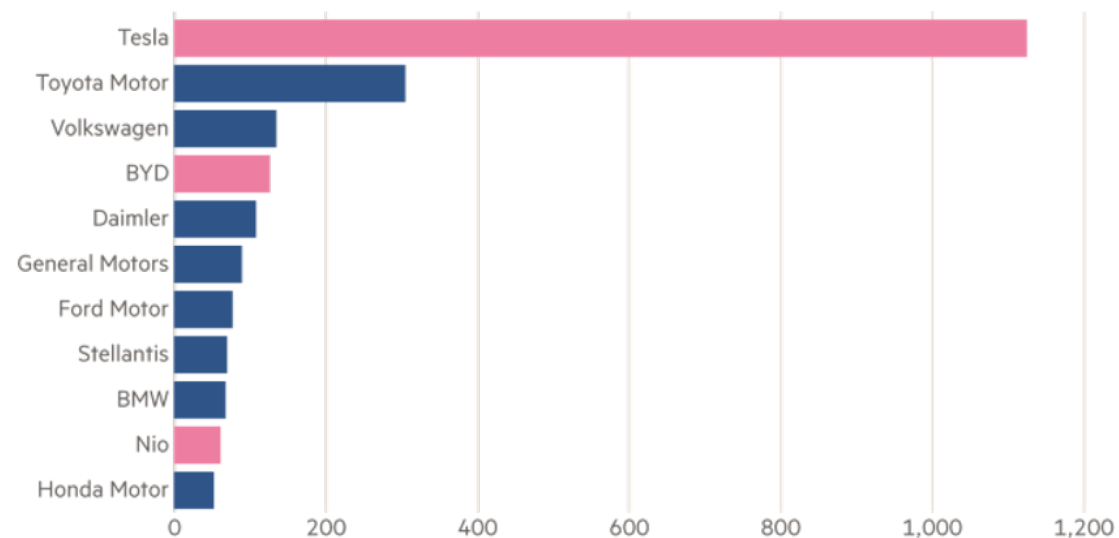
Zero emission new car sales:

- 2040 → Globally
- 2035 → Leading markets

Tesla versus the rest

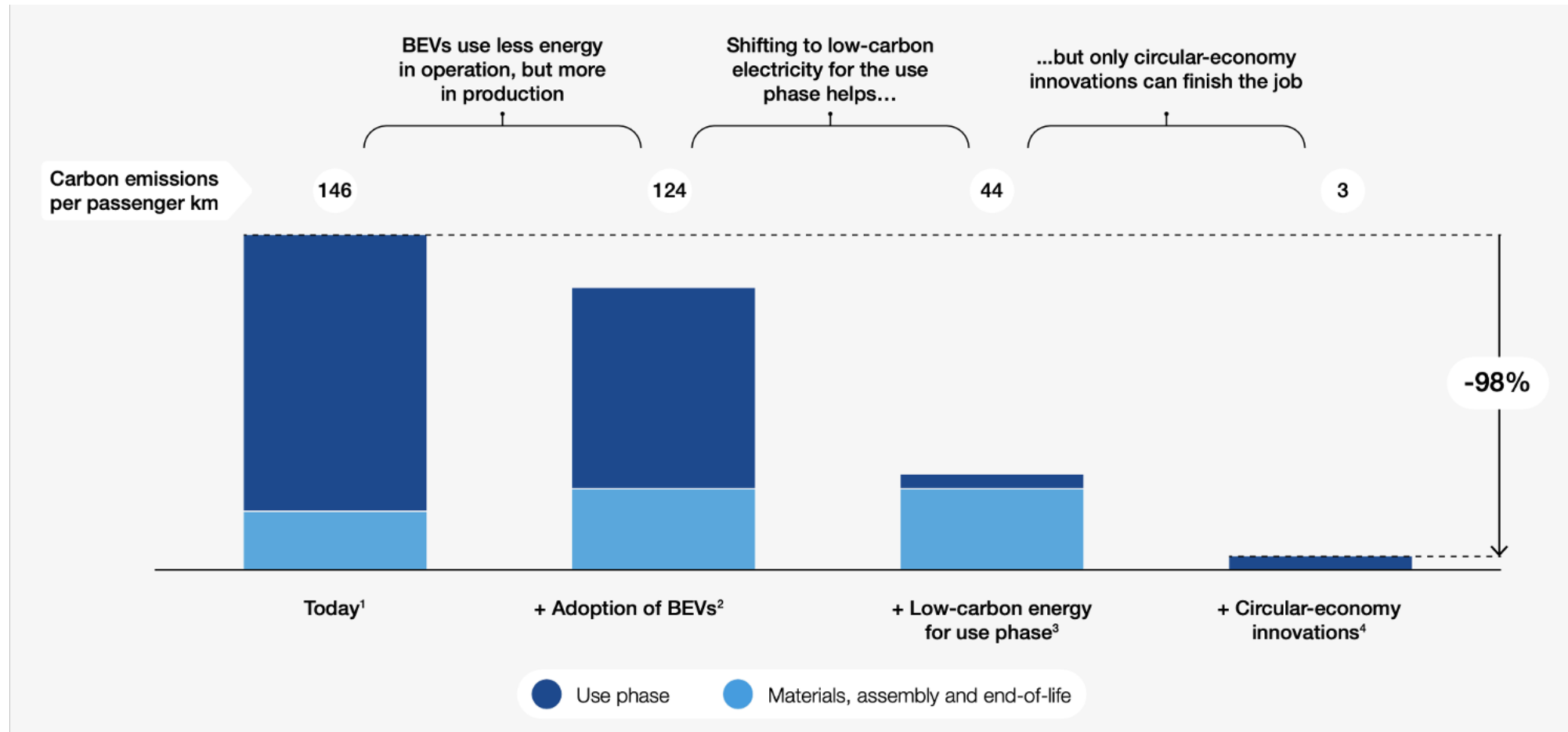
Leading car companies by market capitalisation (\$bn)

