THE fDi REPORT 2023

Global greenfield investment trends

fDi Intelligence

A publication from the **Financial Times** fDi Markets

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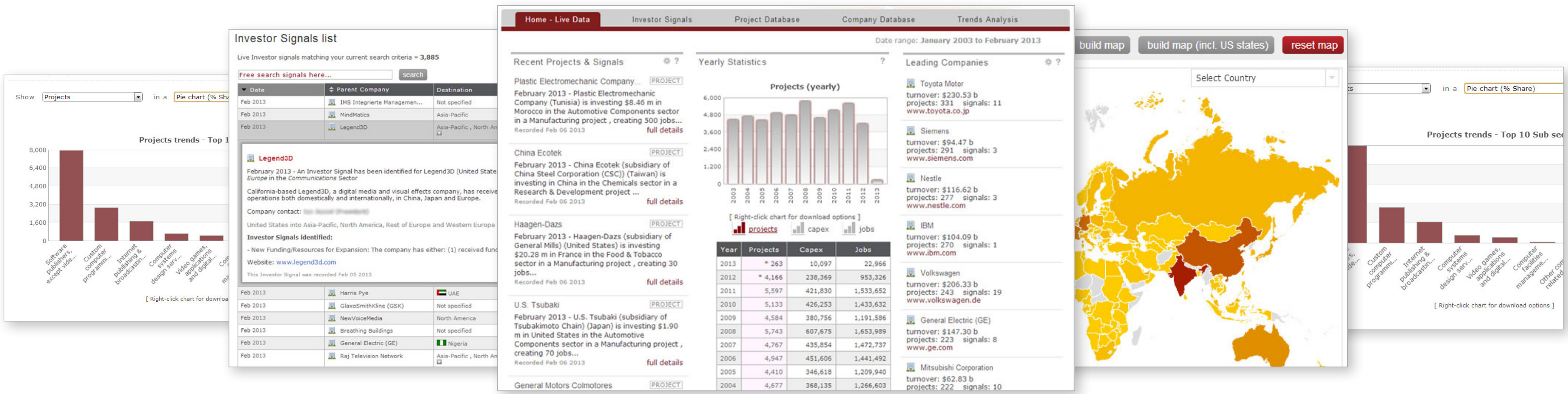

fDi Markets is the most comprehensive service tracking crossborder greenfield investment across all countries and sectors worldwide. This service can be used to:

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A service from the **Financial Times**

FDI becomes mirror of fraying global order

The **fDi** Report 2023 provides a unique glimpse into the fraying global order. Based on data from **fDi** Markets, the proprietary database of **fDi** Intelligence that tracks crossborder greenfield investment, the report takes readers on a unique journey through the paradigm shift that the Ukraine war has accelerated.

The wave of mega investment projects that has been mounting in the US, and to a lesser extent in Europe, is the most glaring effect of that shift. Since the start of the Covid-19 pandemic, Western policy-makers have felt increasingly anxious about the overdependence of their economies on China for critical technologies and minerals. When Russia invaded Ukraine on February 24, 2022, they stepped up efforts to design industrial policies aligned with the resulting, increasingly fractious geopolitical order.

Lured by the generous incentives promised by the likes of the US Inflation Reduction Act and the EU Green Deal Industrial Plan, multinational enterprises have committed billions of dollars to relocating parts of their production base. Economies of scale and automation are inevitable components of their calculus. They are costly decisions, however, that call for major upfront investment. Never before have we witnessed such a high number of projects worth more than one billion dollars (see page 12–13). Provided the majority of these projects live up to expectations — certainly not a foregone conclusion — other companies in their value chain will follow suit, giving new impetus to the reshoring wave.

The Ukraine war has also shored up investment in energy security activities. Western oil and gas firms scrambled to add new assets to their portfolio and plug the hole left by unsustainable Russian supplies. After years of flagging investment levels, activity in the oil and gas sector bounced back and found its way back into the top 10 biggest recipients of global foreign investment (see page 20–21).

> Investments in hydrocarbons and renewable energy no longer look exclusive

Energy security has added a new meaning to the energy transition too. Through its lens, investments in hydrocarbons and renewable energy no longer look exclusive, but complementary. As major economic blocs harbour ambitions to decarbonise their economies, they need renewable energy to clean up their energy matrix, along with a stable, diversified supply of hydrocarbons to secure a transition that will take decades.

In this perspective, governments will have to crowd in any available energy resource. While oil and gas investment has bounced back, foreign direct investment (FDI) in renewable energy has never been higher (see page 6–7).

Distributed renewable energy generation is a less conspicuous, but equally disrupting phenomenon. So-called 'prosumers' — individuals that engage with the power grid as both producers and consumers — have been installing decentralised renewable energy systems (mostly solar) at unprecedented speed in places like China and Brazil.

Electric mobility is another major corollary of the energy transition. E-mobility technologies have become particularly strategic and a main target of Western industrial policies. Inevitably, investment into the production of electric vehicles and batteries has been another tremendous driver of FDI in 2022 (see page 16–17). However, the challenge to source the critical minerals needed to power up these technologies remains cumbersome. The mining sector has yet to match the levels of capital investment we tracked in the e-mobility value chain (see page 24–25).

The **fDi** Report started out as a reference tool for tracking the behaviour and investment decisions of multinational corporations. It has now grown and evolved to gauge the shifting sands of geopolitics and this feeds into said decisions. In these uncertain times, the **fDi** Report 2023, and its data, have never been more valuable.

*Jacopo Dettoni is the editor of **fDi** Intelligence, the Financial Times' specialist unit dedicated to foreign direct investment*

Global overview

International investors announced more than 16,000 foreign direct investment (FDI) projects in 2022, according to **fDi** Markets, the greenfield investment monitor of the Financial Times. These projects represent an estimated value of $1.155tn, with more than 2.2 million jobs being created. The pace of FDI in 2022 shows signs of ongoing recovery following the shock effect of the Covid-19 pandemic, with the number of projects increasing 16% and the pledged capital investment rising by 64% from 2021.

Last year was one characterised by FDI mega projects, with a record number of projects worth at least $1bn of capital investments. A total of 159 such projects (including estimates) were announced in 2022 — the highest level in the past decade.

The US was the top destination country for the number of FDI mega projects as the country attracted a high number of large-scale investment projects in semiconductors and batteries.

However, it was Egypt that ranked as the largest destination for mega projects by amount of capital investment thanks to a handful of large-scale projects in green hydrogen.

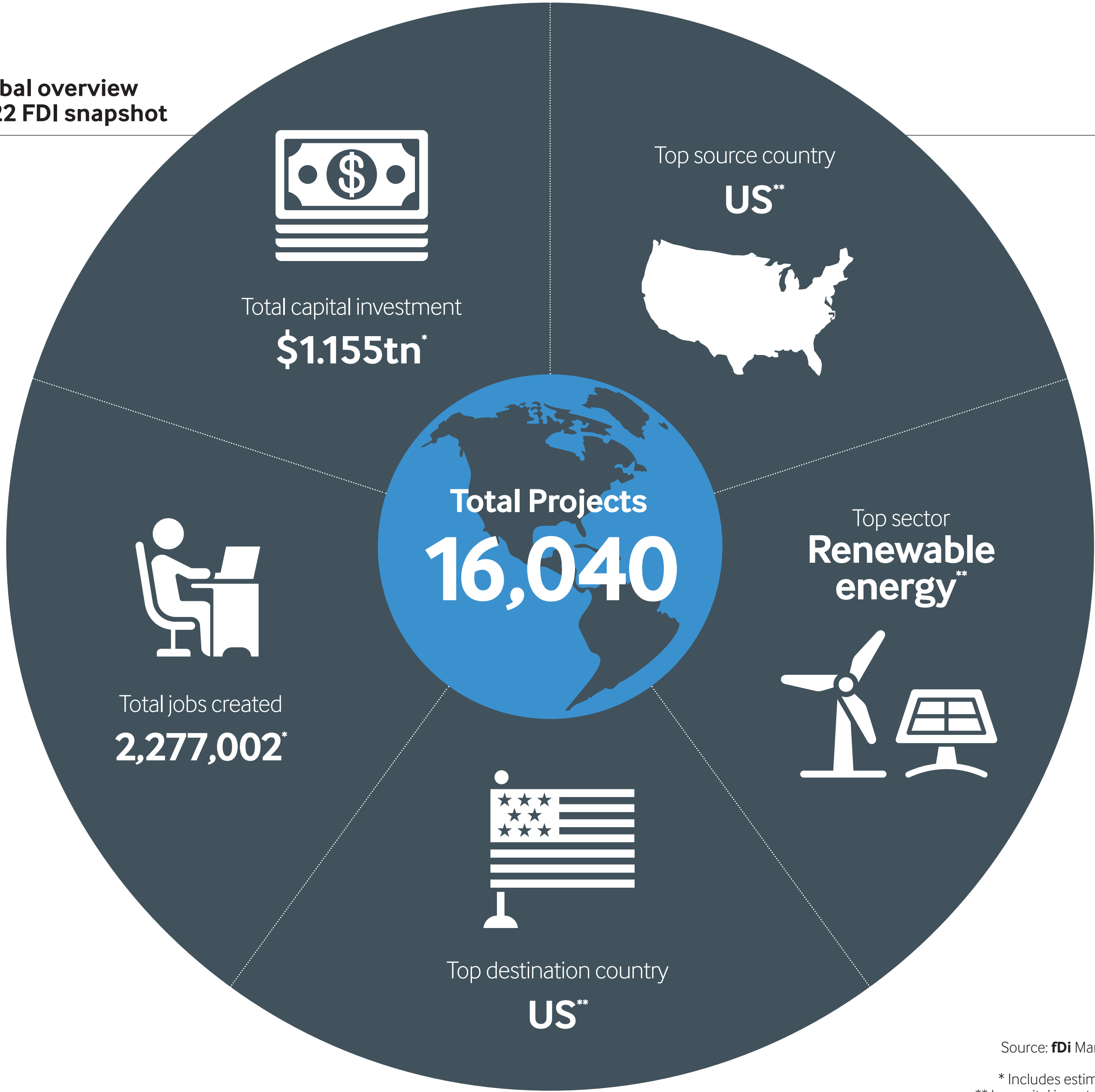
In addition to this, the US was the top source of outbound FDI in 2022, with $207.2bn recorded across 3647 projects.

At a regional level, western Europe attracted the highest number of FDI projects in 2022, at 5250. In terms of capital investment, both western Europe and Asia-Pacific attracted around $279bn, with the latter taking first place by just $229.9m.

Key trends

- For a fourth year running, the renewable energy sector has attracted the highest total capital investment globally.
- Inbound FDI for China declined further in 2022. Compared to 2019, the number of projects into China last year were down 60% and capital investment was down 68%.
- Following Russia's invasion of Ukraine in early 2022, the number of announced FDI projects into Russia plummeted to only 13.

Global overview
2022 FDI snapshot



Source: **fDi** Markets

* Includes estimates
** by capital investment

The big numbers

IN 2022…

16,040

Foreign investors announced a total of 16,040 foreign direct investment projects during 2022.

15.7%

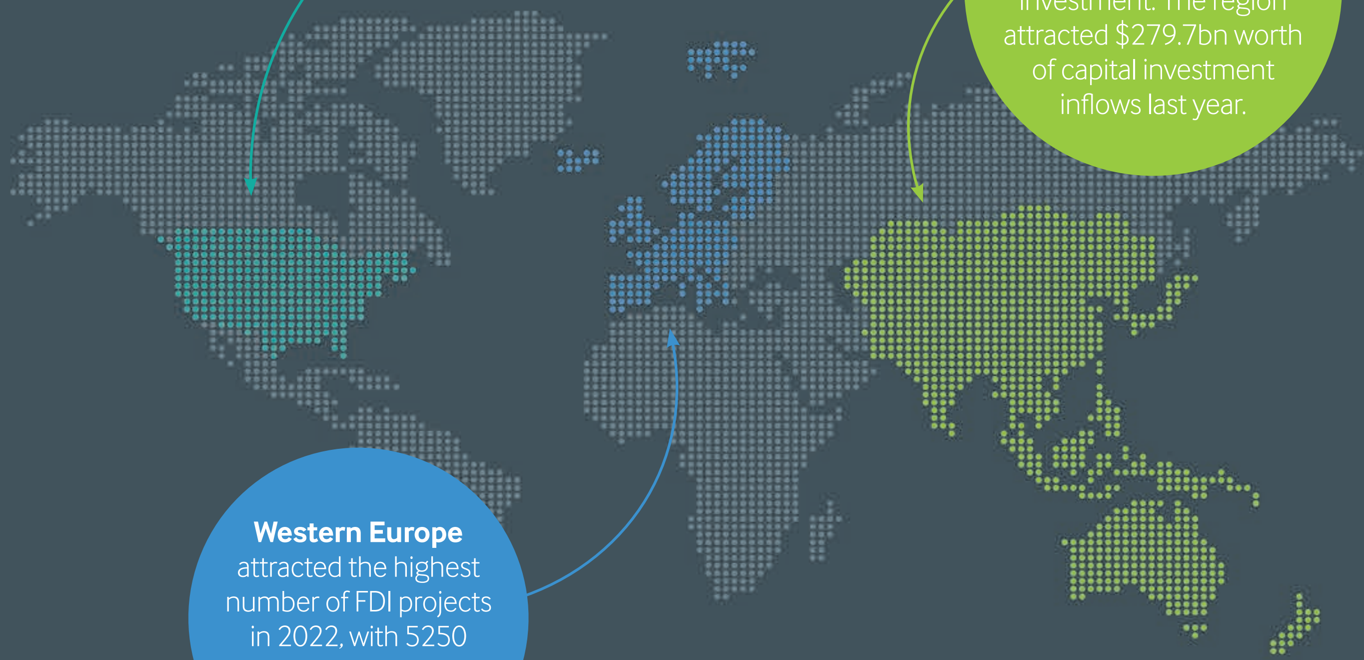
In 2022, the number of FDI projects rebounded by 15.7% from 2021.

