# 腾讯碳中和目标及行动路线报告

## Tencent Carbon Neutrality Target and Roadmap Report

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In order to support a sustainable transformation of our markets, we have developed challenging goals and action plans to ensure that Tencent itself is positioned to make meaningful contributions to the global aspiration of carbon neutrality.

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During China's Two Sessions (the annual session of parliament and its advisory body) in 2021, Tencent Chief Executive Pony Ma submitted a report titled: "Suggestions on Implementing New Development Concepts and Promoting China's Science and Technology Enterprises to Achieve Carbon Neutrality." At that time, Tencent began setting its carbon neutrality goal and emissions reduction plan. After almost a year of exploration and practice, we have determined Tencent's carbon neutrality goal to be the following:

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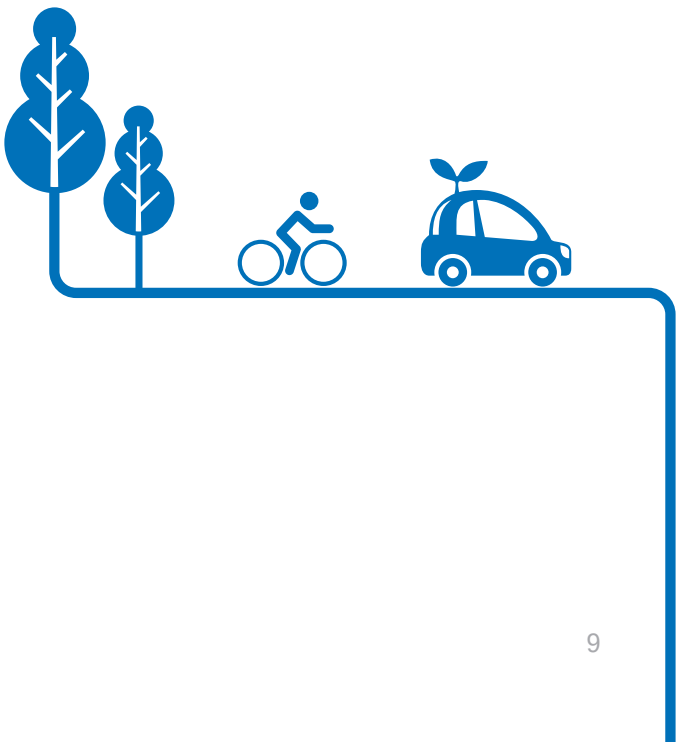
- Tencent hopes to set stricter requirements for itself and become a pioneer in carbon neutrality among technology enterprises. We have benchmarked ourselves against global internet companies and we are determined to achieve comprehensive carbon neutrality in our operations and supply chains as soon as possible;
- Through a detailed examination of Tencent's own greenhouse gas emissions, as well as the planning and preliminary implementation of emissions reduction plans, we believe that it is challenging but feasible to achieve carbon neutrality in our operations and supply chain in the next 10 years;
- Meanwhile, the next 10 years will also be a stage of rapid carbon-neutral transformation for China and its entire society. The proportion of new energy resources used in power grids will greatly increase, and important tools such as the sustainable-power trading system, carbon-trading market, and voluntary emissions-reduction market, will all take shape rapidly. New low-carbon technologies will emerge one after another. We hope to actively participate in this process and assist the development of emerging technologies and improvement of market mechanisms. We have therefore considered and put forth our overall goal of achieving carbon neutrality in our operations and supply chain by 2030.



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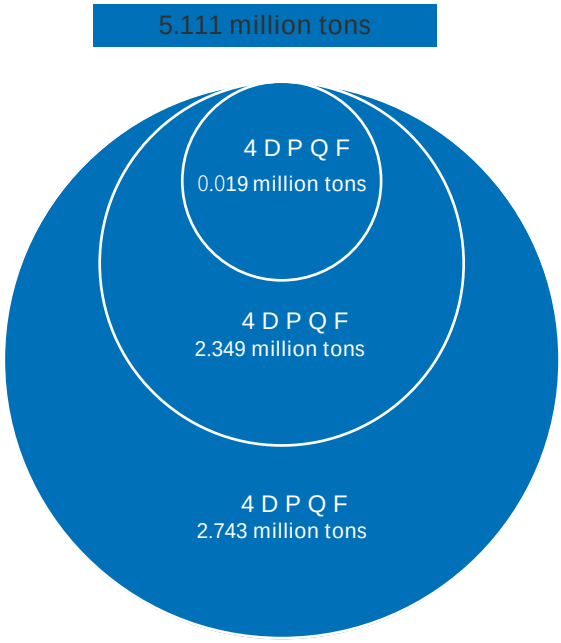


In 2021, Tencent emitted the equivalent of 5.111 million tons of carbon dioxide across three main categories:

### 4DPQF

Emissions from sources owned or directly controlled by Tencent, such as company-owned vehicles, fuel generators, and coolants, amounted to 0.019 million $MtCO_2e$, or 0.4% of the company's total emissions.

### 4DPQF

Emissions from the generation of power and other energy purchased for Tencent operations, for example, electricity consumed by company-owned or jointly constructed data centers and o f ce buildings, amounted to 2.349 million $MtCO_2e$, or 45.9% of the company's total emissions.

### 4DPQF

Indirect emissions from the supply chain, such as infrastructure materials, purchased servers and energy use in company-leased data centers, and employee commuting, amounted to 2.743 million $MtCO_2e$, or 53.7% of the company's total emissions.

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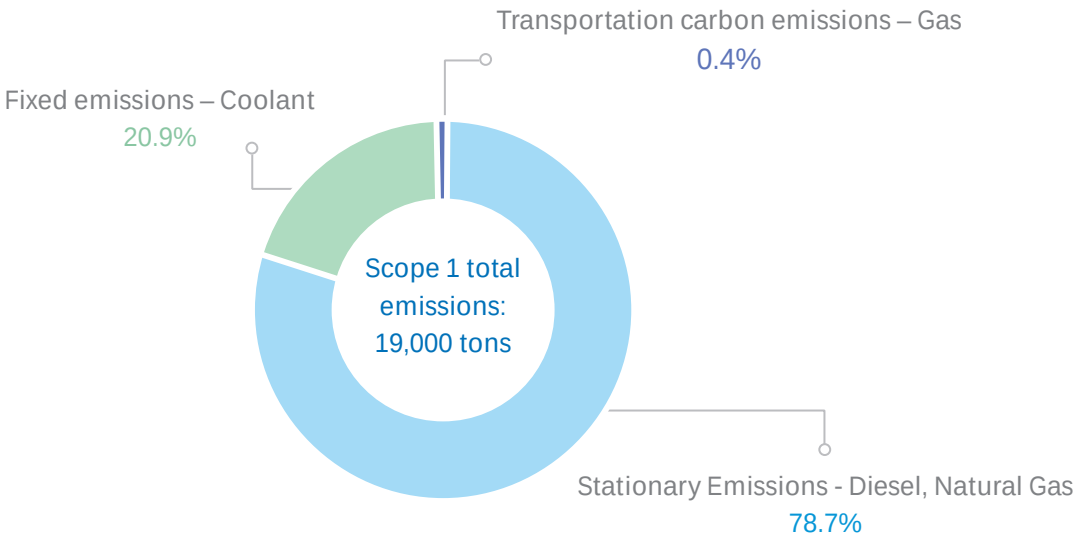
Emissions from Tencent's own operations include direct emissions (Scope 1) and indirect emissions (Scope 2), of which indirect emissions account for an absolute proportion of Tencent's operational emissions.