Electric/hybrid vehicles only



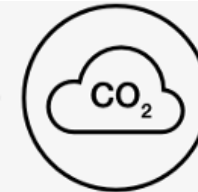
Source: Sentio
© FT

THE NEED FOR INCREASING CIRCULARITY



TRANSFORMATION PATHWAYS

Achieving **net-zero carbon emissions** across the whole life cycle
e.g. Low-carbon materials and assembly, integration with energy grid



Product decarbonization

Enabling **resource recovery** and closing material loops
e.g. End-of-life disassembly and reverse logistics, product passports



Material circularity

Increasing the **lifetime of the vehicle** and its components
e.g. Subscription-based ownership, reuse and remanufacturing at scale



Lifetime optimization

Ensuring efficient **vehicle use** over time and occupancy
e.g. Vehicle on demand, mobility on demand, breathing fleets



Utilization improvement

Source: Accenture Strategy

BARRIERS TO IMPLEMENTATION

- Cars as an 'aspirational' purchase.
- Consideration of marginal costs vs. overall costs.
- Large 'grey' fleet already in operation.

Use patterns

- Current focus on sales price rather than total cost of ownership.
- Benefits of lifecycle optimisation difficult to capture by single business entity.

Business models

Barriers to circularity

Technological and regulatory hurdles

- Lifecycle technologies currently underdeveloped.
- Strict regulatory environment for design/manufacturing in automotive industry.

International considerations

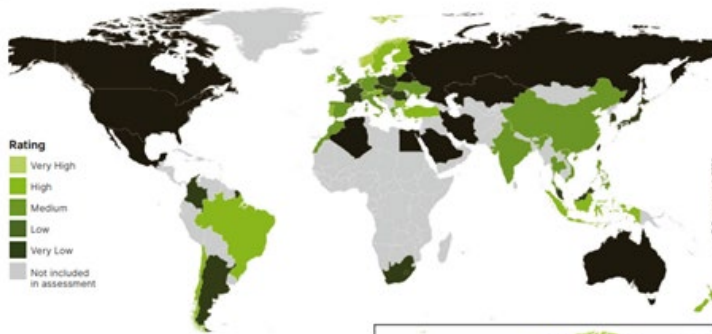
- Competition between nations.
- Differences in infrastructure.
- Efforts are typically coordinated at the national rather than global level.