2,277,002

Announced FDI projects created more than 2.2 million jobs.

The United States retained its spot as the leading destination country, attracting $158.1bn of FDI in 2022, an increase of 73% from 2021.

Asia-Pacific was the top destination region for FDI in 2022, when measured by capital investment. The region attracted $279.7bn worth of capital investment inflows last year.



Western Europe attracted the highest number of FDI projects in 2022, with 5250 announcements recorded.

The 2022 investment matrix

In 2022, capital investment in the renewable energy sector reached its highest ever value since records began in 2003. For a fourth year in a row, the sector has attracted the highest total capital investment globally, with a value of $343.6bn across 527 projects — cementing its position above coal, oil and gas which was last top in 2018.

Capital investment in renewables saw a 158% increase over the past year. At 30%, it was the only sector to take more than a 10% market share. It is also leading in absolute terms, as the sector attracted $210bn more than the previous year. Several mega investments (projects worth more than $1bn) contributed to the sector's strong performance. Egypt was able to secure 19 such investments from companies establishing green hydrogen developments, mostly in its Suez Canal Economic Zone.

The coal, oil and gas sector ranked in second place, with a total estimated capital investment of $104.8bn in 2022. While this represents a 538% increase over the previous year, 2021 was a record low for the sector and the renewed investment is more of a return to form for coal, oil and gas projects, with 2022 capital investment totalling 85% of the 2019 value.

The energy crisis caused by the war in Ukraine and Western sanctions strongly contributed to this increase, as countries — particularly European nations, previously heavily dependent on Russian oil and gas — sought to diversify the origin of their fossil fuels.

The semiconductors sector was the third-most capital-intensive sector, with an estimated $91.6bn invested across 139 projects in 2022. Notably, last year saw a record amount of capital invested in the semiconductors sector, 8% more than 2021 and almost nine times the amount invested in 2019, highlighting the race to secure critical supply chains since the onset of the Covid-19 pandemic. Rising geopolitical tensions between the US and China, as well as supply chain fragility made companies and countries rethink their investment strategies in this sector, shifting towards a more localised approach.

The software and IT services sector saw nearly 290,000 more jobs created in 2022 than in 2021, marking a 108% increase. The 41% year-on-year increase in the number of announced foreign direct investment (FDI) projects in the sector means that one in every four projects announced in 2022 was in software & IT services. The sector attracted around $69bn in capital — 81% more than in 2021 and 76% more than in 2019.

Following a period of strong growth between 2019 and 2021, capital investment in the communications sector decreased by more than one fifth to $53.5bn in 2022. The number of announced FDI projects dropped by 24% to 656 as the sudden pandemic-fuelled demand for IT infrastructure development seems to have waned.

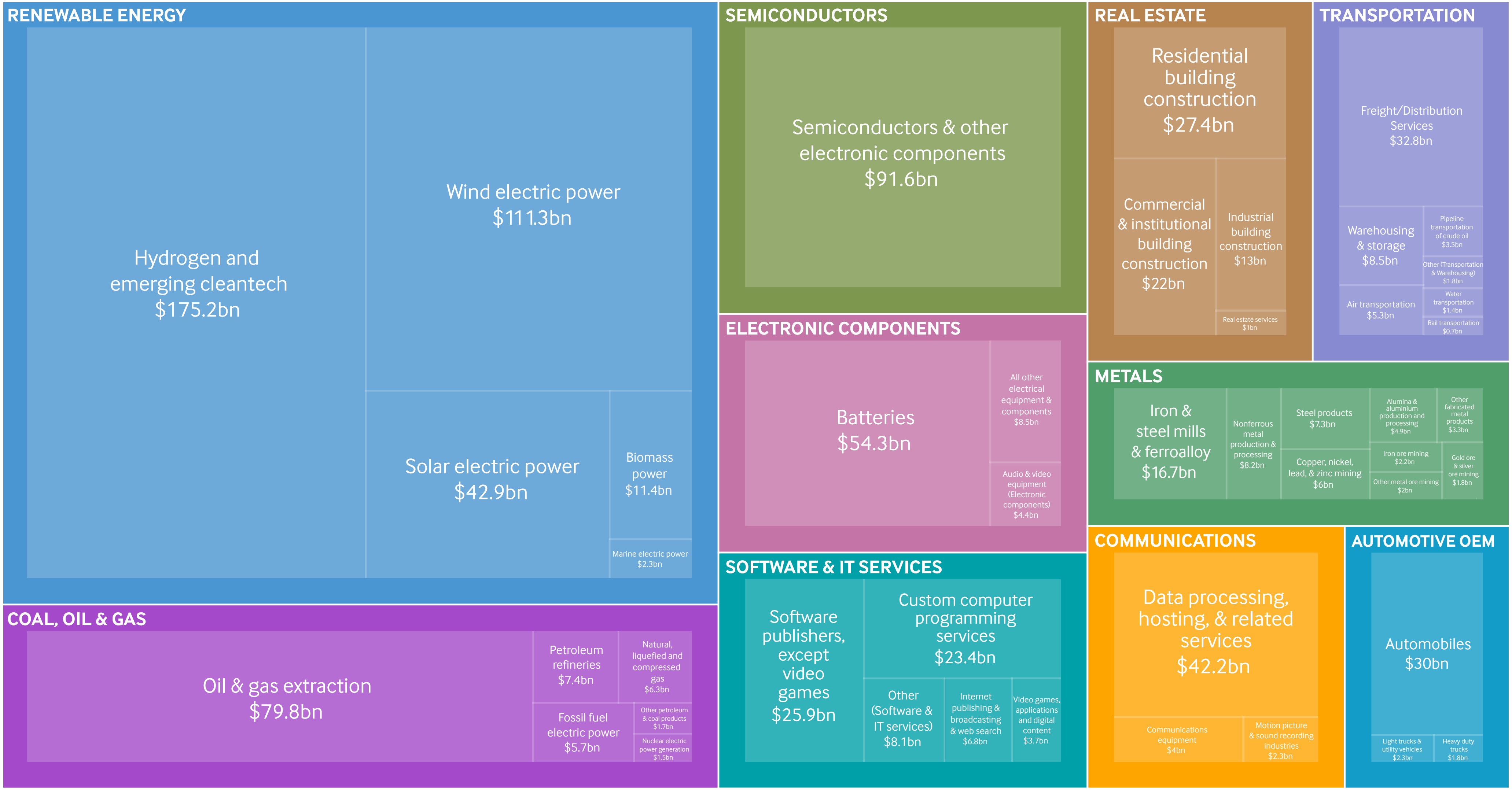
The metals sector attracted $55bn in 2022. This 210% increase on 2021 is the third-largest percentage increase in absolute terms, after the renewable energy and coal, oil and gas sectors. The rebound of global manufacturing as well as the metal sector's centrality for other sectors, such as the renewable energy sector and cathode manufacturing for batteries, made 2022 a strong year for metals.

The electronic components sector has also witnessed a sharp increase in capital investment since 2019. A total 476 projects at a value of $69.7bn were announced in 2022 — 6% of all capital invested in 2022 and more than double the $32.3bn invested in 2019. Investment in the batteries subsector, a vital component of electric vehicles supporting the energy transition, accounted for more than 78% of capital investment in the sector in 2022.

As global air travel rebounded as the Covid-19 pandemic subsided, capital invested in the aerospace sector witnessed the fourth-largest increase in 2022 of around 154%, to reach a value of nearly $6bn. Meanwhile the hotels and tourism sector saw a 34% rise in project numbers over the past year, although capital investment in the sector was almost unchanged in 2022. The sector remains well behind its 2019 figures, with project numbers down 70%, capital invested down 84% and job creation down 74%.

Finally, capital investment in the real estate sector has increased by 28% and remains $2.2bn short of the pre-pandemic level of 2019. Residential and commercial building construction made up the bulk of capital investment in the sector and surpassed their pre-pandemic levels of 2019, increasing by 48% and 5% respectively. However, capital investment in the industrial building construction subsector has decreasing by 41% over the past year, following a 2021 surge fuelled by an e-commerce boom.

TOP 10 SECTORS IN 2022 BY CAPITAL INVESTMENT (US$BN)*



Source: **fDi** Markets Note: Includes estimates

Global competition for climate investment heats up

Henry Loewendahl
CEO, Wavteq Group

Governments and investors are responding to the global sustainability imperative. Governments increasingly see support for climate investment as not only necessary to reducing carbon emissions, but also to catalyse a new wave of economic development. This blurring of climate change goals and economic development goals has sparked global competition for climate investment, and accusations of 'beggar-thy-neighbour' and mercantilist policies between the major trading blocs.

In 2005, less than 2% of global greenfield foreign direct investement (FDI) was in activities related to climate change and the environment (climate FDI). By 2018, climate FDI had grown considerably, but still accounted for only 12% of global FDI. Since 2020, there has been explosive growth in climate FDI; almost 40% (39.4%) of all global capital investment in greenfield FDI projects in 2022 was climate FDI, with total investment approaching close to $500bn.

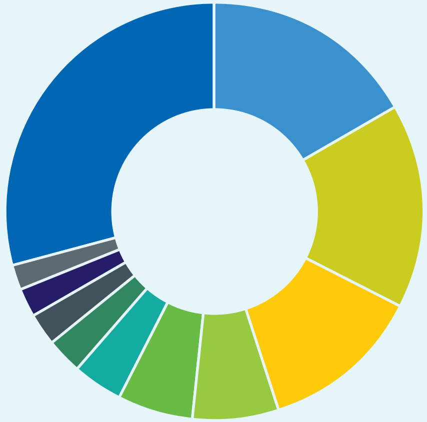
The location of climate FDI has been very concentrated. Over the two-year period from 2021/22, the top 15 countries attracted more than three-quarters of climate FDI (see chart 1). In 2022, investment became even more concentrated with the top five countries attracting 65% of global FDI.

Of the top 15 countries, 37% of FDI from 2021/22 went to emerging markets and 63% to developed economies, although more than half of the countries in the top 15 were emerging markets.

Increasing competition for investment

The greenfield FDI numbers belie major differences in the composition of climate FDI that the top countries are attracting and the level of competition between countries for different parts of the value chain.

CHART 1: GREENFIELD CLIMATE FDI BY TOP 10 DESTINATION COUNTRIES, 2021/22



Market share %		Capital investment ($bn)
16.73%	Egypt	110
15.90%	UK	104
12.45%	United States	82
6.79%	Australia	45
5.82%	Spain	38
3.90%	Italy	26
2.61%	Brazil	17
2.41%	Vietnam	16
2.25%	Morocco	15
2.02%	Hungary	13
29.13%	Others	191

Source: fDi Markets
Note: Includes estimates

Chart 2 shows the breakdown of climate FDI in the leading recipients between renewable energy FDI (primarily solar and wind energy, and hydrogen facilities) and all other climate FDI (primarily manufacturing supply chains).

In many of the leading destinations for climate FDI, this is almost entirely based on attracting the electricity generation and hydrogen facilities. These types of investment are less competitive across countries (although there is competition for financial capital) being primarily based on the investment projects ready to offer (IPROs) in each country, such as solar and wind auctions.

By contrast, Hungary, China, Canada, Mexico and the US are by far the most specialised countries in non-electricity generating climate FDI, especially in the manufacturing supply chain. These FDI projects are much more contestable as companies establish global or regional export platforms, and there is much more competition for these mobile investments.

Governments have been providing investment incentives for decades. These subsidies have generally been aligned with the sector and location's priorities and reflect the level of competition to win investments. There is generally less competition to win renewable energy projects focused on electricity generation as they are more supply driven. The competition is more about which countries and states can offer a good pipeline of investable IPROs for investors. However, given the global imperative to reduce carbon emissions reflected in national targets, renewable energy projects are heavily subsidised in many countries.

There is more competition for FDI for manufacturing projects in the climate FDI supply chains, such as the production of cleantech equipment. While these projects tend to gravitate close to the renewable energy electricity generation projects (especially in the wind sector, given the costs of moving large and bulky wind blades, turbines and towers), these projects often receive high subsidies due to the competition to attract global value chains and the large economic development impact these investments can be high.

According to data from IncentivesFlow, between January and March 2023, the average incentive awarded per job created in three countries (Canada, Spain and the US) that are successfully competing for renewable energy investments and related global value chains was very similar, at around $60,000 per job — far higher than the average incentives awarded in most other sectors. As a percentage of capital investment, governments in Canada and Spain awarded incentives around 20% of capital investment compared to less than 10% in the US.

Mobilising climate FDI: subsidies are not enough

The US Inflation Reduction Act (IRA), and EU and Chinese subsidy programmes that provide tens of billions of dollars for climate related investments are game-changers in accelerating climate FDI and the associated economic development from increased investment.

While China and the US are being accused of using 'beggar-thy-neighbour' policies through unfairly subsidising cleantech industries and thereby shifting investment and global value chains to their countries, there is a much bigger picture that is slowing down carbon emissions and reducing the pace of climate change. Arguably, the subsidies war over clean FDI is a 'race to the top' rather than a 'race to the bottom', and the US administration is right in that the EU should offer matching subsidies rather than complain about the IRA diverting investment – the EU passed its Chips Act on April 19.

What the world needs is much more climate FDI. When we look back at the IRA decades from now, we will not see it as unfair trade policy, but a pivotal moment in increasing government commitment across the developed world to finance climate FDI and help to slow down the pace of climate change.

While the subsidy programmes are welcome news to accelerate climate FDI in the three regions of the world that are responsible for the vast majority of carbon emissions — US, Europe and China — they are not enough. The regulatory environment has not caught up with the change in policy targets and supporting subsidy frameworks, which is resulting in huge delays for investors being able to implement their climate FDI projects. At the same time, trade frictions with China have created supply chain bottlenecks.

In the US, it can take more than four years to get a renewable energy project hooked up to the grid and there are delays of more than a year for vital components from China. In both the EU and UK, it is taking up to four years to get planning consent for renewable energy projects. The EU does plans to reduce this to two years and the UK to one year.

