EMPOWER A MODERATELY PROSPEROUS SOCIETY

CHINA TELECOMMUNICATIONS CORPORATION LIMITED'S 2019 CSR REPORT

REPORT SPECIFICATION

◉ Time Frame

This is the 2019 CSR Report of China Telecommunications Corporation Limited. It covers the whole year of 2019 with some sections beyond this time frame.

◉ Scope of Organization

Organizations covered in this report include China Telecommunications Corporation Limited, its branches and subsidiaries held by it. In the report, China Telecommunications Corporation Limited is also referred to as "China Telecom (CT)", the "Group Company", "the Company", "we", etc.

◉ Release Cycle

This is an annual report that is released every year.

◉ Content Description

This report responds to the major topics concerned by China Telecom's stakeholders to the greatest extent, including regular topics and annual highlights. Data and stories are mainly collected internally with some references to public media news. Amounts of money herein are all in RMB unless otherwise stated.

◉ Reference Standards

This report was compiled by taking references from the "Guidelines for Central SOEs to Fulfill Corporate Social Responsibilities" and the "Guidelines for SOEs to Better Fulfill Corporate Social Responsibilities" issued by the State Owned Assets Supervision and Administration Commission of the State Council (SASAC), the "Guidelines for Preparation of CSR Reports in China" (GB/T 36001-2015) issued by the former General Administration of Quality Supervision, Inspection and Quarantine of China and the Standardization Administration of China, the "CSR Management Scheme for ICT Industry in China" (2016 version) issued by China Association of Communication Enterprises, the "Guidelines for Preparation of CSR Reports in China" (CASS-CSR4.0) issued by Chinese Academy of Social Sciences, as well as the "Sustainability Reporting Guidelines" (G4) by the Global Reporting Initiative (GRI).

◉ Guarantee of Reliability

Information disclosed in this report is true and aims to reflect CT's market, social and environment performance in an objective and comprehensive manner.

◉ Access to Report and Extended Reading

Our CSR report is available in Chinese and English, in print and online. The online version can be downloaded from our website (http://www.chinatelecom.com.cn).

China Telecom has been publishing CSR reports for 10 years consecutively. For more information on the Company's fulfillment of its CSRs, please visit our website for inquiry or download and read previous CSR reports.

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DIALOGUE WITH THE MANAGEMENT

KE Ruiwen
Chairman & Party Secretary,
China Telecommunications Corporation Limited

Q: When China is about to achieve the goal of building a moderately prosperous society in all respects, how does China Telecom think of the responsibility it shoulders?

KE Ruiwen: To build a moderately prosperous society in all respects is the first goal of the "Two Centenary Goals" put forward by our Party and a crucial step towards the Chinese dream of great rejuvenation. Since the 18th CPC National Congress, the CPC Central Committee with Comrade Xi Jinping at its core has promoted the five-pronged approach, advanced the four-pronged strategy, overcome difficulties and forged ahead. As a result, decisive progress has been made in building a moderately prosperous society in all respects.

General Secretary Xi Jinping stated that, the period between the 19th and the 20th National Congress is the period in which the time frames of the two centenary goals converge. In this period, not only must we finish building a moderately prosperous society in all respects and achieve the first centenary goal; we must also build on this achievement to embark on a new journey toward the second centenary goal of fully building a modern socialist country. The year 2019 was a critical year for China in completing the goal of building a moderately prosperous society in all respects and the year 2020 marks the end of achieving such goal. We should follow the decisions of the CPC Central Committee, further focus on priorities, address inadequacies, and shore up points of weakness. We should take tough steps to forestall and defuse major risks, carry out targeted poverty alleviation, and prevent and control pollution, so that the moderately prosperous society we build earns the people's approval and stands the test of time. We should adhere to the new development philosophy, take the supply side structural reform as the main line, and make greater strides in high-quality transformation and development. We should try to overcome the adverse effects of the COVID-19 pandemic, develop new opportunities in crisis, and open up a new prospect in changing situations.

As a central enterprise and basic telecom operator, China Telecom firmly implements the decisions and deployment of the Party Central Committee, thoroughly practices the new development philosophy,

and gives full play to our advantages in 5G and other next-generation information and communications technologies, to empower a moderately prosperous society with all our strengths.