GOVERNMENTAL INFLUENCE

CHINA, UNITED KINGDOM AND NORWAY



2.2 Category Results – Renewable Energy



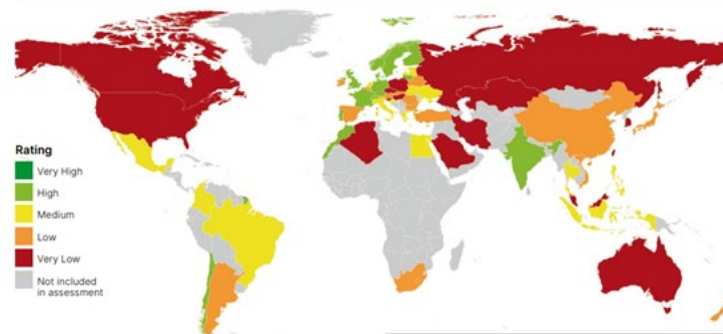
Renewable energy is expanding, despite worldwide economic decline

Key developments:

Renewable energy capacity continues to grow at a record pace, despite the effects of the COVID-19 pandemic. In 2020, 260 GW of renewable energy capacity was installed globally, which accounted for 81% of the total electricity capacity added.¹² In most of the world, wind and solar power were also the cheapest sources of new electricity generation in 2020.¹³ Even the roughest climate transition



2. Overall Results CCPI 2022



Still no countries are ranked in the top three overall positions

Key results:

The world map shows the aggregated results and overall performance for the evaluated countries. The table shows the overall ranking and indicates how the countries perform in the four index categories.

→ No country performs well enough in all index categories



Climate Change Performance Index (CCPI)

Overall Results CCPI 2022

6. 2 ▲ Norway
7. -2 ▼ United Kingdom
38. -5 ▼ China

Greenhouse Gas Emission

4. United Kingdom
13. Norway
60. Chinese Taipei

Renewable Energy

3. Norway
27. United Kingdom
58. Chinese Taipei

Energy Use

10. United Kingdom
43. Norway
57. China

Climate Policy

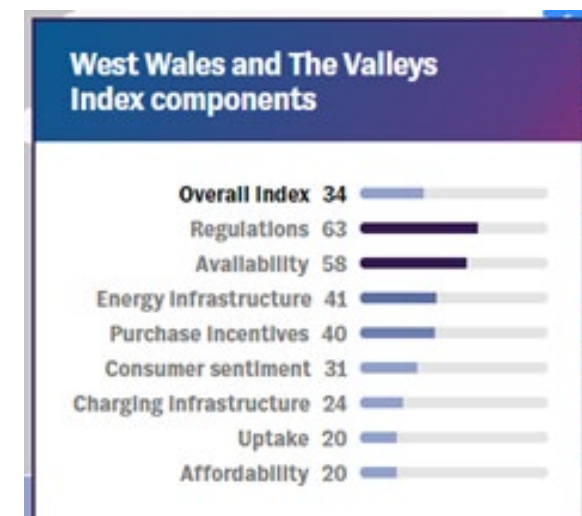
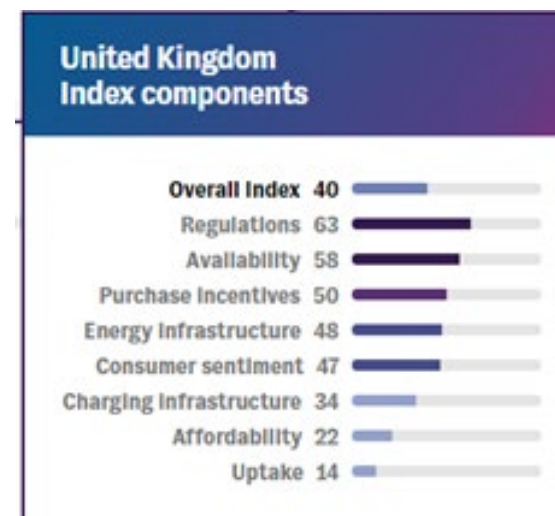
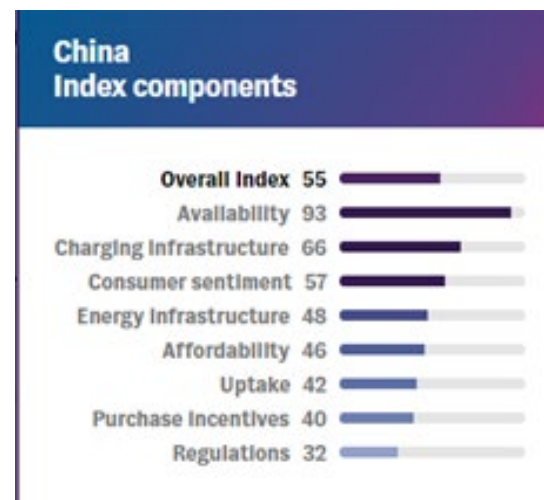
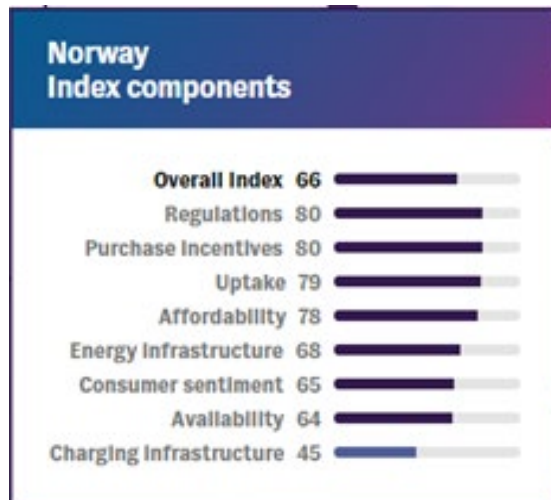
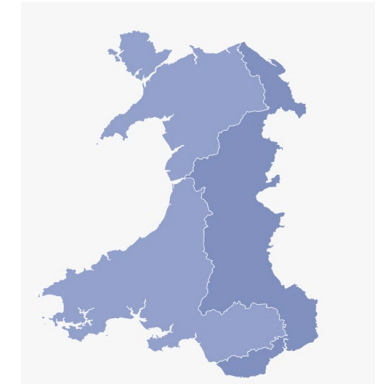
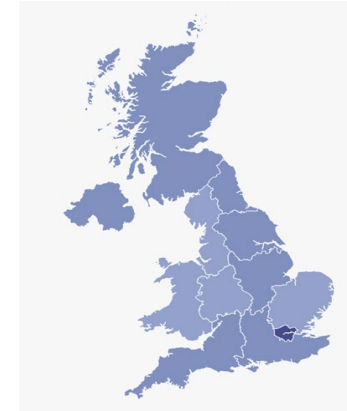
13. China
14. United Kingdom
18. Norway