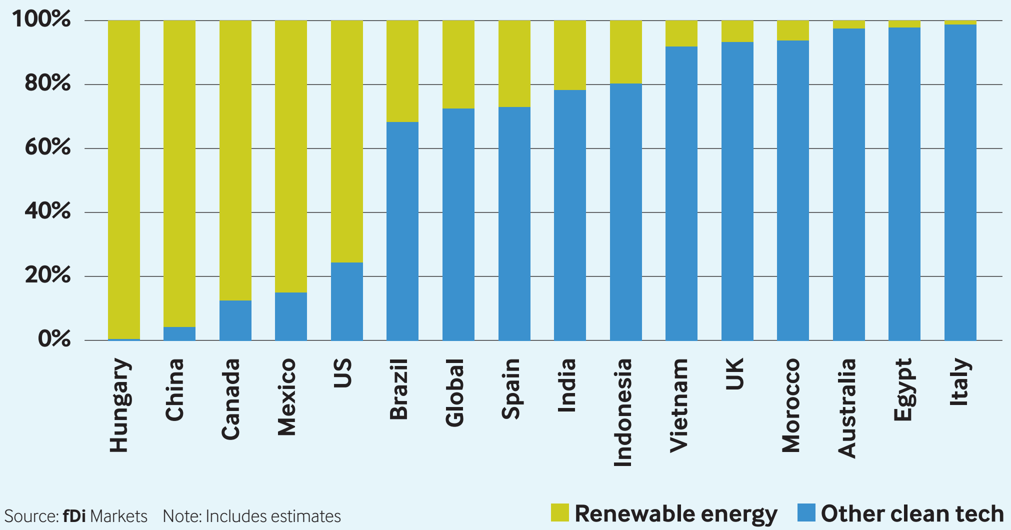
The Energy Transitions Commission estimates that the world could miss out on up to 3500 terawatt hours of clean electricity generation from wind and solar in 2030 (a shortfall of more than 20%) if key barriers to wind and solar deployment are not addressed.

Governments must prioritise renewable energy projects, streamline permit approvals and enable key components to be imported, or the realisation of renewable energy capacity will be too low to hit carbon targets and provide the green energy that electric vehicles, batteries, wind and solar components, and hydrogen production need.

The challenges to attract and implement climate FDI are further accentuated in developing countries, who not only often lack the zoned sites and electricity infrastructure to fast-track investment, but also cannot subsidise investors as in developed economies. Far more support is also needed for developing countries to attract climate FDI.

There is global competition for climate FDI, which is ratcheting up the subsidies being offered to companies. This is accelerating climate FDI and if governments can make the regulatory changes needed so projects can be implemented much faster, it is still possible for FDI to make a major contribution to slowing down the pace of climate change while at the same time delivering substantial economic development benefits.

CHART 2: PROPORTION OF CLIMATE FDI 2021/22 THAT IS RENEWABLE ENERGY VERSUS OTHER ACTIVITIES



Source: fDi Markets Note: Includes estimates

Asia-Pacific

Key trends in 2022 include:

• Foreign direct investment (FDI) into the Asia-Pacific (APAC) region grew in 2022, with the region seeing a 65% increase in capital expenditure from 2021, reaching $279.7bn. In the same period, the number of announced FDI projects increased by more than a third to 3475.

• India was the most attractive destination country in the region by a significant margin, experiencing a 126% increase in the number of announced FDI projects compared to 2021. A total of 994 India-bound projects were recorded in 2022 — 45% higher than its pre-pandemic performance in 2019.

• Capital expenditure into India also increased from $16.1bn in 2021 to $75.8bn in 2022, accounting for 27% of the total recorded investment in the APAC region. Major projects into the country included Hon Hai Precision Industry's semiconductor and display complex in the state of Gujarat, India ($19.5bn) and Petronas's renewable hydrogen energy plant in Mangalore, India ($3.8bn).

• Inbound FDI for China declined further in 2022, with decreases in the number of announced FDI projects numbers (24%), capital expenditure (44%) and job creation (59%). Compared to 2019, the number of projects into China last year was down 60% and capital investment was down 68%.

• The Philippines experienced the second largest growth among the top 10 destination countries for FDI in APAC by project numbers from 2021 to 2022, second only to India. Project numbers into the Philippines increased by 122% from 2021 to 2022. This strong performance returned the country to its pre-pandemic FDI levels.

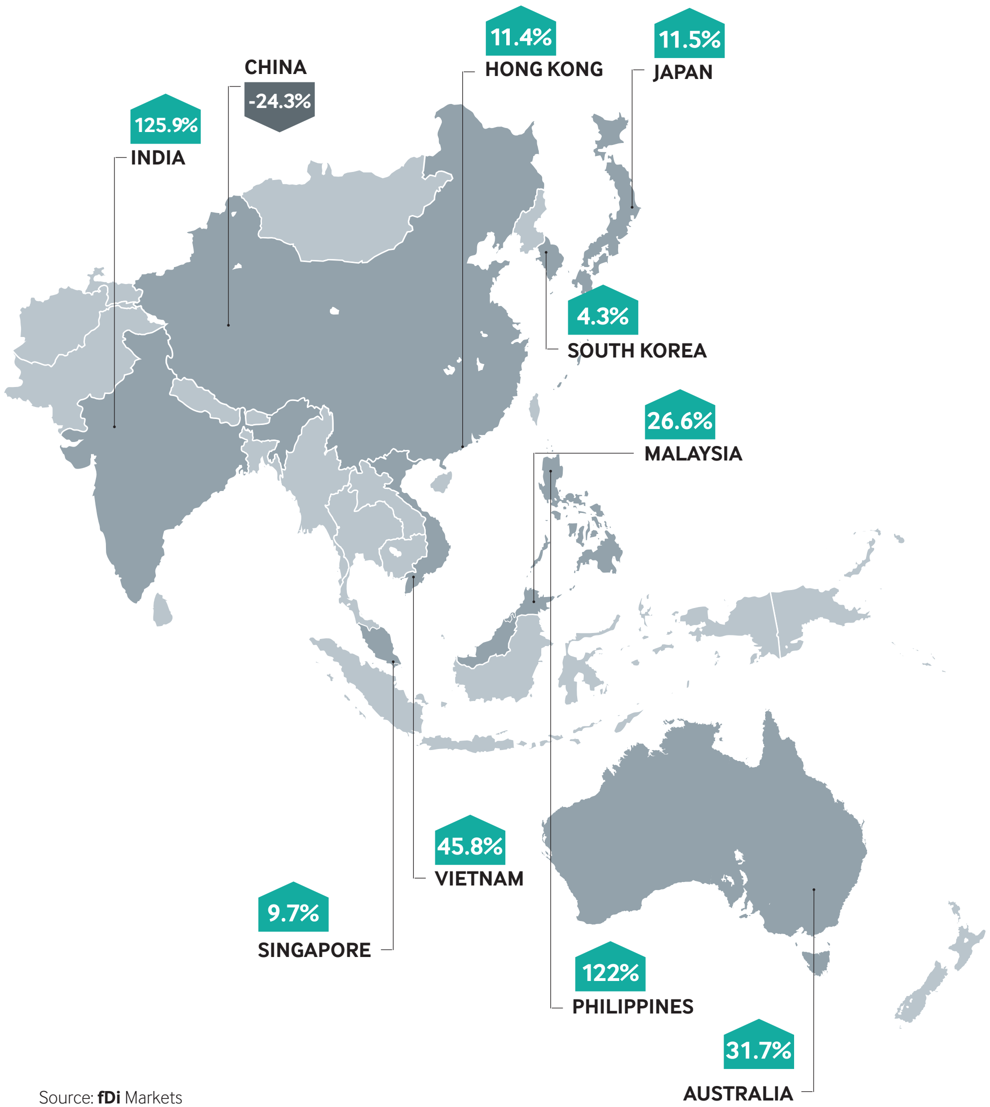
Table 1

FDI INTO ASIA-PACIFIC BY PROJECT NUMBERS 2022

Country	Projects
India	994
Australia	420
Singapore	384
China	314
Japan	194
Vietnam	175
Malaysia	143
Philippines	131
South Korea	98
Hong Kong	98
Others	524
Total	3475

Source: **fDi** Markets

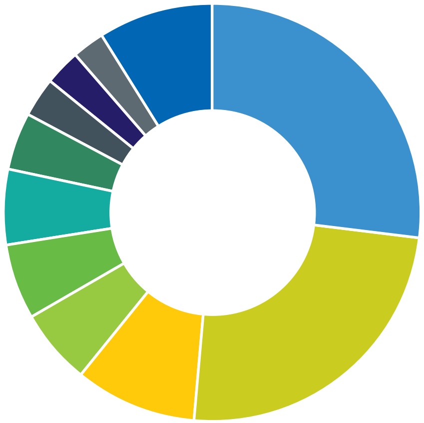
PERCENTAGE CHANGE ON 2022 BY PROJECT NUMBERS



Source: **fDi** Markets

Chart 1

FDI INTO ASIA-PACIFIC BY CAPITAL INVESTMENT 2022



Asia-Pacific market share %		Capital investment ($bn)
27.10%	India	**75.80**
24.55%	Australia	**68.66**
9.23%	Vietnam	**25.81**
5.96%	Malaysia	**16.68**
5.90%	China	**16.50**
5.64%	Singapore	**15.78**
4.65%	South Korea	**13.01**
2.95%	Thailand	**8.26**
2.78%	Turkmenistan	**7.78**
2.50%	Indonesia	**6.98**
8.74%	Others	**24.47**

Source: **fDi** Markets
Note: Includes estimates

Table 2

FDI OUT OF ASIA-PACIFIC BY CAPITAL INVESTMENT 2022

Country	Outbound $bn
South Korea	75.69
Japan	43.14
India	42.00
Taiwan	40.78
China	40.10
Australia	31.75
Singapore	16.97
Hong Kong	6.87
Vietnam	4.68
Malaysia	4.30
Others	7.03
Total	313.31

Source: **fDi** Markets
Note: Includes estimates

Table 3

FDI OUT OF ASIA-PACIFIC BY PROJECT NUMBERS 2022

Country	Outbound projects
India	490
Japan	414
China	371
Singapore	348
Australia	330
South Korea	197
Hong Kong	158
New Zealand	51
Taiwan	47
Vietnam	28
Others	158
Total	2592

Source: **fDi** Markets

KEY TREND

India was the most attractive destination country in the region by a significant margin, experiencing a 126% increase in the number of announced FDI projects compared to 2021.

Recent major projects

- **South Korea-based POSCO** is to establish a $28bn green hydrogen manufacturing facility in Australia by 2040. This is part of the company's plans to invest a total of $40bn in Australia with partners by 2040. Within this, $12bn is to be invested in green steel production.
- **UK-based Vedanta Resources** and Taiwan-based Hon Hai Precision Industry will invest Rs1.54tn ($18.72bn) to build a 63:73 semiconductor and display production complex in the state of Gujarat, India, by 2024.
- **US-based AES Corporation** is planning to build a $12bn offshore wind farm off the coast of Binh Thuan province, Vietnam. It is expected to have a capacity of four gigawatts and would potentially double the country's wind power capacity.
- **Bin Zayed International**, a subsidiary of UAE-based conglomerate Bin Zayed Group, is to invest $9.6bn to develop its Langkasuka mixed-development in Malaysia. The 2000-acre development will comprise a golf course, villa resort homes, a shopping mall, bazaar, five-star hotel and luxury condominiums and is being developed in a 30:70 joint venture with Widad Business Group.

The mounting mega projects wave

Jonathan Wildsmith
Production manager, **fDi** Markets

An impressive 159 large foreign direct investment (FDI) projects worth at least $1bn were announced globally in 2022, **fDi** Markets' cross-border investment data shows. This is a record-breaking number of mega projects, as they are known.

While they represent less than 1% of the 16,000 FDI projects announced worldwide in 2022, they make up for half of the $1tn in capital pledges announced by foreign investors last year, signalling a greater concentration of global FDI in the hands of a limited number of large multinational enterprises (MNEs) with deep pockets and cross-border operations.

The US was a major hotspot for mega investment projects last year. Data from **fDi** Markets shows that the country attracted approximately 14% of the mega projects last year — 22 deals valued at an estimated $88bn in capital investment. Factoring in **fDi** Markets' figures for inter-state investment, the US's overall number of mega projects grows to 39, and adds $74.5bn in capital investment.

A perceived outlier in the data appears as Egypt ranked as the world's top destination for mega projects in terms of capital investment in 2022. The country attracted more than $96.8bn in such projects last year, which is close to three times that of its previous record ($34.9bn in 2016). Meanwhile, by number of FDI projects, it grew from an average of 3.5 mega projects per year between 2013 and 2021 to 19 mega investments in 2022, ranking Egypt second only to the US.

The renewable energy industry accounted for the largest share (35%) of mega projects in 2022 as the sector witnessed unprecedented year-over-year growth. Renewables also received huge capital pledges in green hydrogen and wind energy. Amid higher energy prices and supply constraints after Russia's war in Ukraine, the number of mega investments in coal, oil and gas grew from four in 2021 to 21 in 2022.

Meanwhile, electronic components (including battery manufacturing); metals (including cathode material production); automotive original equipment manufacturing (including electric vehicle production); and semiconductors accounted for close to a third of announced mega projects.

Subsidy race

There are multiple factors that contribute to the growing wave of mega projects seen by major world economies in 2022. Capital availability is clearly one of them. Although central banks abruptly raised interest rates in 2022, the cost of capital was still historically low in the first half of the year, giving MNEs and their financiers plenty of room to carry out international expansions.

The availability of private funding, coupled with soaring public support for investment in strategic industries, has triggered an international subsidies race.