Firstly, develop ICT services for a moderately prosperous society. We advance network building and universal service application in remote rural villages, accelerate infrastructure construction for new information networks such as 5G, Internet of Things (IoT) and data centers, promote integrated development between cloud and network in an innovative way, as well as drive digital transformation, to provide advanced, applicable, secure and reliable services with globally leading networks and lay a solid foundation for the development of a moderately prosperous society.

Secondly, boost economic transformation and upgrading toward a moderately prosperous society. We promote smart operation at greater depth, cooperate with various industries, actively engage in the upgrading toward "new consumption" with "new infrastructure", and innovate and expand the application of 5G and other new-generation of ICTs. These efforts facilitate the transformation and upgrading of traditional industries, improve the capability of undertakings for public well-being, connect all walks of life in their development, promote green development, and push the development of a moderately prosperous society toward higher quality.

Thirdly, enable synergy to promote civilization development in a moderately prosperous society. We stand firm to take people's aspiration for a better life as the direction of our endeavors, and make every effort to help alleviate poverty, engage in charitable undertakings, care for our employees, stringently perform compliance management and actively fulfill social responsibilities overseas as an approach to working with all stakeholders to contribute to the development and progress of social civilization.

Q: In terms of building a moderately prosperous society in all respects, what results did China Telecom achieve in fulfilling social responsibilities in 2019? And what expectations does the Company have towards responsibility performance in 2020?

KE Ruiwen: In 2019, we took Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era as the guidance, fully implemented the spirits of the 19th CPC National Congress and the second, third and fourth plenary sessions of the 19th CPC Central Committee, shouldered responsibilities in building a moderately prosperous society in all respects and achieved good results.

In terms of developing ICT services for a moderately prosperous society, China Telecom pushed forward the construction of 5G networks after being granted a 5G business license, and opened 5G networks in 50 cities nationwide one after another. We also carried out comprehensive co-construction and sharing of 5G base stations with China Unicom, to significantly save resource input. We continuously improved the coverage and quality of 4G networks, and realized full commercial use of the VoLTE (voice communication based on 4G network) service. We kept improving the coverage of optical fiber broadband network in urban and rural areas, and deployed Gigabit optical fiber broadband network. We further cut down tariffs and met the goals of reducing more than 20% for mobile traffic tariff in average and 15% respectively for Internet private lines and broadband tariffs of small and medium enterprises. We expedited the universal service project for remote and poor rural areas, and completed in advance the construction task of about 4,500 4G base stations for universal service in the 4th batch within the year. We tried to create and protect a safe cyber space by earnestly implementing the requirements on cyber and information security, and enhancing our technologies and capabilities. We carried out a special action of "Remaining True to Original Aspirations and Shouldering Responsibilities: Whole Staff Service in Action" to keep improving our service capabilities. We provided number portability service as scheduled. We improved our management system on user information protection, and drove rectification of such problems as crank calls and spam messages. We were at a low level regarding the indicators notified by the Ministry of Industry and Information Technology (MIIT) including the complaint rate on crank calls and spam messages, and the appeal rate per a million of users. We faithfully fulfilled our mission of ensuring safe and unimpeded communications, successfully completed emergency communications guarantee for natural disasters fighting such as the forest fire in Liangshan Yi Autonomous Prefecture, Changning earthquake of magnitude 6.0, and the super typhoon Lekima, as well as the communications guarantee for events such as the activities celebrating the 70th anniversary of the founding of the People's Republic of China, the 7th Military World Games, and the 2nd Belt and Road Forum for International Cooperation.

In terms of boosting economic transformation and upgrading toward a moderately prosperous society, we strengthened communication with partners in all walks of life, conducted multi-dimensional, multi-level and multi-type cooperation, explored and promoted integrated development between 5G and all sectors, and successfully achieved several applications including 5G+industrial Internet, 5G+transportation & logistics, 5G+smart energy, 5G+smart health care, 5G+smart culture &

tourism, 5G+rural revitalization. We actively gave play to the advantages in cloud network integration and assisted customers in promoting the implementation of a large number of projects in the fields of intelligent manufacturing, smart agriculture, smart government, smart security, smart education, smart elderly care, smart community, and smart home, so as to help upgrade traditional industries and improve the quality of the cause of people's livelihood. We further advanced energy conservation and emission reduction, and the energy consumption per unit information flow was 18% lower than that of the previous year, facilitating the green development of customers with the application of information technology.