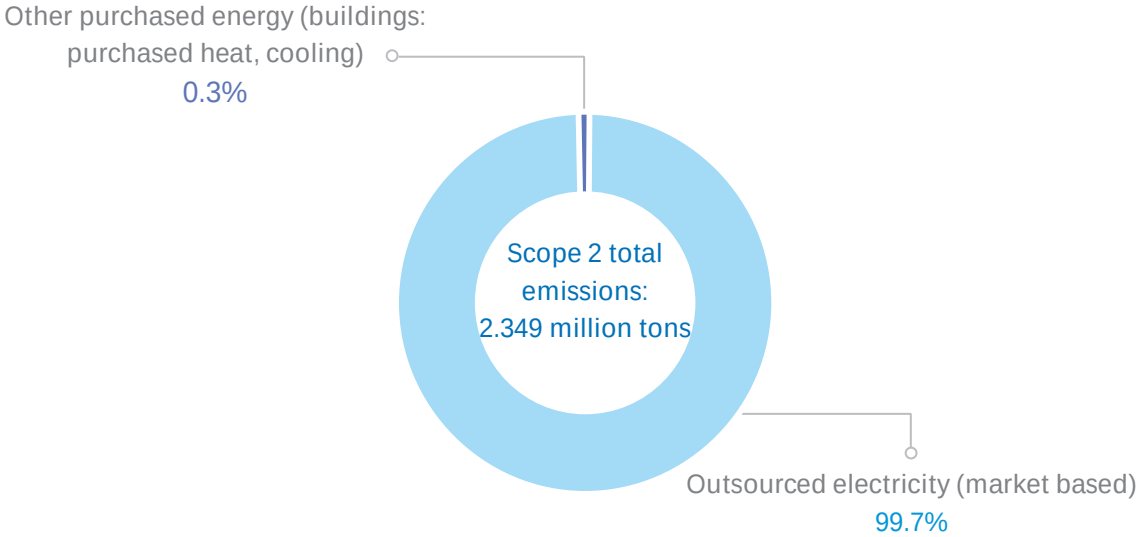
### 4DPQF

In direct emissions (Scope 1), stationary emissions are the predominant emissions sources, including diesel, natural gas, and coolant emissions, which are respectively 78.7% and 20.9%. Both are used for the operation of owned buildings and data centers, and the other 0.4% comes from company-owned vehicle fuel.




### 4DPQF

Indirect emissions (Scope 2) result in the bulk of emissions from operations, accounting for more than 99% of the total operating emissions. This mainly consists of purchased electricity and a small part from other types of purchased energy, such as heating, as well as the operation of co-constructed data centers and owned and leased buildings.



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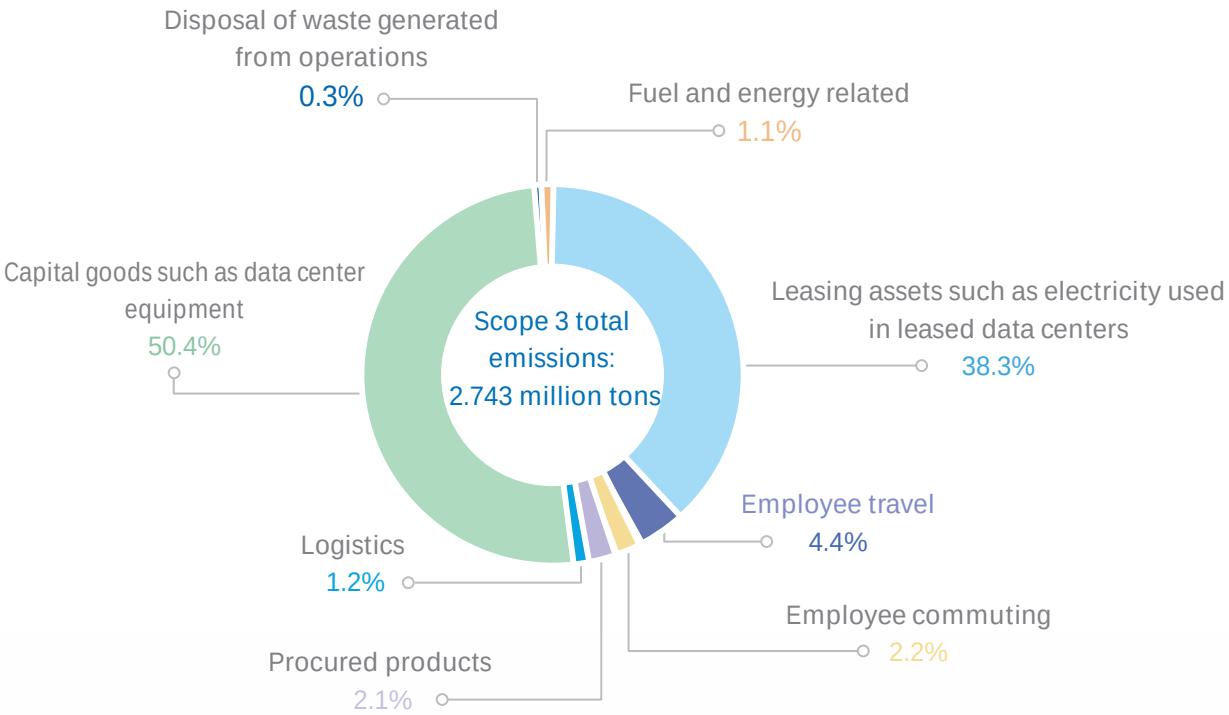
### 4DPQF

Greenhouse gas (GHG) emissions in the supply chain mainly come from capital goods (such as data center equipment and infrastructure consumables), energy used in leased assets (such as electricity for leased data centers), and employee travel, as well as other product procurement, employee commuting, logistics, and other fields.