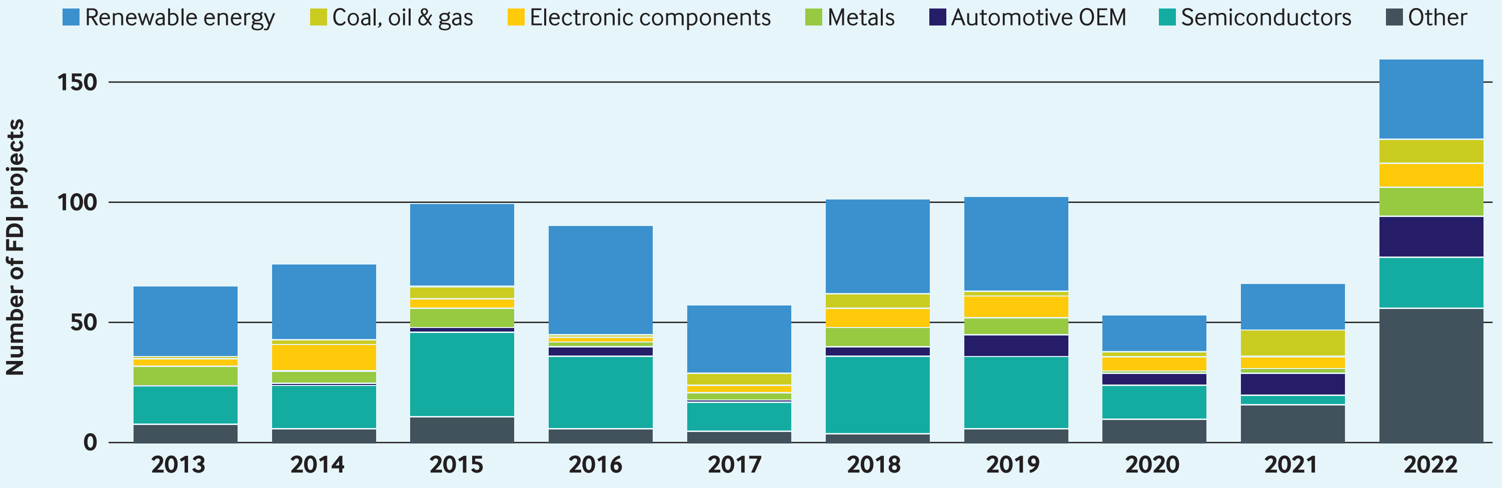
> Investment incentives have become embedded within the lifecycle of investment projects

The Covid-19 pandemic has accelerated the trend of Western governments bringing back industrial policies to reshore production in strategic sectors, build resilience and create new jobs. The US has been particularly assertive in introducing new economic policies of the likes of the Chips Act and the Inflation Reduction Act, which put billions of dollars' worth of incentives on the table for investors in semiconductors and energy-transition technologies.

Facing the daunting prospect of losing competitiveness, the EU scrambled to introduce its own incentives-heavy industrial policies, such as the Green Deal Industrial Plan. Governments across the globe, from Japan and South Korea to India and Mexico have all approved similar plans, effectively triggering a subsidy race to the bottom that has upended the financials of reshoring or nearshoring projects that would have been financially unviable only a few years ago.

However, such plans have drawn their fair share of criticism. The Inflation Reduction Act has come under fire from several EU officials as it allegedly disadvantages Europe's value proposition and lures more investors to the US in key sectors such as electric vehicles and green hydrogen production. "The EU and US should work together to ensure that our respective incentive programmes are fair and mutually reinforcing and thus drive the green transition," Arianna Podesta, the coordinating spokesperson for the EU Commission on economic affairs, tells **fDi** Intelligence.

THE MOUNTING MEGA PROJECTS WAVE: THE NUMBER OF ANNOUNCED FDI PROJECTS WORTH AT LEAST $1BN BY SECTOR, 2013-2022



Source: **fDi** Markets

Investment incentives have become embedded within the lifecycle of investment projects as companies increasingly rely on public funds to support mega-projects. Among others, US-based chip producer Intel has seen its Magdeburg mega-fab in Germany delayed, a part of the company's €80bn investment programme in the EU, due to subsidy negotiations off the back of the energy price crisis in Europe.

IncentivesFlow, a recently acquired **fDi** Intelligence database tracking financial incentives awarded to companies for foreign and domestic investment projects, tracked more than 3400 deals last year worldwide, worth approximately $405bn in capital investment with incentives valued at $44.5bn. While the number of deals fell by 98% from 2021 to 2022, capital investment and incentives grew by 29% and 44% respectively in the same period, which highlights a more concentrated market powered by a wave of large-scale projects.

More than two-thirds of incentives were announced in the US last year, which was up marginally from 64% in 2021 and 62% in 2020. Hyundai Motor Company's $5.5bn electric vehicle manufacturing plant in Savannah, Georgia received the largest foreign deal worth $1.8bn while Micron Technology, a semiconductor manufacturer, was awarded the largest domestic deal valued at $5.8bn.

Green hydrogen boom

The spectacular rise of green hydrogen as a possible key piece in the transition to greener economies also takes credit as a major factor contributing to the mega project wave of 2022.

Of the 159 FDI mega projects tracked last year, more than 59% were in green hydrogen production, as well as the manufacturing of electronic components and semiconductors.

Total announced greenfield FDI in green hydrogen production stood at 58, for an overall value $153.9bn last year — its highest ever level and approximately four times larger than the $35.9bn tracked in 2021, according to **fDi** Markets data. More than 90% of capital invested in green hydrogen projects can be attributed to mega-projects.

Given that utility-scale, commercially viable green hydrogen technology has yet to prove the concept, there remains some scepticism around green hydrogen and its use cases. The majority of these larger, capital-intensive announcements will spread the capital expenditure over the next decade, whereas **fDi** Markets allocates the full investment amount at the time of announcement by the company. This methodology has been used consistently across the 20 year life-span of the **fDi** Markets database to remove variations in the data.

As previously mentioned, Egypt's staggering FDI performance in 2022 can be attributed to a host of mega projects. This influx in capital is directly related to 17 green hydrogen projects, accounting for 97% of Egypt's total inbound capital investment in 2022. In particular, India-based solar energy company Acme Group's $13bn, 2.2 billion tonnes per annum green hydrogen plant in Ain Sokhna, part of the Suez Canal Special Economic Zone, as well as Australian mining giant Fortescue's green energy arm Fortescue Future Industries (FFI) which has pledged up to $10bn until 2030. The state's contribution to FFI's plans ranges between $500m and $630m.

The wave of mega projects has another distinctive feature: it is powered mostly by large MNEs, which inevitably have more resources to allocate to such endeavours than small and medium-sized enterprises and have the soft and hard infrastructure in place to pull them off. Overall, MNEs made up 54% of capital expenditure in mega-projects and 62% of mega FDI project numbers.

Since the pandemic, these larger MNEs have tightened their grip on global FDI flows, controlling a larger proportion of FDI. So far, they have talked the talk by announcing bold plans the world over. Now is the time for them to walk the walk.

Europe

Key trends in 2022 include:

• The number of foreign direct investment (FDI) projects into Europe remained stable in 2022, seeing a rise of less than 1%. The region also saw a 22% increase in capital investment to $341.6bn between 2021 and 2022. Europe experienced a 4% decrease in job creation in the same year.

• Capital investment and job creation in western Europe saw increases of 32% and 7.4% respectively from 2021 to 2022, reaching a value of $279.5bn and more than 383,000 jobs created. Project numbers into the region remained stable, with a 1.3% decrease from the previous year, as 5250 investments were recorded in 2022.

• Emerging Europe's proportion of inbound FDI projects (relative to western Europe) increased marginally, from 22% in 2021 to 23% in 2022. Despite this, the value of capital investment and job creation fell by 7.7% and 18% respectively.

• The UK was the leading destination country in Europe, attracting 1119 announced FDI projects worth an estimated $101.2bn. The renewable energy market made up $72.5bn of the total investment, with the sector accounting for 13 out of 15 mega investments (projects worth more than $1bn) into the country with a surge following ScotWind, a leasing round that enabled developers to bid for blocks of Scotland's seabed to use for commercial-scale offshore wind projects.

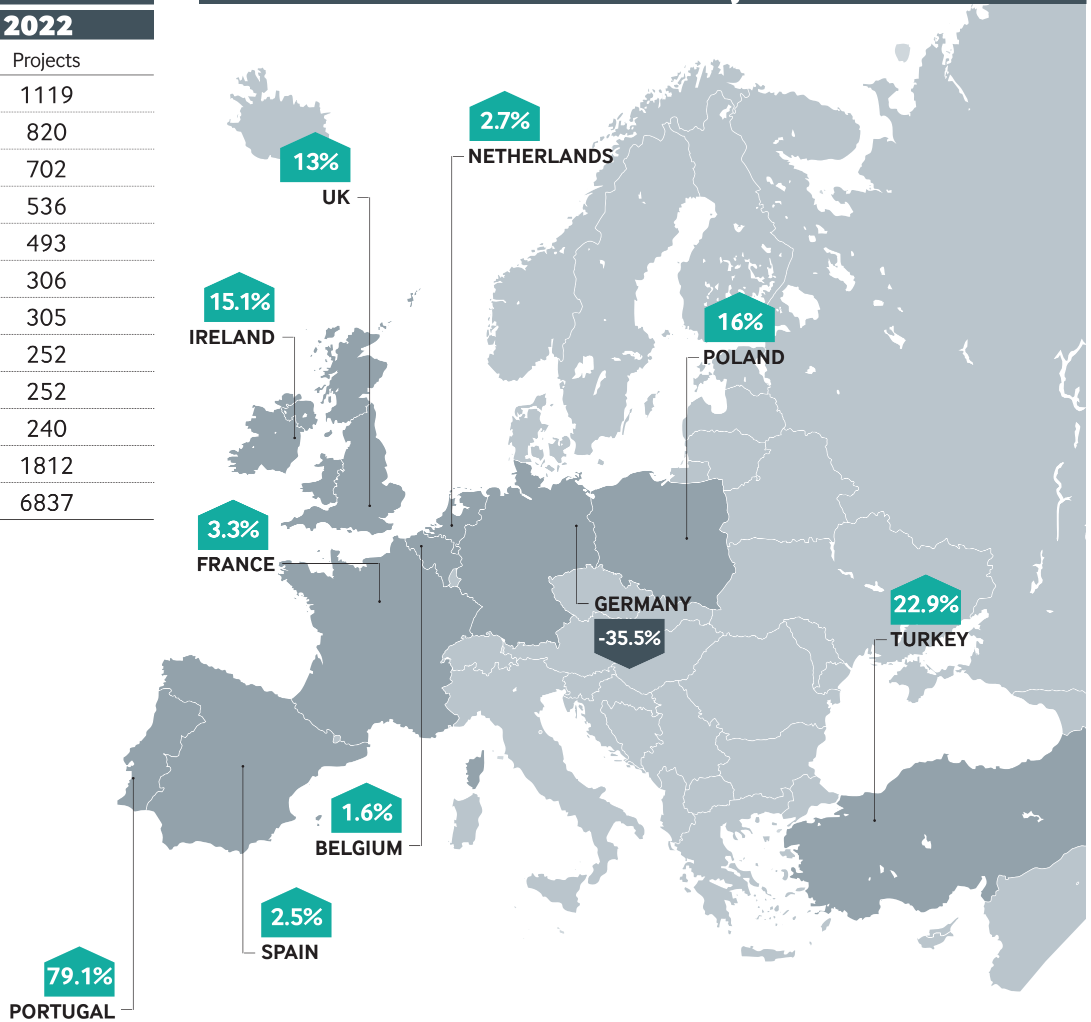
Table 1

FDI INTO EUROPE BY PROJECT NUMBERS 2022

Country	Projects
UK	1119
Germany	820
Spain	702
France	536
Poland	493
Netherlands	306
Ireland	305
Belgium	252
Turkey	252
Portugal	240
Others	1812
Total	6837

Source: **fDi** Markets

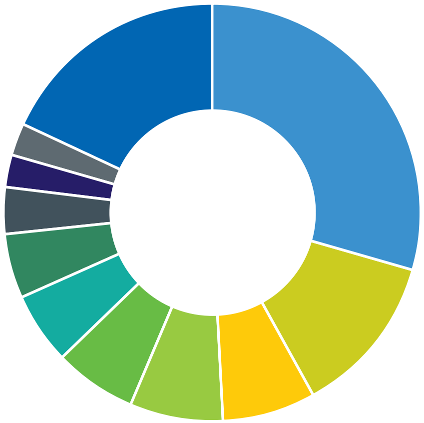
PERCENTAGE CHANGE ON 2022 BY PROJECT NUMBERS



Source: **fDi** Markets
Note: Data on Germany is incomplete

Chart 1

FDI INTO EUROPE BY CAPITAL INVESTMENT 2022



Europe market share %		Capital investment ($bn)
29.64%	UK	101.21
12.41%	Spain	42.38
7.37%	Ireland	25.18
7.05%	Italy	24.07
6.34%	Germany	21.67
5.53%	France	18.88
5.08%	Poland	17.34
3.62%	Hungary	12.37
2.58%	Netherlands	8.82
2.46%	Romania	8.41
17.92%	Others	61.21

Source: **fDi** Markets
Note: Includes estimates

Table 2

FDI OUT OF EUROPE BY CAPITAL INVESTMENT 2022

Country	Outbound $bn
UK	91.13
France	76.87
Germany	62.43
Italy	31.53
Denmark	24.71
Netherlands	24.46
Spain	23.93
Switzerland	20.49
Portugal	16.83
Luxembourg	15.24
Others	83.25
Total	470.89

Source: **fDi** Markets
Note: Includes estimates

Table 3

FDI OUT OF EUROPE BY PROJECT NUMBERS 2022

Country	Outbound projects
UK	1874
Germany	1177
France	895
Switzerland	672
Netherlands	514
Spain	364
Sweden	333
Italy	281
Denmark	262
Belgium	233
Others	1558
Total	8163

Source: **fDi** Markets

KEY TREND

$101.2bn

The UK was the leading destination country in Europe, attracting 1119 announced FDI projects worth an estimated $101.2bn.