In terms of synergy to promote civilization development in a moderately prosperous society, we made every effort to push forward poverty alleviation. We took poverty alleviation through network development as the guide to drive coordinated development of poverty alleviation through various approaches, such as poverty alleviation through ICT application, through industry, through employment, through consumption, through education, and through public good. We have driven a large number of poor people to get rid of poverty and become better off. We were rated "Good" in Evaluation on Designated Poverty Alleviation by Central Units in 2019 for the second consecutive year. Among them, all administrative villages in the 6 counties that were our objects of fixed-point poverty alleviation and pairing assistance have been covered by optical fiber broadband and 4G network in advance. We implemented several demonstration projects for targeted poverty alleviation in accordance with their own characteristics, and endeavored to help poor areas develop their specialty industries, to enhance their self-development abilities. We helped the employees grow and develop. We implemented the "Top 100, 1,000 and 10,000 Experts and Talents Project", employed 1 China Telecom Scientist, 8 chief experts and more than 800 senior experts, provided platforms for making contributions such as "talent zone", "talent workstation" and "talent cloud". We encouraged employees to carry out innovation activities based on their own posts, commended and promoted over 2,500 innovative achievements, and selected more than 280 group level crackajacks. We continued to help the development of science, education, culture and health causes, and achieved new progress in the participation of the information infrastructure construction in countries/regions along the "Belt and Road".

In 2020, China Telecom will resolutely implement the decisions and deployment of the Party Central Committee on fighting against the COVID-19 pandemic and promoting economic and social development. We will strive to fulfill the responsibilities as a central enterprise, and do a good job in normalized pandemic prevention and control, production and operation, as well as reform and development. We will push forward high quality development and further empower all walks of life, in order to make greater contributions to securing a decisive victory in building a moderately prosperous society in all respects and embarking on a journey to fully build a modern socialist country.

TOP MANAGEMENT

KE Ruiwen
Chairman, Secretary of
Party Leadership Group

LI Zhengmao
Director, President, Deputy Secretary
of Party Leadership Group

SHAO Guanglu
Director, Deputy Secretary
of Party Leadership Group

CHEN Zhongyue
Vice President, Member of
Party Leadership Group

FU Yongzhong
Head of Discipline Inspection and
Supervision Team, Member of
Party Leadership Group

ZHANG Zhiyong
Vice President, Member of
Party Leadership Group

LIU Guiqing
Vice President, Member of
Party Leadership Group

ZHU Min
Chief Accountant, Member of
Party Leadership Group

WANG Guoquan
Vice President, Member of
Party Leadership Group

EMPOWER A MODERATELY PROSPEROUS SOCIETY

After generations of hard work, we are about to achieve the goal of building a moderately prosperous society in all respects and realize the first centenary goal of the dream of great rejuvenation of the Chinese nation.

Realize the Dream of Building a Moderately Prosperous Society through a Hundred Years of Struggle

"People work too hard and expect to live a moderately prosperous life." For thousands of years, "moderate prosperity" has been a beautiful dream pursued by the Chinese nation. Since its founding, the Communist Party of China has firmly shouldered the historical mission of seeking happiness for the Chinese people and rejuvenating the Chinese nation. Shortly after the founding of the People's Republic of China, the development goals of "four modernizations" were clearly put forward. After the reform and opening up, the idea of "a moderately prosperous society" was brought up, which made strategic arrangements for China's socialist modernization; and the "three-step" strategic goals were laid out: the first step is to solve the problem of people's food and clothing, the second step is to make people's life generally reach a moderately prosperous level by the end of the 20th century, and the third step is to basically realize modernization by the middle of the 21st century. The first two goals were achieved ahead of time, and building on this, the "two centenary" goals were developed: by the time we celebrate the centenary of the CPC, we will have developed our society into a moderately prosperous one with a stronger economy, greater democracy, more advanced science and education, thriving culture, greater social harmony, and a better quality of life; after this, with another 30 years of work, and by the time we celebrate the centenary of the People's Republic of China, we will have basically achieved modernization and turned China into a modern socialist country.