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We set 2021 as the baseline year for Tencent's carbon neutrality initiative. According to the scope and calculation methods defined in the Greenhouse Gas Inventory Protocol (GHG Protocol) jointly issued by the World Resources Institute (WRI) and the World Business Council for Sustainable Development, we conducted a systematic carbon audit, covering Tencent's Scope 1, 2, and 3 emissions. The definition of each scope and the main emissions activities are as follows:

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|---|---|---|
| Scope 1 | Direct emissions from GHG sources owned or controlled by Tencent | ■ Fuel for generators and power generation equipment<br>■ Company-owned vehicle fuel<br>■ Coolant escape |
| Scope 2 | Indirect greenhouse gas emissions from electricity or other energy sources purchased by Tencent | ■ Owned and co-built data center electricity<br>■ Electricity for owned and leased buildings<br>■ External procurement of heating for owned and co-built data centers<br>■ External procurement of heating for owned and leased buildings |
| Scope 3 | All other indirect emissions from Tencent's supply chain | ■ Electricity for leased data centers<br>■ Upstream production of servers and building materials<br>■ Business travel<br>■ Employee commuting<br>■ Upstream raw materials, production of office supplies<br>■ Transportation of fuel, transmission losses<br>■ Operational waste, garbage disposal<br>■ Transportation of raw materials and commodities |

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The Greenhouse Gas Inventory Protocol (GHG Protocol) jointly issued by the World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD) categorizes companies' greenhouse gas emissions into Scopes 1-3. Scope 1 is defined as "Emissions from operations owned or controlled by the reporting entity"; Scope 2 is defined as "Emissions from purchased or acquired electricity, steam, heating, or cooling consumed by the reporting entity"; and Scope 3 is defined as "All indirect emissions (not included in Scope 2) that occur in the company's supply chain, including upstream and downstream emissions".

More than 90% of Tencent's emissions are concentrated in electricity and infrastructure and equipment procurement, and the remaining emissions are very scattered. Covering all of Tencent's emission sources, we coordinated with data centers, administration, finance, infrastructure, and other departments to take an inventory of Tencent's carbon emissions baseline and build a detailed data collection system.

In this carbon inventory process, we adhered to a scientifically rigorous attitude and strived to be accurate and comprehensive, but were subject to differences in the availability of data from different emission sources. The accuracy and comprehensiveness of the data still needs to be improved. For example, for Scope 3, we conducted an inventory of key Scope 3 carbon emissions based on the GHG Protocol. In the future, we will continue to improve the inventory process to accurately define the range of Scope 3 GHG emissions, sort out variations in Scope 3 GHG emission sources due to business changes, and adjust and update them year by year.

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- In this inventory, the emissions calculated based on actual carbon emission activities accounted for about 65% of total emissions, such as the electricity consumption of Tencent's owned and co-built data centers in various provinces, some infrastructure consumables, travel mileage, and fuel. We calculated emissions based on the emission factors of actual carbon-emitting activities, such as the emission factors of the power system in each province, the average emission factors of various building materials, etc.
- About 30% of emissions were calculated based on expenditures, such as some equipment purchases and some travel expenses, which were estimated according to the average emission factor per yuan.
- Due to the lack of availability and completeness of some data, less than 5% of the emissions were calculated with the "industry average per capita level" method, such as waste, employee commuting, etc. These were estimated according to per capita consumption and the corresponding emission factor.

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- In this inventory, the company sought to pursue comprehensive data coverage, with most of our emissions statistics covering more than 90% of the accounting range that could be identified for corresponding categories.

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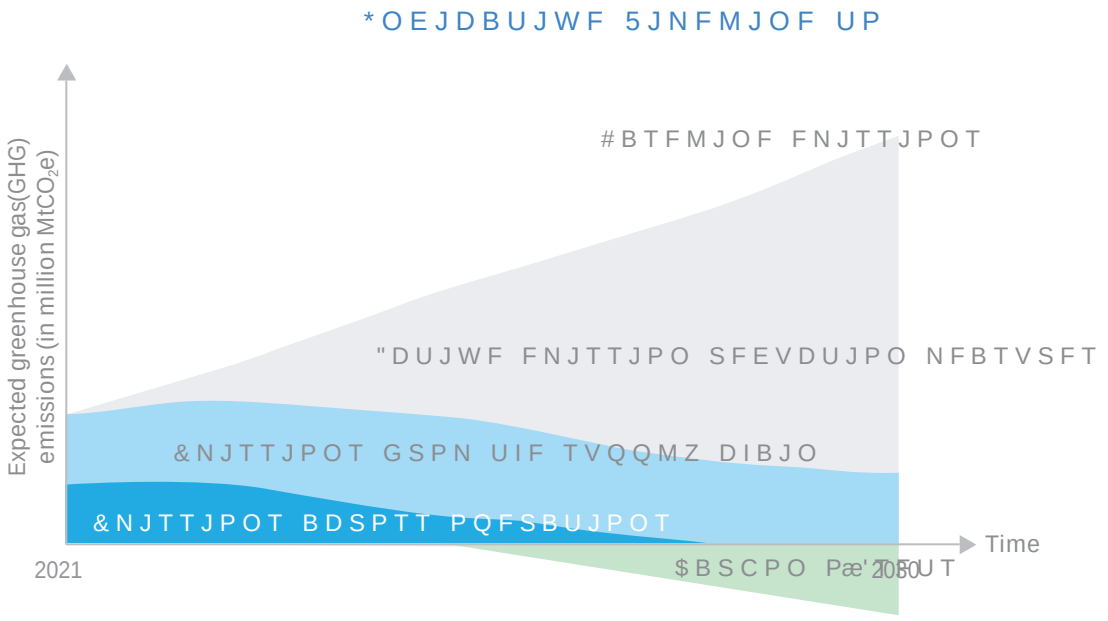
Tencent will prioritize the use of active emissions reduction measures while keeping the use of carbon offsets to a minimum, and promote carbon neutrality in our own operations and supply chain. First of all, we strive to improve efficiency through energy conservation and to control and reduce emissions by reducing energy consumption per unit of output value even as business grows, thereby significantly improving resource efficiency. Secondly, we will greatly increase the proportion of renewable energy we use, especially in our electricity consumption. We will actively participate in renewable power trading and explore investment in and development of new energy projects, which will decouple our energy demand and carbon emissions. Finally, we will use carbon offsets as a supplementary method based on actual needs and eventually achieve carbon neutrality. During this process, we will prioritize the use of active emission reduction measures and minimize the use of carbon offsets, which is consistent with the basic principles of the 1.5° C target of the Paris Agreement.