GOVERNMENTAL INFLUENCE

CHINA, UNITED KINGDOM AND NORWAY

The rEV Index

Countries readiness for EVs



GOVERNMENTAL INFLUENCE

CHINA, UNITED KINGDOM AND NORWAY

Countries readiness

China



Progress to date

- High availability of EV models in the market
- Development of an ultra-fast EV charging network
- Strong policy and regulatory environment to support uptake

Opportunities to accelerate

- Expanding the density of charging infrastructure to improve accessibility
- Increasing/managing grid capacity to support higher electricity demand

UK



Progress to date

- High density and ease of access to public chargers
- Strong regulations and data transparency to support ChargePoint development and use
- Ambitious targets for achieving an EV transition

Opportunities to accelerate

- Increasing the affordability for consumers to switch to EVs through short-term policies and incentives and the introduction of lower cost EVs
- Continued expansion of charging infrastructure (with a focus on rapid-charging facilities)
- Increasing/managing grid capacity to support higher electricity demand

Norway



Progress to date

- Significant financial incentives offered to make an EV switch more affordable
- High share of renewable energy generation, maximising the benefits of an EV transition
- Ambitious targets for achieving an EV transition

Opportunities to accelerate

- Expanding electricity generation capacity to manage increased demand
- Continued expansion of charging infrastructure (with a focus on rapid-charging facilities)

Wales



Progress to date

- Relatively high levels of spare grid capacity to meet increasing electricity demand

Opportunities to accelerate

- Continued expansion of charging infrastructure
- Supporting a shift towards renewable energy to maximise the benefits of an EV transition
- Increasing the affordability for consumers to switch to EVs through short-term policies and incentives and the introduction of lower cost EVs

HIGH TECHNOLOGY-BASED: TESLA

USA



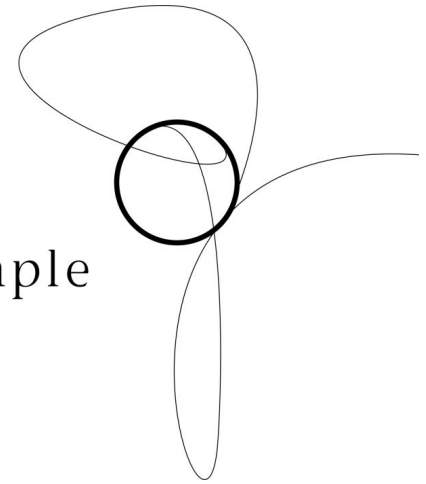
- Tesla Motors Inc. founded in 2003 by Elon Musk, Marc Tarpenning and Martin Eberhard.
- Tesla has created an iconic following like Apple, generating high expectation.
- Musk stated "transitioning to electric mobility with a digitised business model".
- Tesla first in the US to sell directly to customers.
- Tesla employs Tesla Rangers – mobile technicians who make house calls.
- Tesla 360-degree strategy to create complementary clean energy businesses.