Building a moderately prosperous society in all respects is a solemn commitment made by our Party to the people and history, and a crucial step in realizing the dream of great rejuvenation of the Chinese nation. Since the 18th CPC National Congress, the CPC Central Committee with Comrade Xi Jinping at its core has promoted the five-pronged approach, advanced the four-pronged strategy, overcome difficulties and forged ahead. Decisive progress has been made in building a moderately prosperous society in all respects. By focusing on priorities, addressing inadequacies, and shoring up points of weakness, especially vigorously promoting targeted poverty alleviation, hundreds of millions of poor people are entering a moderately prosperous society with steady steps.

From the founding of the CPC, to the founding of the PRC, and to the reform and opening up, from "people's basic needs", to "generally decent lives", and to "moderate prosperity in all respects", after a hundred years of struggle, the dream of "moderate prosperity" that has passed through thousands of years, and carried countless suffering and glories, is going to come true.

Examples of China's Achievements in Building a Moderately Prosperous Society (by the end of 2018)

· GDP reached RMB90 trillion, with per capita GDP equivalent to about US$9,770, ranking in the forefront of middle-income countries.

· The urbanization rate was close to 60%, higher than the average level of 52% in middle-income countries.

· The number of poverty-stricken people in rural areas was reduced to 16.6 million, with a cumulative decrease of 82.39 million since the end of 2012.

· The per capita disposable income of residents reached RMB28,228, the middle-income group exceeded 400 million people, the Engel coefficient of residents dropped to 28.4%, the number of household cars per 100 households reached 33, and the per capita housing construction area of urban and rural residents reached 39 and 47.3 square meters respectively.

· The nine-year compulsory education has been fully popularized, and higher education is changing from a massification stage to a popularization stage, with the gross enrollment rate of 48.1%.

· A social security system covering both urban and rural residents has been basically established, and the average life expectancy reached 77 years old.

Source: National Bureau of Statistics, "Series Reports on the Achievements of Economic and Social Development in the 70th Anniversary of the Founding of the People's Republic of China"

Empower a Moderately Prosperous Society with all Our Strength

While we have made historic achievements in building a moderately prosperous society in all respects, there are still some shortcomings and weaknesses. As the year 2019 was a critical year for China in completing this goal and the year 2020 marks the end of achieving it, we need to continue to work hard and make unremitting efforts.

Examples of Shortcomings and Weaknesses in Building a Moderately Prosperous Society in All Respects

- Most of the old, weak, sick, disabled and poor people do not have the ability and conditions for self-development.
- The areas of extreme poverty such as the "three regions and three prefectures" are relatively concentrated areas where poor people live, and the task of poverty alleviation is heavy; some areas that have been lifted out of poverty have weak industrial foundations, and there are hidden worries that the achievements of poverty alleviation may be lost.
- Poor areas have a weak foundation for education and health care, and poor infrastructure for water, electricity, road and telecommunications. Many places have failed to get through the "last kilometer".
- The task of air pollution control in key areas is arduous. Heavy polluted weather occurs frequently in autumn and winter. The ecological protection and restoration task in the Yangtze River Basin is tough, and the problems of urban black and odorous water body and dirty and messy rural environment are serious.
- Risks in financial and other fields need to be further prevented and resolved.

    -- Extracted from the speech of Xi Jinping at the 4th Meeting of the Central Financial and Economic Committee in April 2019

Socialism with Chinese characteristics has entered a new era. While we are securing a decisive victory in building a moderately prosperous society in all respects and achieving the first centenary goal, we will embark on a new journey toward the second centenary goal of fully building a modern socialist country, and realizing the dream of great rejuvenation of the Chinese nation. The principal contradiction facing Chinese society has evolved to the contradiction between unbalanced and inadequate development and the people's ever-growing needs for a better life. Both China and the world are in the midst of profound and complex changes. China's development has a bright future and is also facing new challenges. We need to thoroughly implement the new development philosophy, promote high-quality development, strive to solve the problem of unbalanced and inadequate development, vigorously improve the quality and efficiency of development, better meet the growing and upgrading needs of the people in all aspects, and continuously drive well-rounded human development and all-round social progress.