*Baseline emissions:Level of GHG emitted in the absence of any measures to reduce emissions

It is estimated that by 2030, Tencent will drive emissions reductions in our operations (Scope 1 + Scope 2 + employee travel/commuting) through proactive emission reductions, while advancing emissions reductions in our supply chain (Scope 3). For a few parts of the supply chain in which it is difficult to reduce emissions, mainly equipment procurement and building materials, we will carry out offsetting by buying carbon emission reduction credits to achieve overall carbon neutrality in our Scopes 1-3.

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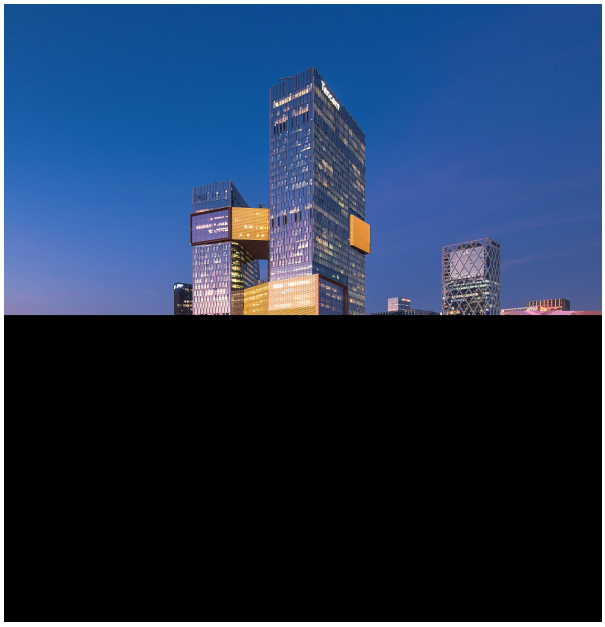
Through technological improvement and management optimization, we shall strive to reduce the demand for new energy while striving to improve our energy e f ciency as part of achieving our carbon reduction goals.

### &OFSHZ 3FEVDUJPO JO 0æ*DF #VJMEJOHT

Even before the launch of our carbon neutrality plan, Tencent has promoted energy-saving e f orts in our o f ce buildings for many years and has achieved recognition for this work. We design our o f ce buildings with energy conservation at top of mind. Tencent has a number of buildings that have obtained LEED Gold certi f cation, including the Shenzhen Binhai Building, Beijing Tencent Building, Chengdu Tencent Buildings A and B, Shanghai Binjiang Building, and others. The Shenzhen Binhai Building, Chengdu Tencent Buildings A and B, and our Wuhan R&D Center have also obtained a 2-star rating from China's Green Building Rating Program.

We also promote energy conservation in our o f ce buildings through various means such as energy consumption management and technological transformation. Since 2012, Tencent has performed energy audits and optimized operations of our owned and leased o f ce buildings to make them more energy e f cient. Our energy-consumption management work has covered all of Tencent's owned and leased o f ce space and is expanding to take into consideration buildings under construction and planning. We continuously work to reduce the emissions of our o f ce buildings by fully understanding and analyzing the systems of each building, and then continually investing in energy-saving renovations of lighting, HVAC, water, and other facilities on the basis of their safe operation and not impacting employees' experience. Tencent's building operation work has also been recognized professionally. The Shenzhen Binhai Building and Chengdu Tencent Buildings A and B have obtained LEED Gold certi f cation, and the Beijing Tencent Building is undergoing LEED Platinum certi f cation.

We actively educate our employees about the importance of reducing emissions and regularly hold informational and other activities to encourage them to develop eco-conscious habits such as turning o f lights and reducing air conditioning. We have also found it important for Tencent to collaborate with partners, set energy management plans with our property management partners, and establish key performance indicators (KPIs) to jointly promote energy conservation in each building.



Tencent Binhai Building

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Around 2012, Tencent began planning a new office building, the Tencent Binhai Building. From the beginning of the design process, full consideration was given to low-carbon approaches and energy reduction. The roof of the building and the surrounding paving stones consisted of water-absorbing "sponge bricks" that help to recycle and reuse rainwater, thereby reducing consumption of tap water in the restrooms and for greenery and creating the first "sponge building" in the country. Meanwhile, the orientation, curtain wall, and shutters of the building were specially designed on the basis of geographic information to maximize the use of natural light and reduce the power consumption of internal lighting. The building's paper products, including facial tissue, paper towels, and printer paper, have all passed Forest Stewardship Council certification, meaning they are made using sustainable forestry practices. In 2020, by implementing energy-efficiency measures such as optimizing the air conditioning controls, the Binhai Building saved 5.98 GWh of electricity and reduced emissions by the equivalent of about 2,690 tons of carbon dioxide compared with 2019.

Panorama of Tencent Gui'an Qixing Data Center

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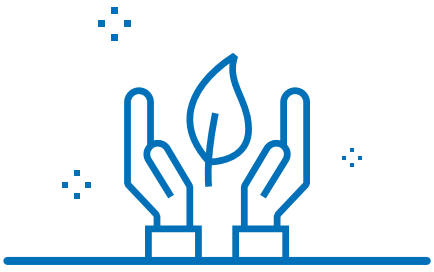
Tencent's fourth-generation data center technology, T-Block, can achieve rapid delivery of data centers in a standardized, productized, and prefabricated manner. T-Block shortens civil construction time by 50% and the delivery time of mechanical and electrical systems by 40%, meaning a facility can be completed in just one year. The energy-saving mode integrates various energy-saving technologies, and the office electricity, power-supply module, IT module, cooling module, and solar-power generation are all packaged into "containers" to achieve ultra-low energy consumption. The Power Usage Effectiveness (PUE) is below 1.3. By way of example, a campus with 300,000 servers can save about 250 GWh of electricity a year compared with a traditional data center.

At the system level, TencentOS's WuNeng system adaptively sets CPU scheduling policies according to the business load of the data center to achieve the lowest system power consumption while still ensuring business performance. During verification scenarios, the WuNeng system accounted for about 10% of the overall reduction in energy consumption of the complete build. It is expected to save 200 GWh/year after large-scale adoption in 2022-2023.