Recent major projects

- **China-based Contemporary Amperex Technology (CATL)**, which develops lithium-ion batteries for electric vehicles (EVs) and energy storage systems, has announced that it will invest €7.34bn to build a 100 gigawatt hour (GWh) battery plant in Debrecen, Hungary. Covering an area of 2.21 million square metres in the Southern Industrial Park of Debrecen, the plant will supply both cells and modules to automakers in Europe.

- **Sweden-based Northvolt** is to build its new 60GWh lithium-ion battery manufacturing plant in Heide, Germany. The €4bn gigafactory, Northvolt Drei, is to employ 3000 people and will produce its first batteries for EVs in late 2025, serving markets in Europe.

- **France-based TotalEnergies**, an international energy conglomerate, has announced it will partner with locally-based Green Investment Group and RIDG to develop a 2GW offshore wind farm project in Scotland. The project is located 30km off the west coast of Orkney and is expected to be operational by 2030. The development will see an investment of more than £4bn and is expected to deliver energy to a hydrogen production facility in Orkney.

Electric vehicle FDI accelerates

Geraldine Ewing
Head,
fDi Markets

Over the course of 2021, annual sales of electric vehicles (EVs) doubled to a new record of 6.6 million. While just 120,000 EVs were sold worldwide in 2012, more than 120,000 EVs were sold each week in 2021 according to the International Energy Agency.

Cross-border investment monitor **fDi** Markets has recorded a marked increase in the number of announced foreign direct investment (FDI) projects in the EV business. Despite a lull in investments during the first year of the Covid-19 pandemic, investment into these technologies have continued to increase since 2016, both in terms of project number and value. A total 281 FDI projects were recorded in 2022 with a cumulative value of $93.7bn — more than 1.5 times higher than in 2021 and nearly three times the capital investment announced in 2019. Manufacturing projects accounted for 96% of the capital investment and 54% of the announced FDI projects in 2022. Some 45 announcements were made in research and development activities, at a total investment of $2.1bn.

Within that, several mega investments (those worth $1bn or more) were announced. Tesla Motors was by far the most active investor in the area, with 59 FDI projects announced since 2016, including three big-ticket overseas gigafactories: Shanghai, Brandenburg and Monterrey.

While 2021 was a peak for Tesla, other automotive firms — both established and start-up companies — announced their highest number of EV projects during 2022. Vietnam's new EV firm Vingroup announced more than $4.5bn in FDI projects in 2022 and traditional automakers such as Volkswagen, Daimler, BMW, Hyundai and Ford ramped up investments in EVs with a combined $25.1bn invested in 2022 alone.

A total of 281 FDI projects were recorded in 2022 with a cumulative value of $93.7bn

As the cost of fuel continues to rise and the price gap between EVs and conventional cars decreases, EVs and hybrid vehicles are becoming an increasingly attractive choice for consumers. However, there are several factors that are throttling uptake, including primarily their range. For EVs to be embraced in any significant way, the issue of how far they can travel between charges requires urgent investment and innovation.

While the range of these vehicles is increasing, wider access to charging points is needed to make charging EVs as easy as refuelling internal combustion vehicles. McKinsey estimates that the EU 27 will need at least 3.4 million operational public charging points by 2030 to reach the target of becoming carbon-neutral by 2050 and to meet anticipated public demand. Alongside this, extensive energy grid upgrades will be required to distribute power to these new points. In all, McKinsey estimates this build-out of EV-charging infrastructure will cost more than €240bn by 2030.

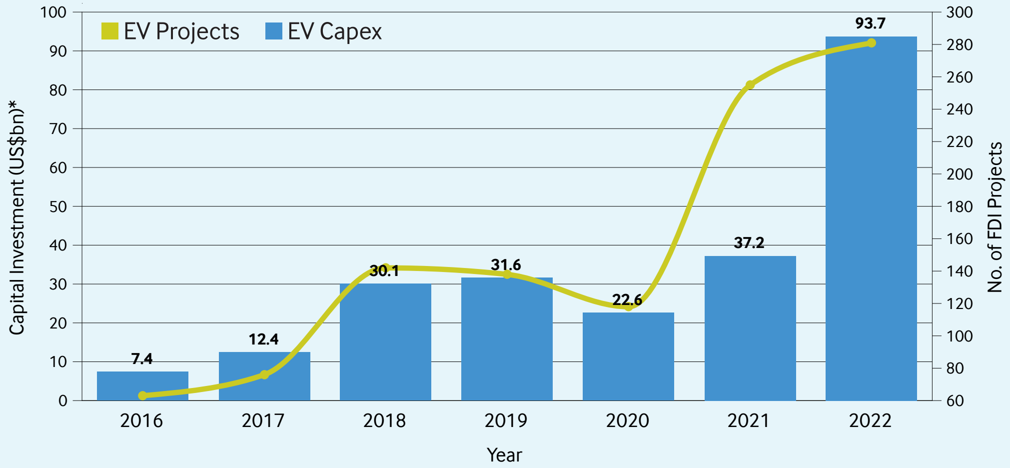
Access to critical materials poses a risk

Battery innovations have driven up the average range of EVs from 127km in 2010 to 349km in 2021, according to IAE data. Despite the battery supply chain being fraught with critical material insecurity, suppliers appear to be making strategic early investments to ensure new factories are at nameplate capacity in time to meet the moment.

fDi Markets has recorded an equally steep increase in the number of FDI projects tagged as part of the battery supply chain since 2016, as manufacturers are investing with future EV requirements in mind. When looking at only those projects serving the transport equipment cluster, we can see that investments totalling an estimated $79.3bn were announced in 2022, compared to just $22.1bn in 2019. This boost in capital investment was supported by mega investments in the batteries subsector; however, the volume of projects announced in the sector in 2022 also increased by 48% to 157 announcements.

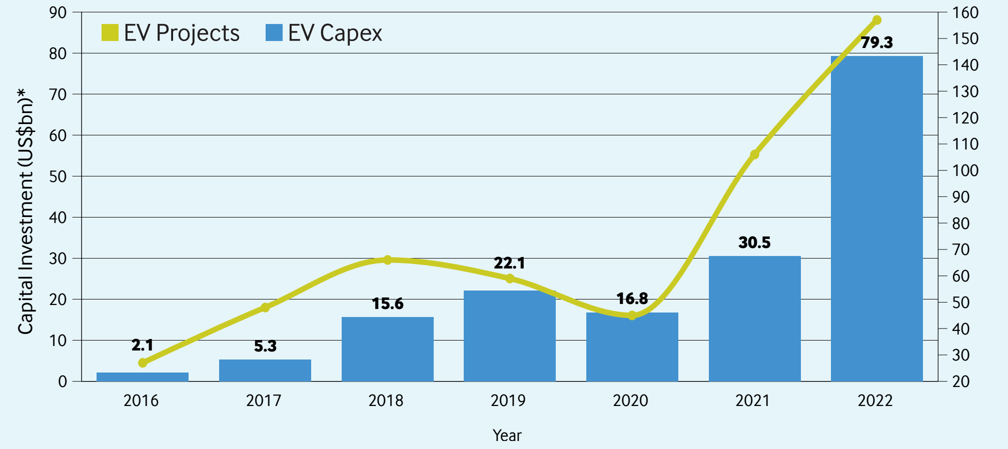
Because an EV battery can account for as much as 40% of the car's cost and because the leading five battery makers hold an estimated 80% of the global market share according to Goldman Sachs research, battery supply chain constraints appear to have the most potential to slow growth in EV uptake as pricing power has shifted to the battery makers and limits profitability for automakers.

FDI IN ELECTRIC MOBILITY ACCELERATES: FDI PROJECTS UNDER THE 'ELECTRIC VEHICLES' TAG BETWEEN 2016 AND 2022



Source: **fDi** Markets *Includes estimates

BATTERY SUPPLY CHAIN FOR EVS IN GROWTH: FDI PROJECTS TAGGED BATTERY SUPPLY CHAIN IN THE TRANSPORT EQUIPMENT CLUSTER 2016-2022



Source: **fDi** Markets *Includes estimates

Investment outlook

There is an uncertain outlook for EVs in the near-term, but companies appear undeterred and continue to invest in electrification, spurred on by mounting incentives and policy support — from the Inflation Reduction Act in the US to the EU's Green Deal Industrial Plan. This pressure has brought about advances in electrifying light commercial vehicles (LCVs) fleets globally. LCVs are particularly ripe for investment as many are used for urban delivery and since LCV fleets are driven intensively, often operate on predictable routes and can be charged at commercial depots.

Electric medium- and heavy-duty truck sales totalled more than 14,200 in 2021, which represents less than 0.3% of the total number of registrations for such vehicles worldwide and as such, this segment has growth potential — particularly in the electric bus space. The EU's Clean Vehicles Directive has led to national targets to transition to public procurement of only zero-emission buses, and this will no doubt increase uptake.

fDi Markets' investor signals database, which monitors early indications by companies considering future investment in foreign markets, has recorded notable announcements from firms aiming to tap this potential in 2022. In the LCV space, Saic Maxus Automotive, announced an ambitious strategy aiming to become the largest supplier in Europe, while UK-based truck firm Teeva Motors raised $54m to fund its North American and European expansion plan. Supporting technologies are also in receipt of funding for the implementation of existing technologies. Germany-based Chargd, an EV charging platform that connects vehicles of any type and chargers, and US-based Loop Global, a charging infrastructure company, each announced funding and access to new resources in 2022.

The climate for EVs is not without its challenges; however, there are no signs that demand from consumers will wane, and strong support exists from governmental organisations, so it is likely that investments in this space will continue to grow. Implications of the Inflation Reduction Act in the US as well as similar policies across the world do leave questions on how countries will compete for the market share in this lucrative industry.

North America

Key trends in 2022 include:

• In 2022 the total number of foreign direct investment (FDI) projects into North America rose to 2330 — an increase of 19% and 26% compared to 2021 and 2020, respectively. The region also witnessed a 59% increase in capital investment from 2019 figures, reaching $178.1bn in 2022. Additionally, inbound projects supported the creation of more than 241,100 jobs, the largest figure for the region since records began in 2003.

• The US retained its position as the top destination country in North America, in terms of project numbers, capital investment and job creation. The US received an estimated $158.1bn in inbound capital investment — an increase of 73% compared to 2021 and an increase of 59% from 2019 — suggesting a strong bounce back from the pandemic lows.

• The US's strong capital investment increase last year can be traced back to a substantial increase in the average project size in terms of capital investment. The average capital investment per project rose to $80.4m in 2022. This is in comparison to an average project investment of $51.5m in 2019 and $56.8m in 2021, demonstrating a higher yield of investment per project in 2022. The increase is largely explained by the 22 mega-investment projects (projects worth more than $1bn) announced in the country.

• The amount of FDI into Canada has remained steady throughout 2022. The country saw a 2.6% increase in the number of projects compared to 2021. The amount of capital investment into Canada was just shy of $20bn in 2022; while this represents a 4.6% decrease from 2021, capital investment into Canada saw double-digit growth between 2019 and 2021.

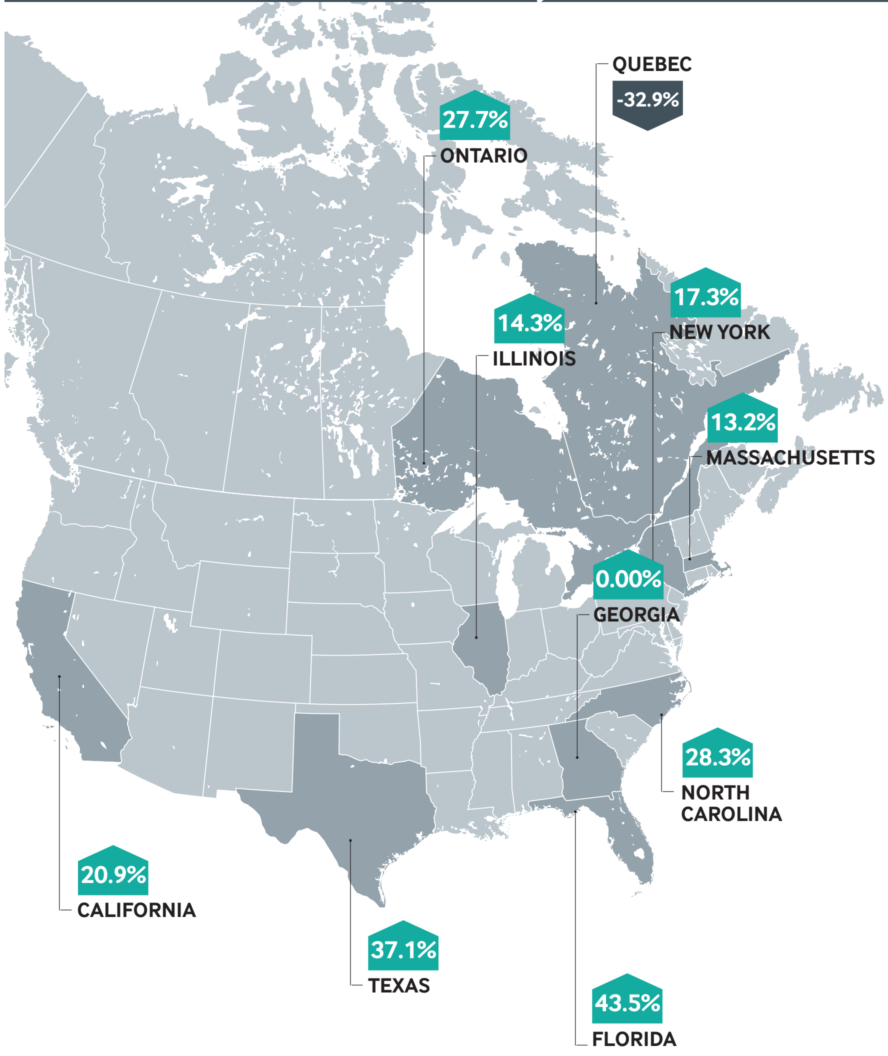
Table 1

FDI INTO NORTH AMERICA BY PROJECT NUMBERS 2022

State	Projects
New York	231
Texas	229
California	197
Ontario	175
Florida	155
Massachusetts	77
North Carolina	68
Illinois	64
Georgia	63
Quebec	53
Others	1018
Total	2330