Examples of the Challenges Faced by China in Development

- The endogenous power of economic growth is not adequate enough, the innovation ability is not strong enough, and the competitiveness of enterprises needs to be improved.
- The quality and efficiency of development are not high enough, the level of the real economy needs to be improved, the economic structure needs to be optimized, and the quality of products and services needs to be enhanced.
- The gap between urban and rural areas and among different regions is still large in terms of development and income distribution.
- There's a long way to go for ecological environment protection.
- There are many shortcomings in the field of people's livelihood, and the public face many problems in employment, education, health care, housing, elderly care, etc.

The telecom industry is a strategic, fundamental and leading industry in the national economy. As a central enterprise and basic telecom operator, China Telecom has the responsibility and the ability to give full play to the role as a driver and supporter, and make new and greater contributions to securing a decisive victory in building a moderately prosperous society in all respects and embarking on a journey to fully build a modern socialist China.

China Telecom works from three main aspects to empower a moderately prosperous society：
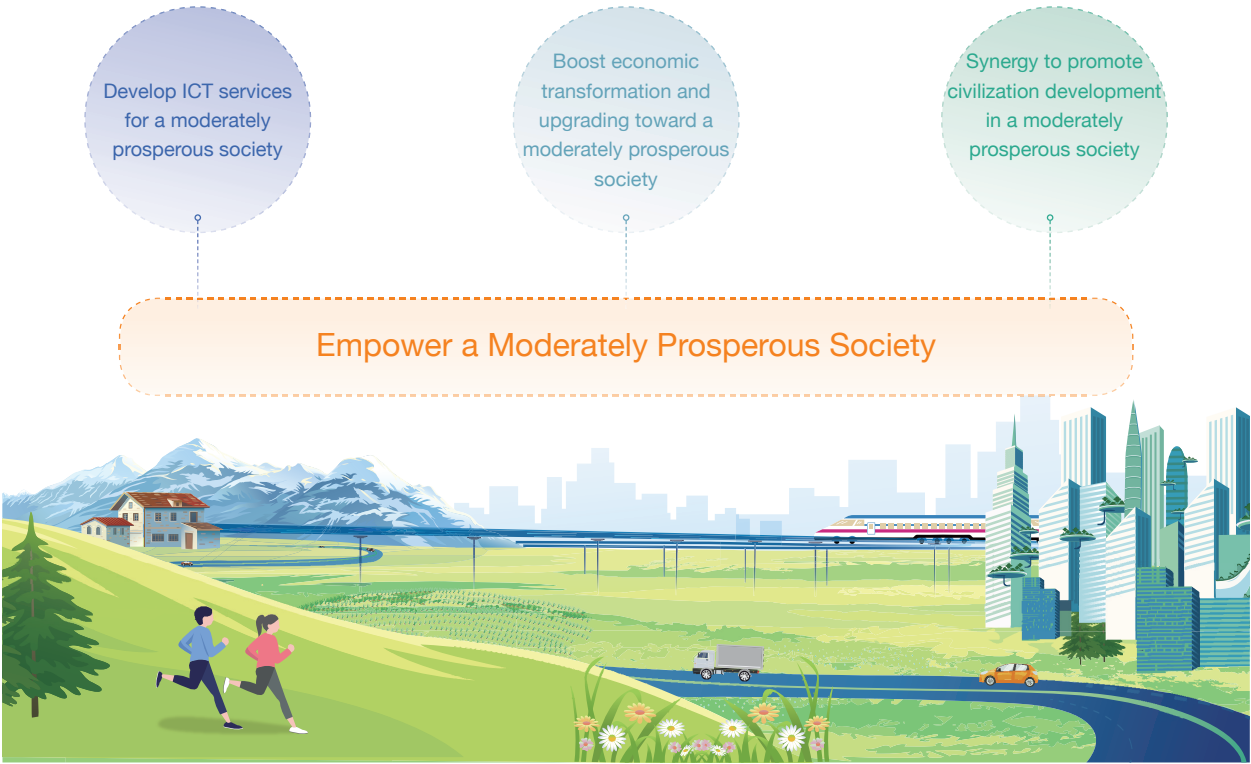
Develop ICT services for a moderately prosperous society