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In order to improve the cooling e f ciency and reduce the energy consumption of the data center, Tencent Data Center has tested many emerging technologies, such as natural cooling, liquid cooling, tri-generation, waste-heat recovery, and other innovations.

- The Tencent Gui'an Qixing Data Center was built in a cave in Guizhou Province in southwest China, making full use of the natural low temperature to greatly reduce the use of air conditioning. T-Block makes wide use of advanced, self-developed, indirect evaporative-cooling air handling units. By taking advantage of the cool outdoor air combined with water spray, these units replace large compressor systems to achieve low PUE operation. We are also exploring extremely e f cient data center technical solutions using cold plate liquid-cooling technology. We have already conducted a small-scale pilot in the Qingyuan area, and it has achieved a PUE as low as 1.06.

- On its foundation of solar power generation, Tencent's Shanghai Qingpu Data Center has adopted tri-generation to achieve greater energy e f ciency. We built a natural gas plant to power the data center. Hot water and gas produced by the power generation are introduced into evaporative cooling equipment to produce chilled water to cool the data center. In winter, the hot water can also heat the surrounding o f ce buildings and residential areas. The primary energy utilization rate of the entire system is greatly improved, and energy gradient utilization is achieved.

- Tencent's Tianjin Data Center recycles waste heat generated by the servers. Through a heat pump, water in the municipal network can be heated to 55C for residential heating in winter. This can reduce carbon dioxide emissions by 52,400 tons per year, equivalent to planting 2.86 million trees, equal to a forest covering 2,500 football fields. We plan to implement this technology in our Huailai, Zhangjiakou facility to realize more eco-friendly heating.

Waste Heat Recovery System in Tianjin Data Center

## %BUB $FOUFS *OUFMMJHFODF 1MBUGPSN

Tencent Data Center has combined proprietary cutting-edge technology, diverse operating and management scenarios to create the data center intelligence platform. The platform manages more than 100 of Tencent's data centers around the world, accessing data from more than 15 million infrastructure measurement points. The platform applies automated management, monitoring and analysis, and intelligent recommendations to help make our data centers more e f cient and eco-friendly.

In 2021, Tencent data center intelligence platform continued to play an important role in our carbon neutrality e f orts through functions including carbon emissions inspection, load forecasting, AI cooling optimization, AI forecasting of equipment health, analysis of renewable energy utilization, and microgrid monitoring. The platform can automatically and accurately obtain energy data in real time and carry out re f ned classi f cation, statistical, and scienti f c modeling. Combined with big data and arti f cial intelligence, it can provide the most economical energy and emissions reduction solutions to assist in operational decisions.

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We have used our experience to encapsulate large data center planning methodologies, such as the Normandy model and the Tbase model. An example of this is the modular design of our fourth-generation T-Block data center technology, discussed above.

### PO3FEVOEBO %FTJHO

Overall optimization of DR power-supply architecture, overall DC redundancy optimization, and battery-system design optimization

### &OFSHZ 6

Improve CPU utilization of main IT equipment and improve energy-conversion e f ciency of key power equipment

### $PPMJOH 5FDIOPMP

Make full use of air cooling and experiment with cold plate liquid cooling to control the temperature of high-power servers

### 4JUF 4FMF

Comprehensive consideration of local new energy sources, external power resources, network infrastructure such as internal and external connections and communication, business needs, climate, and other factors

### JPO -PBE 0QUJNJ[BU

Use AI algorithms to predict server demand peaks to intelligently load-shift and better achieve load balancing and renewable power matching

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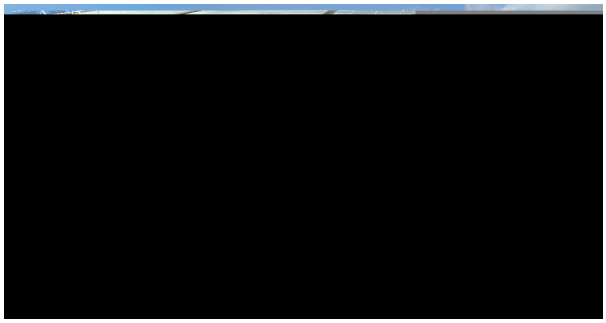
Electricity consumption, especially in data centers, is the main source of carbon emissions for internet technology companies. The carbon emissions indirectly generated by the purchased electricity of Tencent's data centers and buildings account for more than 65% of our total emissions. Given the constant rise in demand for computing power, even while factoring in improvements in energy efficiency, we expect that related electricity consumption may continue to grow. Significantly increasing the proportion of renewable energy we use and breaking the link between energy demand and carbon emissions are of strategic significance for Tencent if we are to achieve carbon neutrality as scheduled.

At present, China's renewable energy market is still developing, and so are related policies and market mechanisms. The overall supply and reliability of renewable energy still needs to be improved. For enterprises, there are challenges in purchasing renewable energy on a large scale. For example, renewable energy is usually directly connected to the end users, and it is di f cult to purchase 100% renewable energy through the power grid. Tools like green energy certi f cations are still in their early days, and related policies are still being explored. We are working diligently in many areas to meet these challenges and increase our mix of renewable energy. We have begun exploring distributed new energy, microgrids, and other technology at our own data center nodes with the help of rooftop solar cells and other facilities. Meanwhile, we are actively making transactions for cleaner energy, promoting development of the market, and exploring investment in and development of new energy programs.



Tencent Data Center Roof Photovoltaic

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In 2020, Tencent o f cially launched the development and construction of distributed rooftop solar cells at our data centers. Due to reliability and safety issues, data centers pose more challenges to photovoltaic installations compared to those at industrial and commercial enterprises. After repeated engineering and technical demonstrations, distributed solar project of 6.6 MW came online at Tencent's Qingyuan Qingxin Data Center Park in September 2021 and has so far generated more than 4 GWh. We are also pleased to announce that the 13 MW distributed solar installation at Yizheng Data Center began generating power in February 2022. Additionally, we are planning some 32 MW worth of distributed solar projects at our Qingyuan Qingcheng, Tianjin High-tech Zone, Shanghai Qingpu, and other locations, as well as exploring a 30 MW integrated wind-solar project in Huailai, Hebei. This re f ects a new model of more eco-friendly and lower-carbon data centers. To date,

neutrality. Players can build a carbon-neutral island through urban reconstruction, ecology districts, and carbon-neutral demonstration areas. The game strived to mimic the carbon-neutral construction paths in real life and covered knowledge on industrial transformation and improvement, personal emissions-reduction, and environmental preservation. It innovatively explored the intersection of games and real-life charity, encouraged players to participate in environmental programs, and helped raise awareness of a low-carbon lifestyle among the public.