Source: **fDi** Markets

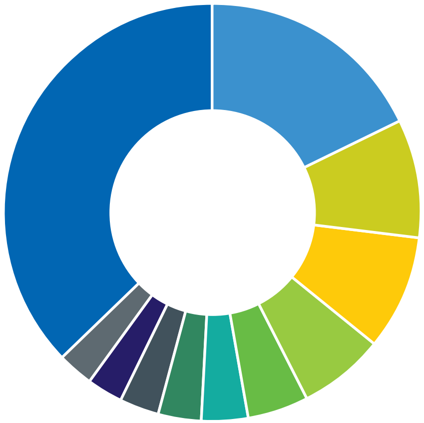
PERCENTAGE CHANGE ON 2022 BY PROJECT NUMBERS



Source: **fDi** Markets

Chart 1

FDI INTO NORTH AMERICA BY CAPITAL INVESTMENT 2022



North America market share %		Capital investment ($bn)
17.93%	Arizona	31.93
9.13%	Georgia	16.26
8.96%	Texas	15.96
6.66%	Ontario	11.86
4.78%	California	8.51
3.50%	North Carolina	6.23
3.38%	Ohio	6.02
2.99%	Tennessee	5.33
2.91%	Michigan	5.18
2.56%	Kansas	4.57
37.20%	Others	66.26

Source: **fDi** Markets
Note: Includes estimates

Table 2

FDI OUT OF NORTH AMERICA BY CAPITAL INVESTMENT 2022

Country	Outbound $bn
California	47.35
Texas	35.08
Washington	22.70
New York	22.04
Ontario	16.44
Virginia	16.20
Massachusetts	6.99
British Columbia	6.75
Pennsylvania	6.23
Connecticut	6.07
Others	48.79
Total	234.64

Source: **fDi** Markets
Note: Includes estimates

Table 3

FDI OUT OF NORTH AMERICA BY PROJECT NUMBERS 2022

Country	Outbound projects
California	988
New York	573
Texas	259
Ontario	226
Massachusetts	222
Washington	173
Illinois	172
Florida	142
New Jersey	120
Quebec	110
Others	1117
Total	4102

Source: **fDi** Markets

KEY TREND

The US retained its position as the top destination country in North America, in terms of project numbers, capital investment and job creation.

Recent major projects

- **Taiwan-based Taiwan Semiconductor Manufacturing** is to establish a second semiconductor manufacturing plant in the US state of Arizona. In 2020, the company committed $12bn to a chip plant in Arizona which is set to open in 2024. In November 2022, it announced plans for a second site that will manufacture more advanced three nanometre chips, starting in 2026. The overall investment for both sites is $40bn.

- **South Korea-based Hyundai Motor** has announced that it plans to open an electric vehicle and battery manufacturing facility in the US state of Georgia. The company will invest $5.5bn in the Hyundai Motor Group Metaplant America which is expected to create 8100 new jobs.

- **Shell, a subsidiary of Netherlands-based Royal Dutch Shell**, has partnered with Norway-based Equinor to develop the Sparta project in the US Gulf of Mexico. The deep-water oil field development project is expected to garner an investment of close to $4.3bn.

- **Panasonic Energy**, a provider of battery technology-based products and solutions which operates as a subsidiary of Japan-based industry conglomerate Panasonic, is to build a $4bn battery plant in the US.

Ukraine war redraws energy investment map

Joshua Crawford,
Production manager,
fDi Markets

The Ukraine war sent shockwaves through the global energy market. As Russia weaponised its gas supplies to Europe, Western governments abruptly woke up to the risk of depending on Russian imports for their domestic energy security. Western oil majors were also caught in the crossfire, after sinking dozens of billions of dollars into the development of Russian oil and gas reserves. The fate of those assets still hangs in the balance as the war continues and divestment mechanics remain uncertain. What is certain is the swift mobilisation of capital and resources to plug the hole left by demised Russian ventures, and serve the new geopolitical mantra of pivoting energy supplies away from Russia.

After years of subdued activity, cross-border investment into new coal, oil and gas ventures spiked. The sector ranked second globally by capital investment in 2022, with an estimated $104.8bn of projects announced. Capital investment growth from 2021 was also the highest of any sector, as **fDi** Markets noted a 538% increase. Additionally, project growth was the second-highest of any sector, with a 67% increase recorded. This growth follows a record low performance between 2020 and 2021, despite the 2022 energy crisis.

The conflict in Ukraine is a major part of the transforming global energy map. As recorded by **fDi** Markets, eastern Europe's share of coal, oil and gas capital investment fell by almost 44% between 2021 and 2022. Other regions benefited strongly from this: Qatar, for example, attracted its highest level of coal, oil and gas foreign direct investment (FDI) since 2009, drawing in more than $28bn. This makes the Middle East the top destination region for coal, oil and gas FDI in 2022, when measured by estimated capital investment. Qatar's inflows are attributable to projects like the Ras Laffan liquified natural gas site, in which France-based Total Energies is investing $3.5bn. The development forms part of the company's efforts to compensate for its withdrawal from Ukraine following the invasion.

Jim Burkhard, head of research for oil markets, energy and mobility at S&P Global Commodity Insights, says that, as a result of the war, a "true global market ... doesn't exist anymore".

The US has been pivotal in creating this redefined global market, which exported a record 11.1 million barrels of crude oil and refined products per day during the third week of February 2023 — more than the total output of either Saudi Arabia or Russia, and up from nine million barrels per day at the same point in 2022.

Santos, an Australia-based oil and gas producer, announced plans in August 2022 to develop the Pikka oil project on the North Slope in the US state of Alaska. The $2.6bn joint venture, which seeks to create more than 500 jobs, forms part of a company plan to diversify oil sources away from Russia, in light of the war.

> After years of subdued activity, cross-border investment into new coal, oil and gas ventures spiked

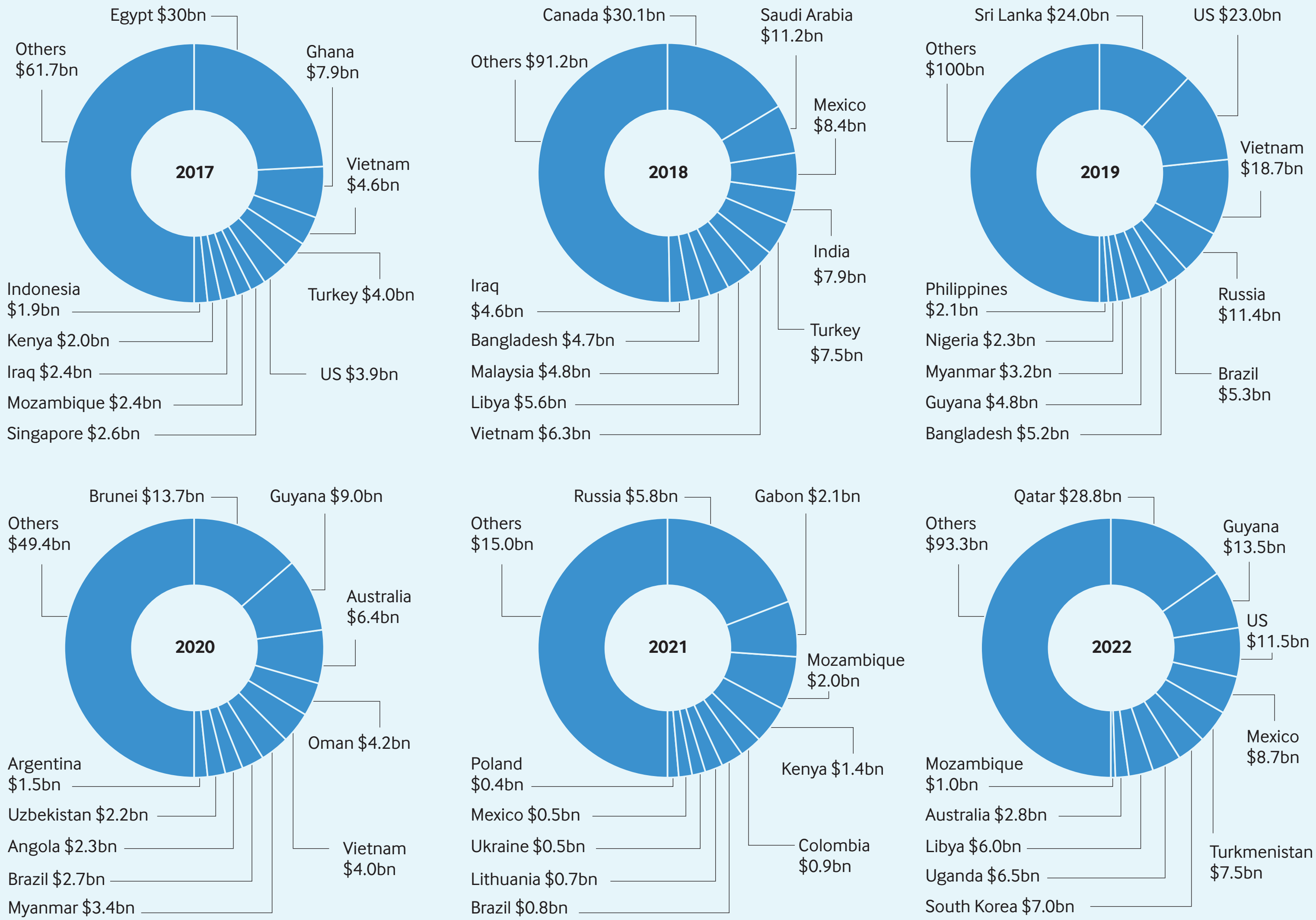
Elsewhere in the US, Shell announced the $4.3bn Sparta project in the Gulf of Mexico, obtaining the project rights in June 2022. Shell, which generated its highest profits in 15 years in 2022, devoted more than $13bn of capital investment to coal, oil and gas FDI ventures globally during 2022, the highest invested sectorally by the company since 2018.

The US ranked second globally in 2022 for its attraction of coal, oil and gas projects, and came third for related capital investment flows, with inbound ventures worth an estimated $11.2bn. Although the levels of capital investment fall well short of those obtained in 2019, when more than $23bn was invested, it was still the second-strongest year for the US coal, oil and gas market since 2011. This market forms a major part of the North America region, which increased its global share of coal, oil and gas capital investment by almost 10% between 2021 and 2022, the third-highest share obtained since 2013.

In comparison, renewables FDI into the US fell to its lowest level since 2017, as the number of projects dropped from 58 to 44 between 2021 and 2022. Capital investment also levelled down, to an estimated $8.1bn — the lowest recorded by **fDi** Markets since 2018.

Other players are adopting significant roles in redrawing the global energy map. For example, Guyana emerged as an alternative energy

REDRAWING THE FOSSIL FUEL INVESTMENT MAP: THE PROPORTION OF CAPITAL INVESTMENT* IN COAL, OIL AND GAS BY TOP 10 DESTINATION COUNTRIES, 2017-2022 ($BN)



Source: fDi Markets *Includes estimates

supplier during 2022 in light of the Ukraine conflict, increasing its oil exports by 164%. The country also attracted more than $13bn of capital investment from US-based Exxon Mobil in 2022, with the announcements of the Yellowtail joint venture and Uaru ultra-deepwater oilfield.

Guyana is receptive to these energy investments. President Bharrat Jagdeo says the country is in a "mad rush", trying to diversify its oil supply and secure new sources of revenue within this window. The auctioning of new offshore exploration blocks is set to keep driving the local market, attracting potential investors like Shell, Petrobras and Chevron. Among other motivations, it is hoped the introduction of new players will lessen the dominance of Exxon Mobil-led consortiums and diversify the investment field.

Guyana is one of the stand-outs of the Latin America and Caribbean region, which increased its market share of coal, oil and gas capital investment by more than 7% between 2021 and 2022, with the region receiving almost one-quarter of global investment flows.

Last year, in large part due to the Ukraine conflict, was marred with unpredictability across global sectors. Despite this, the coal, oil and gas FDI industry achieved growth, with other world regions benefiting from eastern Europe's demise. The growth of the industry in 2022, the scale of sectoral investments, and the regulatory environments of major economies on a redrawn map, like the US, in addition to smaller players like Guyana, suggest coal, oil and gas FDI will continue to perform strongly, regardless of renewable energy developments and global events.

Middle East and Africa

Key trends in 2022 include:

• Foreign direct investment (FDI) into the Middle East and Africa (MEA) increased in 2022, with the number of announced FDI projects increasing by 54% to 2131 since 2021. Capital investment into the region also rose by 234% over the period, reaching $261.2bn.

• Regionally, the number of FDI projects destined for the Middle East increased from 870 in 2021 to 1397 in 2022. This represents a growth of 61% on 2021 and a market share of 8.7% of FDI projects globally. The number of announced FDI projects into Africa rose from 517 projects in 2021 to 734 in 2022. While project numbers have decreased by 30% since 2019, capital investment into Africa was more than 2.5-times higher in 2022 than it was in 2019.

• The UAE has retained its position as the top destination for projects in the region in 2022. A total 879 projects were announced, marking a 71% increase from 2021. The UAE also accounted for 41% of FDI projects across the MEA and 15% of jobs created in the region.

• The number of FDI projects into Egypt rose by more than 150% to 148 in 2022, representing an estimated capital investment of $107bn. This represents a 41% market share in the MEA region and ranks it as the top destination country for capital-intensive FDI in the region, and second globally in 2022. This growth is fuelled by several mega projects being announced in renewable hydrogen.