Boost economic transformation and upgrading toward a moderately prosperous society

Synergy to promote civilization development in a moderately prosperous society

Empower a Moderately Prosperous Society

Develop ICT services for a moderately prosperous society. China Telecom advances network building and universal service application in remote rural villages, accelerates infrastructure construction for new information networks such as 5G, IoT and data centers, promotes integrated development between cloud and network in an innovative way, as well as drives digital transformation, so as to provide advanced, applicable, secure and reliable services with globally leading networks and lay a solid foundation for the development of a moderately prosperous society.

Boost economic transformation and upgrading toward a moderately prosperous society. The Company promotes smart operation at greater depth, cooperates with various industries, actively engages in the upgrading toward "new consumption" with "new infrastructure", and innovates and expands the application of 5G and other new-generation of ICTs. These efforts facilitate the transformation and upgrading of traditional industries, improve the capability of undertakings for public well-being, connect all walks of life in their development, promote green development, and push the development of a moderately prosperous society toward higher quality.

Enable synergy to promote civilization development in a moderately prosperous society. The Company stands firm to take people's aspiration for a better life as the direction of its endeavors, and makes every effort to help alleviate poverty, engages in charitable undertakings, cares for our employees, stringently performs compliance management and actively fulfills social responsibilities overseas as an approach to working with all stakeholders to contribute to the development and progress of social civilization.

FEATURE: EMPOWER A MODERATELY PROSPEROUS SOCIETY WITH COMMERCIAL 5G USE

5G Set Sail

Research and development on 5G technologies has been gradually carried out from 2012. In October 2015, ITU-R officially set the legal name of 5G as "IMT-2020", after which the R&D on 5G standards has been accelerated. In June 2018, 3GPP unveiled its SA plan for 5G NR standard, signifying the official release of the first truly complete international 5G standard, and 5G construction started. In June 2019, MIIT granted 5G business licenses to four communications operators: China Telecom, China Mobile, China Unicom and China Broadcasting Network, and started the first year of commercial 5G use in China.

Intelligent connectivity **5G**

2019

HD voice+high-speed data
4G

Voice+data
3G

Digital voice
2G

Analog voice
1G

Wireless paging

1978   1982   1987   1995   2009   2013

Development History of Mobile Communications
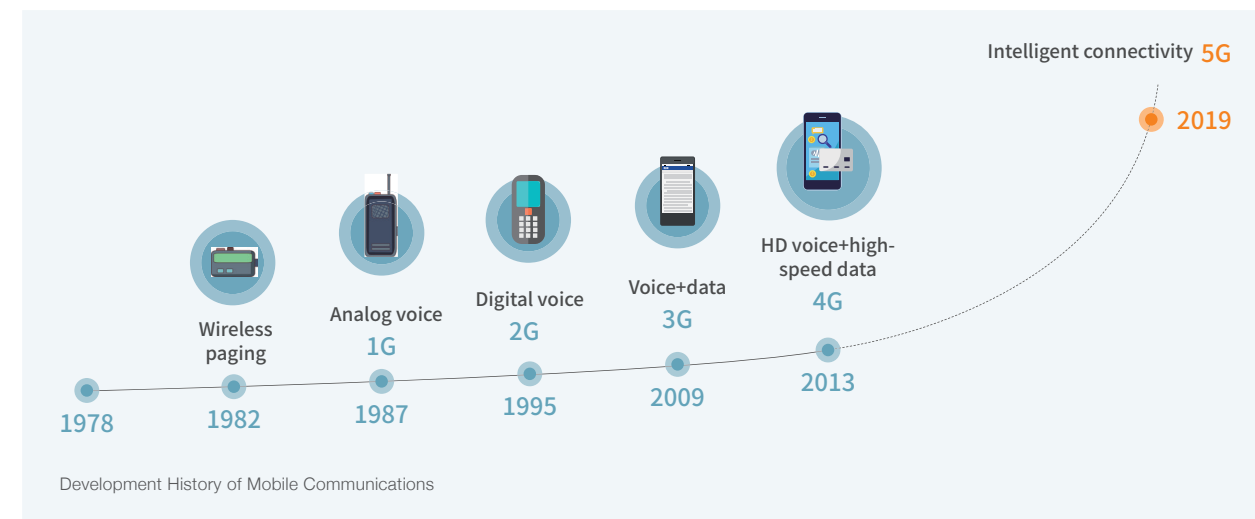
TIPS

What is 5G? What will 5G bring to society?