Tencent Carbon Island Homepage

Meanwhile, Tencent Games TiMi Studio was invited by the United Nations Environment Programme (UNEP) to join the 1 M B Z J O H G P S U I F 1 M B O F U ". The studio announced a series of initiatives to work with the industry and use the power of gaming to raise public awareness of environmental protection and achieve carbon neutrality. Since that promise in 2021, the environmental content in TiMi games has reached 110 million players and helped them better understand climate challenges. In collaboration with UNEP and Tencent Institute of Games, TiMi also held an environmental track under the Tencent Next Idea Youth Game Developer Championship, reaching more than 300 universities around the world. Promoting diverse, positive social values in our games is something we have been committed to for a long time, and we will continue to explore using games to raise awareness of low-carbon concepts.

Playing for the Planet Alliance

On the foundation of spreading low-carbon knowledge, turning the value of emission-reduction into incentives for the public is also e fective. Carbon incentive mechanisms will be an important tool to advocate for the low-carbon lifestyle. In the exploration of Tencent carbon incentive mechanisms, we pay more attention to scienti fc methods of emissions-reduction accounting. In December 2021, Tencent and the Shenzhen Municipal Bureau of Ecology and Environment jointly launched the - P X $ B S C P O 1 M B O F U Mini Program, which was the frst authorized carbon incentive mechanism pilot product in Shenzhen as well as Tencent's frst foray into this feld. In this Mini Program, everyone gets a small planet of their own. By taking public transportation and adopting other low-carbon behaviors in real life, people accumulate a carbon score that can help the evolution and growth of their virtual planet. Low-carbon travel was the frst scenario launched. Based on the "Work

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Tencent strives to embrace industry and contribute to the real economy through digitalization. We believe that digitalization will play an important role in the process of carbon neutrality. Low-carbon innovation and optimization of the industrial structure is a complicated process. It requires different aspects of innovation, including new technologies, efficiency improvement, and evolution of management models. Each step is full of challenges. As a technology enterprise, digitalization is where we can play the biggest role in low-carbon transformation. Based on our years of experience in the internet industry, there is no doubt that digitalization plays a significant role in improving efficiency. As more enterprises begin to manage their own carbon emissions and join in carbon trading, digital technology will play an indispensable role in the calculation and management of carbon assets, as well as the sharing of emissions-reduction methods and paths across different industries. The low-carbon transition will also increase demand for automation, the Internet of Things, advanced data analysis, and artificial intelligence. Based on these considerations, we have started exploring and facilitating the low-carbon transformation of the industrial sector.

Just like every enterprise needs a financial system, a clear corporate carbon ledger is indispensable. A measurement, reporting, and verification (MRV) platform for corporate carbon emissions is becoming more and more important. In creating an .37 QMBUGPSN GPS DPSQPSBUF DBSCPO BDDPVOUJOH, digitalization can play an important role. Carbon emissions are measured in an iterative manner, and multiple data sources can be used to improve data accuracy. Reporting and disclosure requirements are complex and diverse, and software can help easily complete all kinds of disclosure requirements. Data systems can provide semi-automatic verification. We are also exploring the use of blockchain and other cutting-edge technology to provide effective solutions for issues like difficulty data collection, large workloads, and missing or lost data. This ensures that the entire carbon path is traceable and makes it easier for managers and staff to stay informed of real-time carbon emissions, conduct analysis, and make decisions.

Digitalization can optimize the intelligent management of different elements and systems by adding functional modules, and significantly improve resource efficiency from the perspective of energy consumption optimization and reliability. In terms of architecture, Tencent launched the 4NBSU #VJMEJOH .BOBHFNFOU 1MBUGPSN, which is an Internet of Things operating system deeply adapted for smart building scenarios. The system was deployed in the comprehensive energy-management transformation of the headquarters of China Power Investment Corp. (CPI Group) in 2020. Working with CPI Group's own intelligent resource-management platform, it helped to realize the digital management of all digital and physical processes and elements. For instance, it created

an integrated microgrid including rooftop, ground, and curtain wall solar cells, as well as wind. At the same time, power generation, storage, and usage are analyzed pushed to users through desktops and Mini Programs. In this way, we can explore intelligent building solutions to help the innovative development of distributed energy in the region.

In terms of industrial campuses, Towngas Energy and Tencent Cloud built a zero-carbon campus intelligent energy platform based on 5 F O D F O U $ M PöT E& O F S H Z . Tencent Cloud's expertise in digital technology, combined with Towngas Energy's comprehensive energy development and management experience, resulted in a more comprehensive and superior digital energy solution. The platform supports intelligent energy-data management analysis, prediction, and optimization to provide clear carbon emissions reports and accurate and e f cient carbon management. In the future, the platform can also f exibly expand to include energy-e f ciency management, energy trading, carbon trading, and other applications to help industrial campuses accelerate their zero-carbon development.