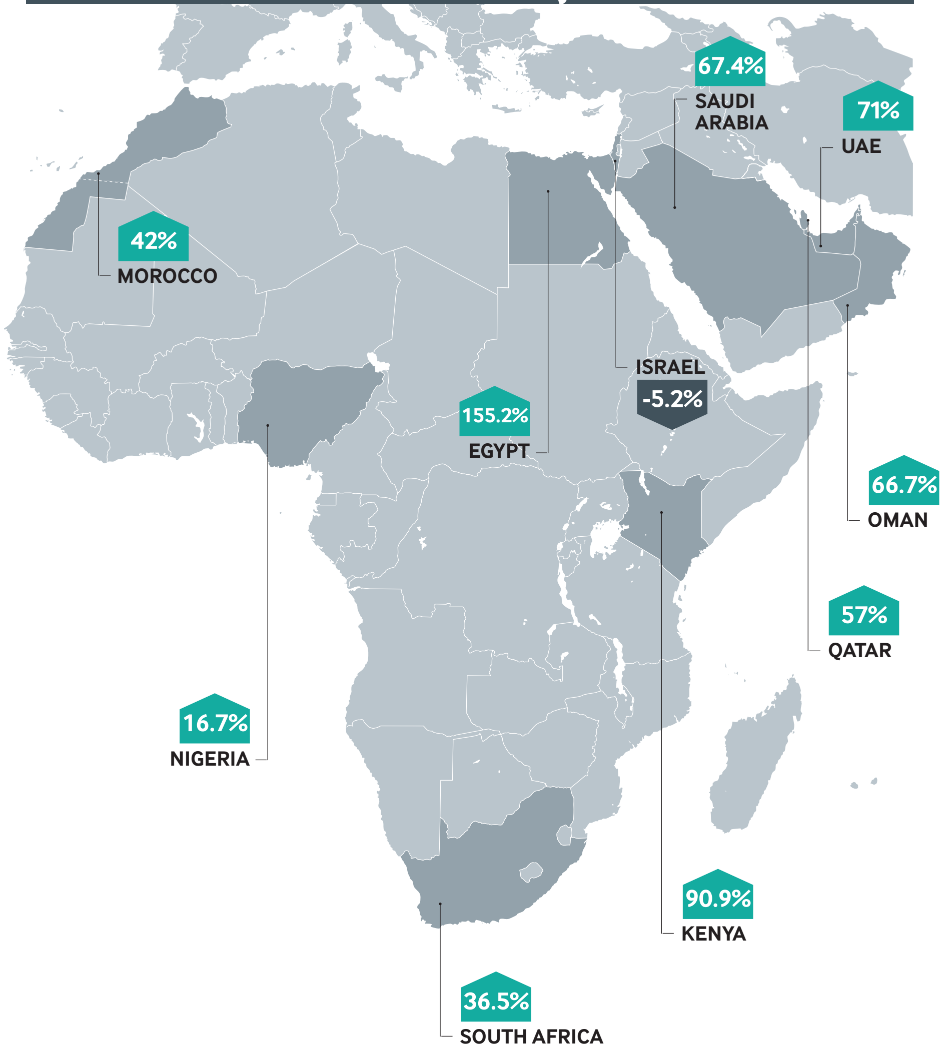
Table 1

FDI INTO MIDDLE EAST AND AFRICA BY PROJECT NUMBERS 2022

Country	Projects
UAE	879
Saudi Arabia	216
South Africa	157
Egypt	148
Qatar	135
Israel	73
Morocco	71
Kenya	63
Nigeria	49
Oman	35
Others	305
Total	2131

Source: fDi Markets

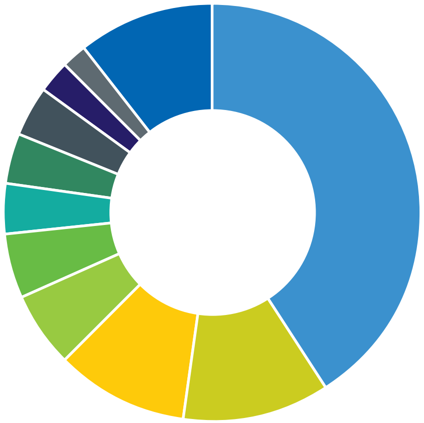
PERCENTAGE CHANGE ON 2022 BY PROJECT NUMBERS



Source: fDi Markets

Chart 1

FDI INTO MIDDLE EAST AND AFRICA BY CAPITAL INVESTMENT 2022



Middle East and Africa market share %		Capital investment ($bn)
40.97%	Egypt	**107.00**
11.40%	Qatar	**29.78**
10.24%	South Africa	**26.76**
5.86%	Morocco	**15.31**
5.00%	Saudi Arabia	**13.05**
4.00%	UAE	**10.45**
3.90%	Uganda	**10.20**
3.75%	Oman	**9.79**
2.44%	Libya	**6.36**
1.99%	Zimbabwe	**5.21**
10.44%	Others	**27.28**

Source: **fDi** Markets
Note: Includes estimates

Table 2

FDI OUT OF MIDDLE EAST AND AFRICA BY CAPITAL INVESTMENT 2022

Country	Outbound $bn
UAE	84.00
Saudi Arabia	21.78
Israel	9.31
South Africa	1.67
Qatar	1.15
Mauritius	1.15
Oman	0.69
Nigeria	0.63
Burundi	0.53
Kenya	0.47
Others	2.04
Total	123.42

Source: **fDi** Markets
Note: Includes estimates

Table 3

FDI OUT OF MIDDLE EAST AND AFRICA BY PROJECT NUMBERS 2022

Country	Outbound projects
UAE	272
Israel	192
Saudi Arabia	62
South Africa	47
Nigeria	39
Egypt	33
Mauritius	21
Kenya	21
Qatar	17
Kuwait	17
Others	102
Total	823

Source: **fDi** Markets
Note: Includes estimates

KEY TREND

The number of FDI projects into Egypt rose by more than 150% to 148 in 2022, representing an estimated capital investment of $107bn.

Recent major projects

- **UAE-based URB**, a developer of sustainable cities, is to invest $20bn to develop a new self-sufficient city in the eastern region of South Africa. The residential hub will have 40,000 units allocated across 12 residential districts. The city is expected to house 150,000 residents. Covering 1700 hectares, the net-zero smart city will have mixed-use hubs.
- **India-based Acme Group** is to construct a $13bn green hydrogen plant in Ain Sokhna, Egypt, part of the Suez Canal Special Economic Zone. The plant, to be built over 4.5 million square meters (sq m), will produce 2.2 billion tonnes of green hydrogen annually.
- **UK-based Globeleq Generation** intends to build a 3.6-gigawatt (GW) hydrogen production hub within the Suez Canal Economic Zone in Egypt. The hub is to be powered by 9GW of wind and solar capacity within the zone. The $11bn green fuel production plant will be located on an area of 10 million sq m and have a production capacity of two million tonnes annually.

The EV dichotomy: investment into manufacturing far exceeds that into raw material extraction

Alex Irwin-Hunt
Global markets editor,
fDi Intelligence

Global demand for lithium-ion batteries is expected to soar in the coming years due to the electrification of mobility and the broader energy transition. Forecasts about the battery capacity needed are staggering. McKinsey estimates that the amount of gigawatt-hours (GWh) of lithium batteries needed will increase by more than six times: from 700 GWh in 2022 to around 4.7 terawatt-hours by 2030.

More than 90% of that demand will come from mobility applications such as electric vehicles (EVs). Battery manufacturers, and the automakers they plan to supply, are in a rush to secure a steady supply of the raw materials and equipment needed to meet production demands and serve this growing market. But there is a massive disconnect in time and action within the supply chain.

An imbalance between huge investment into downstream battery and EV manufacturing compared with much lower capital expenditure into battery metals and mineral extraction risks upending the EV revolution. By consequence, the barriers to reaching electrification targets risk slowing the whole energy transition.

In 2022, foreign investors announced EV manufacturing projects worth more than $92bn, according to **fDi** Markets. By comparison, only $14.6bn was pledged to greenfield foreign direct investment (FDI) mining projects across all minerals and metals. This much smaller figure also includes investments into raw materials — such as lithium, nickel and cobalt — needed for EV batteries and other components.

The capital expenditure (capex) difference has widened significantly in recent years, but it is nothing new. FDI pledges in EV manufacturing have been higher than those in metal extraction projects every year since 2016, according to **fDi** Markets.

This massive capex split is partially a result of large-scale advanced manufacturing operations typically needing more capital investment than relatively small extraction projects. But there are other fundamentals driving the challenges facing the EV revolution.

While mining projects can take up to 20 years to start production after a deposit is discovered, downstream battery production operations can take as little as three years to start production.

Caspar Rawles, chief data officer at Benchmark Mineral Intelligence, an EV supply chain specialist, describes this imbalance in lead times of projects as "the great raw material disconnect", noting that the deficit in markets for commodities like lithium will continue until new raw material operations come online.

A lot of downstream investment is also done by cell manufacturers and automakers who are big enough to raise significant capital and invest off their balance sheet. "Those companies can make the decision to find a plot of land and get a plant built," says Mr Rawles. "But when it comes to raw material supply, it takes a lot longer."

Buoyed by generous incentive packages from the US, EU and other jurisdictions, automakers and battery manufacturers have partnered up and set out major expansion plans. In 2022, a whopping 26 mega projects (investments with at least $1bn of capital pledged) were announced in battery and EV manufacturing, compared with four into extraction projects.

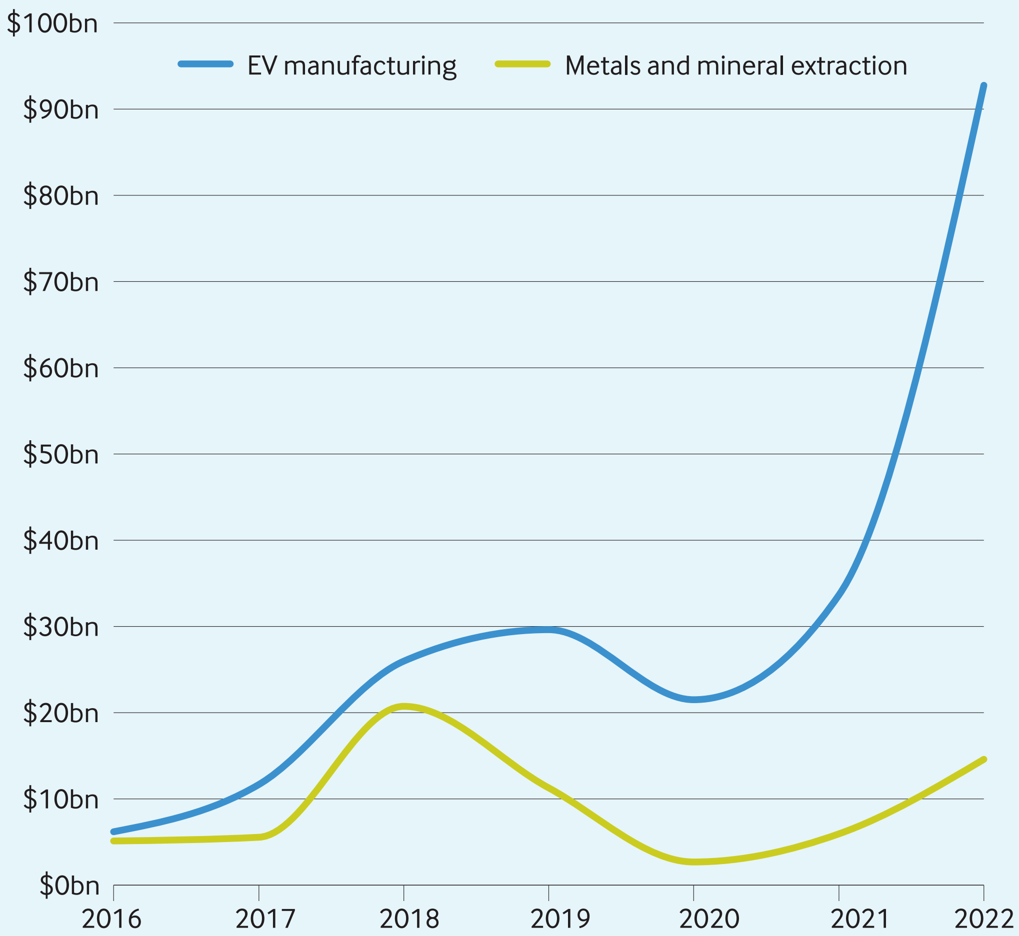
These mega manufacturing projects have proliferated globally. South Korea's Hyundai is investing $5.5bn into a battery and EV complex in the US state of Georgia. In Hungary, China's CATL is set to invest $7.49bn to build Europe's largest gigafactory, which will have capacity to produce 100GWh of batteries once fully operational.

Taiwan's Foxconn will invest $8bn into a factory in Indonesia, which will produce battery cells, cathode precursors and EVs. Meanwhile, Swedish battery start-up Northvolt is set to plough $4.25bn into a 60GWh gigafactory in Heide, Germany.

Despite the emphasis placed on the importance of minerals needed to supply all these vast factories and to meet global climate targets, mining companies are not investing anywhere near as much as they should.

Exploration spending on non-ferrous

THE GREAT RESOURCE IMBALANCE: FOREIGN DIRECT INVESTMENT INTO UPSTREAM AND MIDSTREAM OF EV SUPPLY CHAIN, 2016-2022



Source: **fDi** Markets *Includes estimates

EV manufacturing' includes greenfield FDI projects tracked in electronic component, automotive component and original equipment manufacturer (OEM) sectors. 'Metals and mineral extraction' shows tracked greenfield FDI mining projects across all minerals and metals, including those needed for EV batteries and other components.

metals stood at $11.2bn in 2021, roughly half the level seen in 2012, according to S&P Global. More than half of that spending went towards gold, rather than critical metals needed for EV batteries; just 21% went towards copper — a widely used material in green technologies, including EVs, charging infrastructure, wind turbines and solar photovoltaics. The critical need for copper in the energy transition has created a huge market opportunity.