5G is the fifth generation mobile communications technology for digital cellular networks. Compared with 4G, it has faster network transmission speed, lower network latency, larger network capacity and richer product forms. Integrating with different sectors and industries, 5G can bring a lot of changes to society. For example:

· Upgrade the interaction mode, realize the interconnection of everything, and bring interactive experiences such as ultra high definition video, VR (virtual reality)/AR (augmented reality);

· Change the way of life, such as unmanned driving, intelligent home, telemedicine, etc.;

· Reshape the industrial mode, realize the interconnection of all factors such as R&D, production, service and management, and facilitate the further digital, networked and intelligent development of all industries;

· Improve the efficiency of social governance, bring new smart applications for urban operation, environmental protection, public security, emergency response, etc., and promote the modernization of governance capacity.

Promote Commercial 5G Use

In accordance with the national requirements on promoting 5G development, China Telecom focused on key 5G technologies, network and business capabilities in 2019, strengthened technological research and development, and actively promoted 5G technology test and commercialization. After obtaining the 5G business license, the Company quickly started the construction of 5G network, carried out co-construction and sharing with China Unicom by giving full play to the advantages of both sides in network, frequency and other resources to build a 5G access network with high efficiency and high quality nationwide, and accelerated the development of its 5G network service capacity.

China Telecom adheres to open cooperation and joint innovation, exerts efforts to build a new ecology of 5G construction and development, promotes industrial chain development with partners, focuses on key scenarios, and empowers all walks of life, with the aim to provide customers with more intelligent and efficient comprehensive information services.

—— KE Ruiwen, Chairman of China Telecom

On June 26, 2019, Chairman Ke of China Telecom delivered a speech "5G Empowers Smart Society" at the MWC 2019 Shanghai

Milestones on Promoting 5G Development in 2019

Displayed 5G applications such as smart home, smart community, smart city, smart industry and cloud-network integration at the MWC 2019 in Shanghai, and released six 5G cloud-network solutions to promote 5G industry innovation

Signed a "Framework Agreement on 5G Network Co-construction and Sharing Cooperation" with China Unicom to comprehensively carry out the co-construction and sharing of 5G access network

Established China Telecom 5G Industry Innovation Alliance at E-surfing Smart Ecosystem Expo, to gather industrial partners and promote 5G development

April   **June**   **July**   **September**   **October**

Held the 5G Industrial Chain Innovation Cooperation Conference in Shenzhen, and signed cooperation agreements with 59 partners to accelerate 5G innovation and commercial preparation

Launched "Digital Government Enabling Platform" and "New-generation OTN Fine Optical Network" at the 5G+Digital Government Forum in Beijing to help build digital China

Rolled out 5G packages, 5G membership rights and 5G special applications at the PT Expo China, which were opened in the first batch of 50 cities in China, and 5G was officially put into commercial use

Held the 5G+Industrial Internet Summit together with China Academy of Information and Communications Technology, and released the open platform of China Telecom on industrial Internet to drive project cooperation

Main Actions for Promoting 5G Technological R&D in 2019

Area	Main Actions
Technology innovation	• Led or participated in technological standards development in the fields of super uplink, 5G coverage enhancement, and 5G bearing. • Carried out 5G network technology verification, realized roaming among different manufacturers, 4G/5G interoperability, interface interworking between core network and wireless network, and opened 5G SA (standalone) commercial network. • Carried out R&D on 5G core capabilities, developed and deployed management platforms and capability open platforms for MEC (mobile edge computing) and network slicing, as well as developed low-cost innovative solutions and products for 5G indoor coverage. • Took the lead in formulating the 5G SA Implementation Guidelines to provide reference information and guidance for promoting the scale implementation and development of the 5G SA network around the world.
Business innovation	• Conducted R&D on general-purpose 5G products, including E-surfing Ultra HD, e Cloud VR, e Cloud Games, e Cloud Computer, 5G Cloud Conference, 5G Cloud Business Live Streaming, 5G Cloud Video Monitoring, 5G Private Lines, etc. • Conducted R&D on 5G integrated applications with all industries, including the vertical industry applications of 5G+industry, agriculture, transportation, education, health care, environmental protection, etc. • Explored new business models and built an open platform for applications.