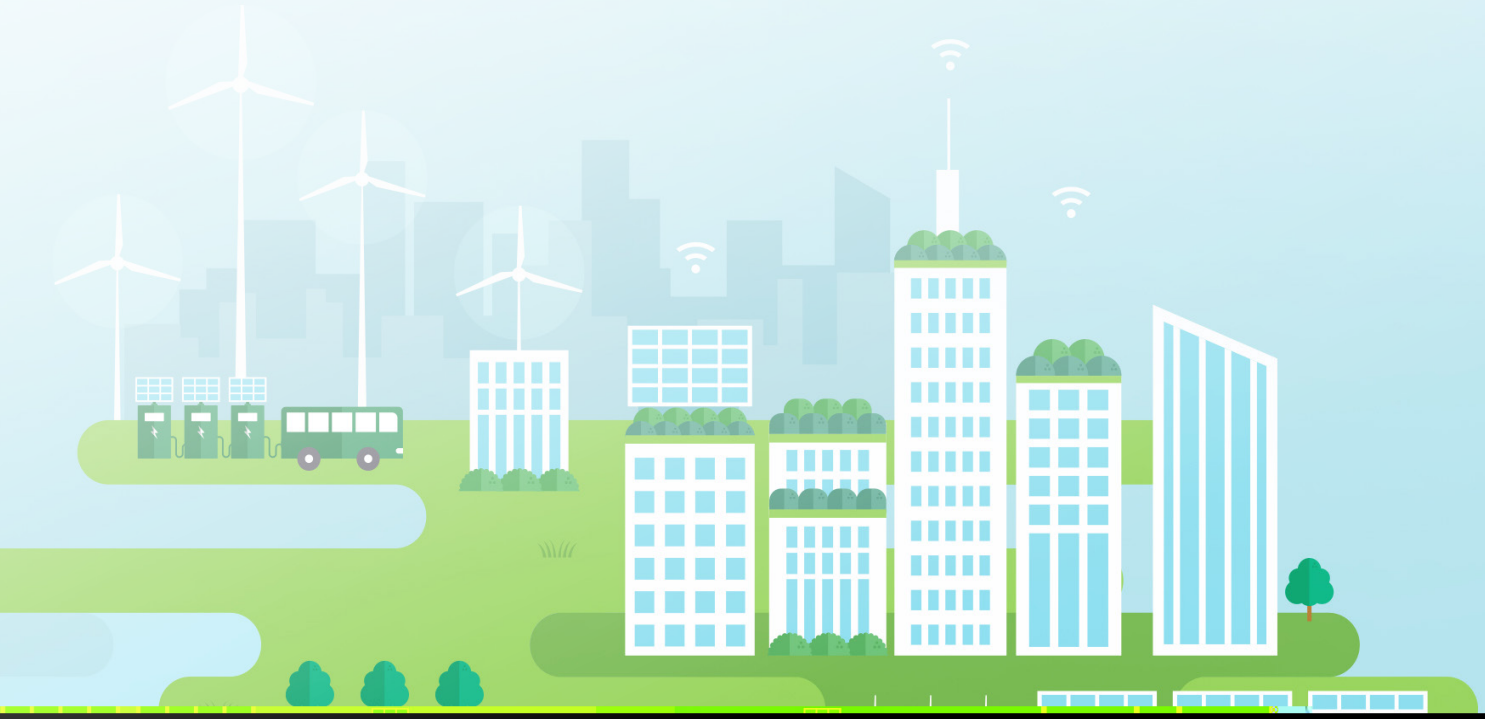
Companies' low-carbon operation cannot be achieved without e f cient and convenient P O M J O F Pæ* D F UWeChat launched Tencent Meeting/ VooV, WeCom, Tencent Docs, and WeCard to help enterprises promote paperless o f ces, e fectively solve the problem of long-distance communication, and signi fcantly reduce business travel needs for all industries. In December 2019, we launched our Tencent Meeting/VooV video conferencing product. Since the launch of the product, it has resulted in the cumulative reduction of more than 15 million tons of carbon emissions.

When looking at broader human society, Tencent has been exploring how digitization and AI can help solve challenges in food, energy, and water for many years. David Wallerstein, Chief eXploration O f cer of Tencent, f rst proposed the initiative of "* G P S '& 8 at a seminar co-hosted by UN-Habitat and Tencent in April 2019. The idea is to use arti f cial intelligence to tackle the three global challenges of food, energy, and water to help achieve sustainable development goals. Since then, Tencent has explored new frontiers in how AI can be applied to areas such as agriculture, thermal power, and energy savings. For example, smart thermal power plants can enable preventive maintenance of equipment, improve equipment reliability, reduce boiler fuel costs, and improve power-generation e f ciency. David Wallerstein's book, AI For Few, elaborated on these theories and revealed behind-the-scenes stories of how Tencent helped agriculture through the power of AI. At the same time, in the context of climate change, climate prediction is an important means to improve adaptability. Tencent is working with the startup Reask to explore AI-powered, high-order climate prediction models to optimize disaster models and climate analysis methods and help enterprises and society better cope with the risks brought by climate change.

Along with the rapid development of digital products, demand for digital infrastructure is also increasing across society. The transition of traditional IT infrastructure to cloud computing has improved the e f ciency of resource utilization and o fered another potential avenue to reduce emissions. Moreover, the variety of measures Tencent has taken to reduce emissions at our data centers has helped optimize energy consumption and increased the proportion of renewable energy.

These measures have not only helped progress towards carbon neutrality in Tencent's own operations and supply chain, but have also provided MPX DBSCPO DPNQVUJOH QPXFS clients reduce their own carbon footprints.

As we travel down the road of carbon-neutral transformation, we believe digitalization has a lot to offer, with many promising areas worth exploring. For example, in order to further improve efficiency and optimize energy consumption, automation will play a more important role in industry. In the energy system of the future, solar, wind and other alternative energy sources are inherently random, intermittent, and unstable. Microgrids, energy storage, and other fields are also developing rapidly. Digitalization can help contribute to building a more flexible and intelligent energy system. As more and more enterprises undergo the low-carbon transition, digitalization will see further developments, such as more accurate monitoring of carbon emissions and more precise management of energy consumption and carbon assets. We will work closely with internet partners in various industries to explore how digitalization can facilitate the low-carbon transformation.



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Tencent has long been involved in charitable works. In 2007, we established the Tencent Charity Foundation. Over the years, we have found that traditional approaches to charity have only a limited impact on many major social issues. By bringing digital technology, innovative models, and a business perspective, we hope that sustainable innovation can truly solve social issues at scale. In 2021, Tencent established the Sustainable Social Value Organization (SSV) with "Tech for Good" as its mission. The SSV is tasked with exploring high-quality and sustainable action plans through innovations in technology, products, and approaches. It shares social values and enhances social well-being, which is also the organization's primary goal.

Carbon neutrality needs such exploration. Carbon neutrality is not only an environmental issue but also a development issue. We face two challenges: to quickly decarbonize industry and society, and also rapidly create, develop, and deploy emerging technologies. Under these circumstances, commercial viability is particularly important. The transition to carbon neutrality can only be achieved if high-quality, low-carbon products and technologies are mature and commercially viable. Within our SSV organization, we established a Carbon Neutrality Laboratory to accelerate the innovation and development of low-carbon technology, products, and models. In addition, we cannot overlook the fact that the low-carbon transformation will be accompanied by social and economic changes, including ones touching on survival and development, fairness, and justice. Therefore, Tencent also integrates carbon neutrality with its rural revitalization and other initiatives, aiming to focus on different social groups involved in the low-carbon transformation and on social development from a broader and long-term perspective.