Global copper demand is expected to grow from 25 million metric tonnes (MMT) today to 35 MMT by 2035, according to S&P Global, with supply falling short by nine MMT. Meeting this demand will need "significant investment across the whole value chain", but mining permitting processes need to be sped up in Europe and the Americas, notes Roland Harings, the CEO of Aurubis, Europe's largest copper producer.

The protectionist nature of government support throws another spanner in the works. The US Inflation Reduction Act, a bill with $369bn worth of incentives to support domestic EV production, renewables and critical minerals, is a case in point.

Automakers can only claim EV tax credits if 40% of the critical minerals contained in their batteries are extracted or processed in the US. While this is in response to China's dominance across most critical mineral supply chains, from extraction through to processing, this regionalisation contravenes global needs.

Phoebe O'Hara, an analyst at Fitch Solutions, agrees that governments could do more to support mining projects, many of which have been halted in the US and Europe due to regulatory and environmental, social and governance (ESG) barriers. An example of this was seen in Serbia in early 2022, where Rio Tinto's planned $2bn lithium mining plant was blocked due to local protests and political opposition.

"Government will need to decide whether they can offset some ESG concerns with the belief that increasing EV production is for the greater good of the energy transition," says Ms O'Hara.

Mr Harings says there needs to be a shift in public perception towards "better in my backyard" thinking and a speeding up of mining permitting processes in Europe and the Americas to more quickly scale up primary production of metals such as lithium and copper.

Several major automakers, including Germany's Volkswagen, are actively partnering with mining companies to directly source raw materials and investing further up the EV supply chains. Many are also exploring alternative battery chemistries, which use different concentrations of metals like lithium and cobalt, to help accelerate their electrification plans and minimise their exposure to issues in the supply chain.

US carmaker Ford is a case in point. It will invest $4.5bn to advance sustainable nickel production in Indonesia as part of a deal signed with nickel miner Vale Indonesia and China's Zhejiang Huayou Cobalt.

The Pomala Block HPAL Project, located in the southwest of the Indonesian island of Sulawesi, will produce up to 120 kilotons of contained nickel per year in the form of mixed hydroxide precipitate. It is expected to start commercial operations in 2026.

Latin America and the Caribbean

Key trends in 2022 include:

• Foreign direct investment (FDI) into Latin America (Latam) grew in 2022, as project numbers, capital expenditure and job creation increased by 13%, 50% and 29%, respectively over the course of the year. During the period, the number of FDI projects rose from 1119 to 1267, capital expenditure grew from $63.2bn to $95bn and total jobs created went from more than 234,000 to more than 302,000. However, last year's regional figures remain lower than levels recorded in 2019.

• Mexico was a key driver of Latam's growth, ranking as the top destination for projects, capital expenditure and job creation. A total of 433 projects landed in Mexico, constituting more than a third of all FDI projects in the region and a 27% increase compared to 2021. The country also received an estimated $35.6bn in capital expenditure, more than double the amount it received in 2021.

• Brazil was the second-most attractive destination country in Latin America, with 231 projects, $17.8bn in capital expenditure and more than 33,000 new jobs created by foreign companies. Conversely, while Brazil received the second-highest amount of capital expenditure and saw a 32% increase in projects compared to 2021, its total inbound capital expenditure decreased by 22% over the same period.

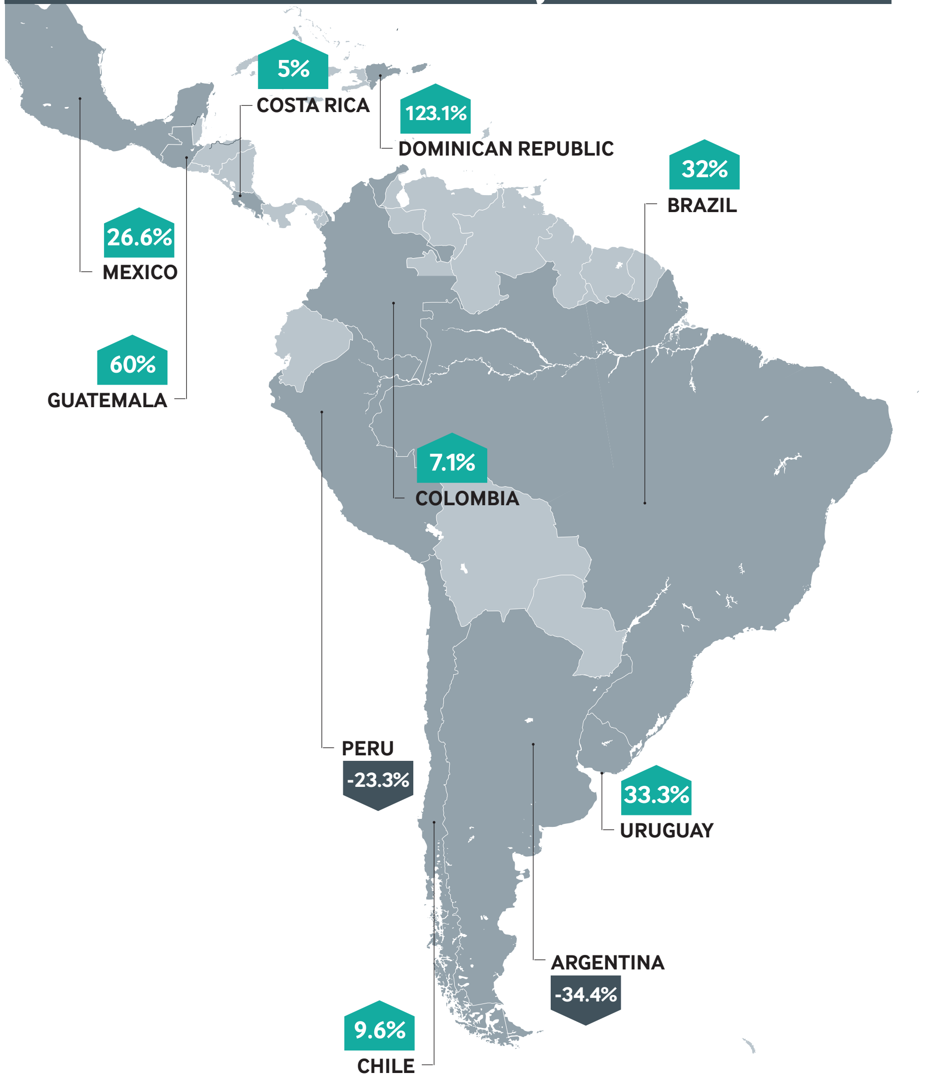
Table 1

FDI INTO LATIN AMERICA AND THE CARIBBEAN BY PROJECT NUMBERS 2022

Country	Projects
Mexico	433
Brazil	231
Costa Rica	147
Colombia	135
Chile	80
Argentina	63
Peru	33
Dominican Republic	29
Uruguay	24
Guatemala	16
Others	76
Total	1267

Source: **fDi** Markets

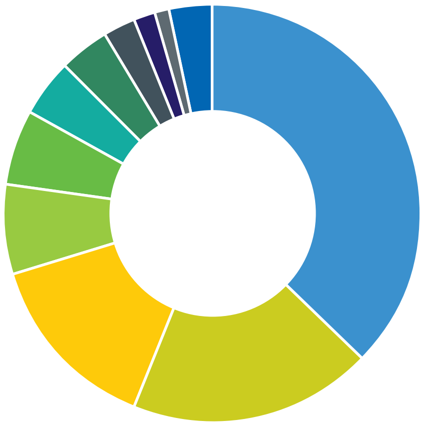
PERCENTAGE CHANGE ON 2022 BY PROJECT NUMBERS



Source: **fDi** Markets

Chart 1

FDI INTO LATIN AMERICA AND THE CARIBBEAN BY CAPITAL INVESTMENT 2022



Latin America and the Caribbean market share %		Capital investment ($bn)
37.43%	Mexico	**35.57**
18.78%	Brazil	**17.84**
14.25%	Guyana	**13.54**
7.02%	Argentina	**6.68**
5.67%	Chile	**5.39**
4.51%	Panama	**4.28**
3.73%	Dominican Republic	**3.54**
2.56%	Costa Rica	**2.44**
1.72%	Colombia	**1.64**
1.22%	Peru	**1.16**
3.11%	Others	**2.96**

Source: **fDi** Markets
Note: Includes estimates

Table 2

FDI OUT OF LATIN AMERICA AND THE CARIBBEAN BY CAPITAL INVESTMENT 2022

Country	Outbound $bn
Mexico	3.79
Chile	3.41
Brazil	1.83
Argentina	1.53
Bermuda	0.65
Colombia	0.47
Guatemala	0.36
Jamaica	0.30
Cayman Islands	0.18
Trinidad & Tobago	0.17
Others	0.65
Total	13.32

Source: **fDi** Markets
Note: Includes estimates

Table 3

FDI OUT OF LATIN AMERICA AND THE CARIBBEAN BY PROJECT NUMBERS 2022

Country	Outbound projects
Brazil	89
Mexico	64
Argentina	50
Chile	41
Colombia	28
Bermuda	24
Peru	13
Cayman Islands	10
St Vincent and the Grenadines	8
Guatemala	6
Others	27
Total	360

Source: **fDi** Markets

KEY TREND

Mexico was a key driver of Latam's growth, ranking as the top destination for projects, capital expenditure and job creation.

Recent major projects

- **US**-based petrochemical company ExxonMobil has announced plans to invest $10bn in its Yellowtail development and $3.5bn in its Uaru development offshore Guyana.
- **Australia**-based Woodside Energy, an independent energy company, is to invest $4.5bn to develop an ultra-deep water Trion oilfield offshore Mexico.
- **Celulosa Arauco y Constitucion**, a wood pulp producer and a subsidiary of Chile-based Empresas Copec, is investing $3bn to open a new pulp mill in Mato Grosso do Sul, Brazil. The facility will have an annual capacity of 2.5 million tonnes. Construction is expected to begin in 2025 and the factory is set to open in the first quarter of 2028.
- **Compania Cervecerias Unidas**, a subsidiary of Netherlands-based Heineken, is investing $2.7bn to increase the production and packaging capacity at its manufacturing plant in Luján, Argentina. The funds will also go towards innovation operations at the site. This is in addition to a $4.5bn investment at the site announced in 2020.

Top foreign investors in 2022

Switzerland-based office provider International Workplace Group (IWG) was the most active foreign investor in 2022. The company recorded a total of 160 foreign direct investment (FDI) projects, an increase of 36% on the previous year, and invested an estimated $324m in 2022. The company posted its highest-ever revenue in its 34-year history with 24% growth in system-wide revenue to $3.8bn as more companies permanently embraced hybrid working models.

US-based online retail company Amazon was the second-most prolific investor in 2022 for FDI projects. The firm announced 50% fewer FDI projects than in 2021, when it was the most active investor. Of the 97 FDI projects the firm announced in 2022, 49 were within the communications sector — 78% of those are within ICT and internet infrastructure, mainly to build and power its data centres. US-based technology company Alphabet (the parent company of Google) also announced 15 projects in the communications sector — accounting for 58% of its FDI projects.

Germany-based Deutsche Post and US-based industrial real estate developer Panattoni ranked third and fourth within the top investors in 2022 by number of FDI projects, investing in 69 and 49 FDI projects respectively. Closely related to this are transportation and warehousing firms AP Moller–Maersk and Kuehne+Nagel, who also placed in the top 20 most active investing companies in 2022 and collectively announced 67 FDI projects last year.

Automotive firms Germany-based Volkswagen and Netherlands-based Stellantis rank as the joint-ninth-most active overseas investors announcing 25 FDI projects each in 2022 and investing $9.1bn and $5.4bn respectively. Stellantis announced a $4.1bn electric vehicle battery manufacturing facility in Windsor, Canada, and Volkswagen is to create a new £2.5bn facility at its site in Crewe, the UK, to exclusively manufacture electric vehicles.

Of the top 20 most active investing companies in 2022, four operate primarily in the software and IT services sector. Major technology firms such as Alibaba, Unity Technologies, Danir and Alphabet announced a combined 106 projects in the year with an estimated cumulative capital investment of $5.7bn.

Companies operating primarily in the coal, oil and gas industry made a comeback in 2022. France-based TotalEnergies, US -based Exxon Mobil, UK-headquartered Shell PLC and Italy-based Eni SpA all ranked within the top 20 companies in terms of capital invested. These companies, while also investing in renewables, accounted for more than $98bn in capital investment last year, which equates to approximately $1.7bn per project. Investments purely in fossil fuel projects accounted for $57.5bn of the total amount invested by these companies in 2022 with Exxon Mobil and Shell PLC posting impressive revenues for 2022 of $398.7bn (44% growth year-on-year) and $381.3bn (46% growth year-on-year) respectively.

With $343.6bn invested across 527 projects in the renewable energy sector in 2022, it is fitting that there are several related companies within the top 20 investors. Several capital intensive FDI projects, many of which fall into green hydrogen, were announced by TotalEnergies, Energias de Portugal, Eni SpA and Acme Group during the year.

Posco was the top company for capital investment in 2022. The South Korea-based iron and steel company is to invest an estimated $40.1bn overseas, primarily across two mega-projects announced in December to build a green steel production factory and green hydrogen manufacturing facility in Australia by 2040. The leading company for overseas job creation was Hon Hai Precision Industry (Foxconn). The Taiwan-based company announced plans to create an estimated 83,700 jobs globally in 2022.

Given the continued high demand in the semiconductor industry, three of the top 20 companies by outward capital investment announced major projects in the sector. US-based Intel, Taiwan-based Taiwan Semiconductor Manufacturing and UK-based Vedanta Resources announced FDI projects valued at $28bn, $19.9bn and $13.9bn respectively.

TOP 20 MOST ACTIVE FOREIGN INVESTORS WITH ANNOUNCED PROJECTS IN 2022

Source: fDi Markets Note: Includes estimates

About fDi Intelligence

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