LEASE AND CIRCULAR MODEL: RS

WALES

riversimple



- Riversimple set up by former Morgan motorsport engineer Hugo Spowers in 2007.
- An “alternative to battery electric cars for those who will find *charging them a challenge*”.
- “*service as opposed to sold*” - aimed at eliminating waste.
- Higher quality build components to save operating costs over the lifetime of the vehicle.
- Created the **Circular Revolution** is the first UK hub for circular economy thinking.



Chwyldro Cychol
Circular Revolution

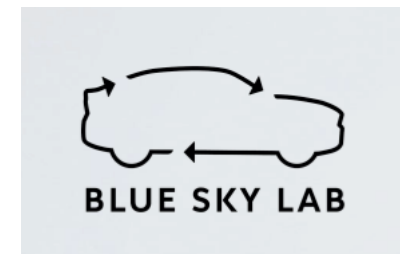


‘FIRST SMART POWER SOLUTION’: NIO

CHINA



- NIO founded in November 2014, Shanghai, China.
- “*Urban life is fast, but Power Swap is even faster*”.
- It takes only *3 minutes to swap a fully charged battery*.
- Swappable and upgradable batteries to provide users with power services for all scenarios.
- Battery and vehicle electric system checks are performed during each swap for optimisation.
- Blue Sky Lab, which transforms vehicle manufacturing scrap materials into environmentally friendly products.



OTHER FIRST MOVERS IN EV'S

INTERNATIONAL

Cost...



Changli CLZKC-009 truck is a 3KW truck with a top speed of 28mph. This \$2,000 electric pickup truck has more range than a used Nissan Leaf.

Access...



WeCharge originally from Kickstarter, allowed everyone to profit from supplying power through individual external wall plugs. Recently acquired by VW reworked into a monthly subscription.

Flexible...



iEV Motors ApS, Car that starts at 78cm wide and expands robotically to accommodate up to 3 adults. Saving energy and storage when not in use.

Moving towards sustainability

TRADITIONAL CAR MANUFACTURING COMPANY

- Adoption & transition to mobility model
- Adapt to the new market constraints
- Exploit the innovation as a market opportunity
- Using proven technology and manufacturing strengths
- Collaborations with other companies
- Investment in R&D

Using the 3 pillar model as a template to transition to eco-sustainability

- Environmental
- Social
- economic



Business sustainability consists of three principles, often regarded as the pillars of sustainability:

- Pillar one: The environment
- Pillar two: The society
- Pillar three: The economy

SUSTAINABILITY ASPIRATIONS & GOALS

Many companies use the sustainability statement to convey

- Sustainability aspirations
- Sustainability goals
- Sustainability progress

Typically used in website information and Company annual reports this clearly sets out how the company will deal with sustainability and environmental issues.

This is vital to provide confidence in the company and its product through the transition

Our Sustainability Aspirations

We are working to revolutionize mobility, fueled by new challenges and the desire to help build a better world for everyone.



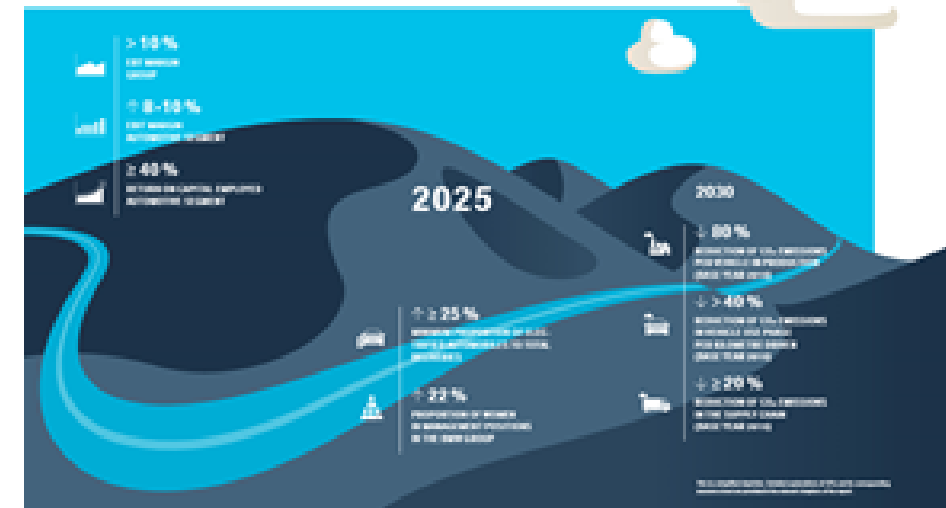
(Ford Motor Group, 2021)