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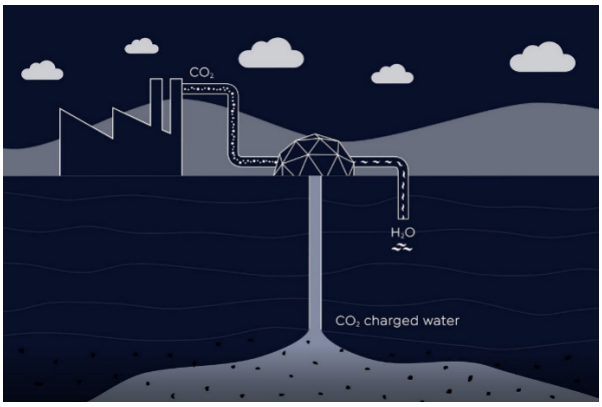
We are well aware that the low-carbon transformation of society cannot just rely on changes in public awareness and the e f ciency improvements brought by digitalization. It also requires a variety of disruptive and innovative physical technologies. Technological innovation is playing a decisive role in every f eld, from cleaner power systems and more renewable energy, to innovative industrial processes, electric transportation, and eco-friendly buildings. This includes the further iteration of existing commercial technologies, for example, speeding up commercialization of alternative energy solutions. It also includes new technologies that have not been widely used in the market, such as production of hydrogen through electrolysis, electrochemical energy storage, and so on. Meanwhile, for many scenarios and industries with high emissions-reduction costs, negative-carbon technology will also be indispensable. These are all areas that we will continue to focus on.

In terms of exploring and using emerging low-carbon technologies, Tencent embraces the spirit of openness and sharing when it comes to the various low-carbon technologies in our own data centers, buildings, and campuses. We also pay close attention to innovative technologies emerging from all corners of society and promote the development of emerging technologies through pilot projects, funding, and implementation.

For example, Tencent's data center technology has undergone four generations of innovation and PUE reduction, and we have opened our research results and patents to promote emissions reductions across the industry. We have built our data centers in locations where hydropower is widely available, hoping to drive industrial digitalization and a positive cycle of low-carbon transformation in these areas. In the broader realm of energy reduction, renewable energy, emissions reduction, and carbon o f sets, we also use our infrastructure projects to explore the use of alternative-energy power generation, energy storage, microgrid clusters, the internet of energy, low-carbon and eco-friendly materials, and carbon sinks. As we gradually become carbon neutral, we also help create more opportunities to apply innovative low-carbon technologies.

We also pay close attention to the development of various innovative technologies and provide diverse resources to support the e f orts of industries, universities, and research institutes to accelerate the deployment and application of low-carbon technologies through scienti f c research, pilot demonstrations, and innovative business models. For example, Carbon Capture, Utilization, and Storage (CCUS) is a key technology system and is also one of the core pathway to achieving carbon neutrality in hard-to-abate industries. Tencent is working with the Icelandic company Carb f x to promote the sequestration of $CO_2$ through mineralization, a relatively low-cost and widely available technology. The basic principle of this technology (as shown in the f gure) is to dissolve $CO_2$ in water under a certain pressure and inject it into underground rock layers with high reactivity and high porosity to achieve faster solidi f cation of the $CO_2$. Tencent is promoting a

pilot project for this technology in China, which is the first $CO_2$ mineralization sequestration pilot in Asia.

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In addition to technologies to reduce industrial emissions and carbon, nature-based solutions (NBS) are also an important path to mitigate and adapt to climate change. Among them, forestry carbon sink projects have been successfully practiced for many years, and there are a lot of projects underway to tap the potential of the ocean and farmland carbon sinks as well. The carbon sink potential of natural systems is being continuously tapped through research and commercialization. For example, the ocean offers vast carbon sink potential while also offering the benefits of biodiversity protection, disaster prevention and mitigation, as well as significant additional social, economic, and environmental benefits. We are already planning to partner with the State Key Laboratory of Marine Environmental Science of Xiamen University to consolidate our understanding of the marine carbon cycle, promote ecosystem protection and restoration, develop marine carbon-sink measurement methodology, and promote carbon sink trading.

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In our understanding, carbon neutrality is by no means an independent process. To the contrary, carbon neutrality will have a profound impact on different industries and different people. Tencent's SSV organization continues to explore social value innovation in rural revitalization, fundamental science, FEW (food, energy, water), and educational equality. Carbon neutrality is not only one of the SSV's key social values, but also has strong synergies with other social values that we focus on. Creation of broader social value is also an important consideration in the process of going carbon neutral and as we strive to help the communities we care about to benefit from this historic transition.

In our past work and exploration, we have also seen the deep integration of the low-carbon transformation and sustainable social value innovation, especially in rural revitalization. Distributed alternative-energy projects in rural areas can not only provide clean energy but also increase local incomes through business models that can commercialize its environmental and emissions-reducing attributes. In nature-based solutions (NBS) projects, ecological protection and restoration are often accompanied by helping local residents build new sustainable livelihoods. The spread of agricultural emissions-reduction technologies also has the potential to help farmers increase their incomes and improve their living standards by guiding consumers to buy low-carbon products and achieving emissions-reduction certifications. We have begun implementing a number of projects related to rural low-carbon transformation and exploring different ways to combine carbon neutrality with rural revitalization. We look forward to contributing to rural development while advancing the process of carbon neutrality.

We firmly believe that advancements in low-carbon technology cannot be separated from the development of fundamental science. Since the Xplorer Prize was launched by the Tencent Foundation in 2018, it has recognized 150 outstanding young scientists, including many from the fields of energy, environmental protection, chemical new materials, advanced manufacturing, and transportation. They are engaged in research that is closely connected to the low-carbon transformation. We also continue to explore more ways of supporting fundamental science, such as through practical applications, commercialization, and other means.

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Carbon neutrality involves comprehensive changes in production and lifestyle. We believe that technological progress is important to achieving our carbon neutrality target. We fully understand the high degree of uncertainty in technological development, insist on proactive exploration and courageous trial, and strive to contribute to the rapid development of low-carbon technologies.

Carbon neutrality involves the comprehensive transformation of economic and social development. We believe that participation by all stakeholders is an important guarantee to achieving carbon neutrality targets as scheduled. We will uphold an open and cooperative attitude and actively cooperate with all parties to jointly build a low-carbon ecosystem and create an atmosphere conducive to the low-carbon transformation of society.

Carbon neutrality is a far-reaching transition and a complex and lengthy process that requires unremitting e f orts to help change happen. We believe that to achieve the goal of carbon neutrality, we must be rooted in the present and take rapid and scienti f c actions. We must also look to the future and adhere to a long-term and macro-level strategy. Tencent will demonstrate patience and f rmness and make practical contributions to the carbon-neutral transformation of the nation.