BMW Group
Region MEA
Sustainability Report
Global Initiatives and Group Goals

04 05 06

Strategic targets



(BMW GROUP, 2020)

Sustainability progress and Standards

- The need to promote eco-sustainability values of the Company for Customers, shareholders and potential investors.
- The use of ISO standards and affiliation to Global organizations concerned with sustainable and social policies
 - Global reporting initiative
 - United Nations Global Compact
 - The World business council for sustainable Development
- The use of ISO 14001 Environmental standards and ISO 26000 Social responsibility

Benefits of ISO 14001 Certification



Improved environmental management

Reduce your resource use, improve the overall efficiency of your business and keep the larger impact of your operations to an absolute minimum.



Legal compliance

Understand how statutory and regulatory requirements impact your organization and its customers.



Reduced operating costs

Achieving efficiencies in energy and water usage and through waste minimization means money saved.



Improved stakeholder relationships

If you are attempting to expand your business into new territories, certification is the best way to demonstrate to potential customers that you're taking proactive steps to be responsible.



Proven business credentials

Independent verification against a globally recognized industry standard speaks volumes.



Ability to win more business

Procurement specifications often require certification as a condition to supply, so certification opens doors.

Environment

Address environmental risks and leverage opportunities, recognizing that the fate of your business is tied to the planet.

Our environment work



Social

Manage impacts and opportunities affecting employees, workers in the value chain, customers and local communities.

Our social work



Governance

Support the economic development of the societies in which you operate, leading to good governance and stability.

Our governance work



Sustainable Development

Help deliver on our world's priorities through action and collaboration, ensuring a better future for all.

Our development work

Sustainable Finance

Make better investments by proactively managing sustainability risks.

Our Sustainable Finance work

Supply Chain

Extend principled practices throughout your entire network ensuring sustainability performance.

Our supply chain work

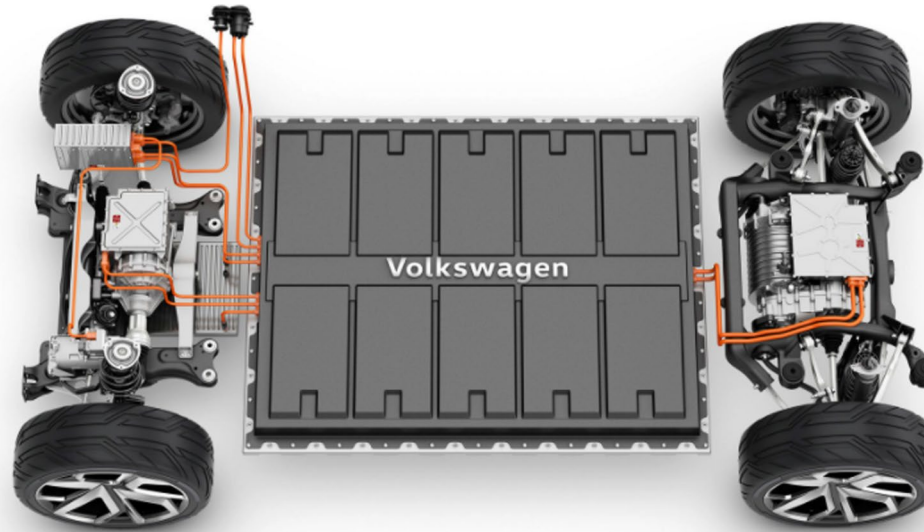
UN Global Compact What is go/our work

COLLABORATIONS

Automotive manufacturers have in the past collaborated with engine or vehicle floor plans to provide models to complete in their range without substantial investment in new designs and production facilities.

Types of collaborations

- Technological & Data
- Manufacturing & Production
- Infrastructure
- Financial





CONCLUSION

- Net zero goal remains a primary driver of innovation.
- Governmental support for manufacturing EV has driven down cost
- The approach by manufacturers to ease the use of EV vehicles is ever-expanding and diverse.
- Collaborations with other car manufacturers and those with EV, battery technology and software developers is crucial in accelerating this transition.

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