5G Technology R&D Results

7 projects
Led national major special technical projects on 5G

15 newly increased projects in the year
48 projects in total
Carried out international 5G standardization projects and work

469 newly increased in the year
1,128 in total
Submitted contributions on international 5G standards

39 newly increased in the year
263 in total
Applied for 5G patents of invention

Main Actions of China Telecom and China Unicom on 5G Co-construction and Sharing

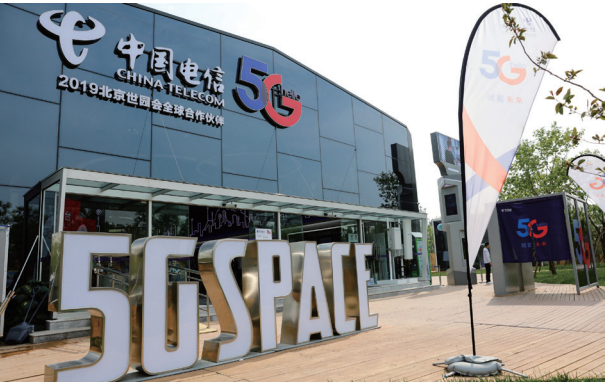| Initiative	Specific Actions	Significance
Coordinated promotion of planning & construction	• Set up joint working groups at the Group, provincial and city companies levels to enhance communication and collaboration. • The Group companies of the two sides collaborated on formulating 5G network planning, evolution strategies, investment plan, equipment technical specifications, joint procurement standards, and unified evaluation system for co-construction and sharing. • The provincial and city level companies of the two sides collaborated on promoting local planning and construction.	• Implement the national 5G development arrangement, build a high-quality 5G network covering the whole country at a faster speed, and meet the needs of consumers as soon as possible
Complementary resources for efficiency improvement	• Fully shared frequency, base station and other important resources. • The two sides agreed to build in sections, work out the construction plan and scheme together, and try to maximize the sharing of various resources such as computer rooms, site locations, optical cable, pipelines, and pole lines. • Worked together to optimize the basic network structure and layout to improve network security and emergency response capability.	• Effectively reduce the cost of 5G construction and operation, and achieve the synergy effect of 1+1>2 through resource sharing.
Joint publicity and sharing for branding	• Jointly made publicity the quality and image of 5G network while maintaining the user belonging unchanged, independent brand, independent application innovation and operation. • Both sides ensured the network quality and perception, treated users equally, to realize network sharing and fair use, and achieve indistinctive network perception, service provision and response, and customer network incident handling.	• Carry out the new development philosophy and set up a model for large-scale co-construction and sharing of communications operators

5G Co-construction and Sharing Results of China Telecom and China Unicom in 2019

	Municipalities directly under the central government covered	Capitals and cities with independent planning status covered	Prefecture-level cities and other cities covered
62,000 Total 5G base stations	Beijing, Shanghai, Tianjin, Chongqing	Guangzhou, Nanjing, Wuhan, Chengdu, Changsha, Xining, Shijiazhuang, Jinan, Hangzhou, Harbin, Haikou, Lanzhou, Taiyuan, Nanchang, Yinchuan, Changchun, Urumchi, Kunming, Hohhot, Xi'an, Guiyang, Shenyang, Zhengzhou, Fuzhou, Nanning, Hefei, Shenzhen, Ningbo, Qingdao, Dalian, Xiamen	Suzhou, Foshan, Zhuhai, Dongguan, Mianyang, Jinhua, Yingtan, Wuhu, Qionghai, Jiaxing, Liuzhou, Quanzhou, Wuxi, Wenzhou, Xiongan New Area
50 Cities covered nationwide	4	31	15

Promote 5G to Empower Society

Taking into account the characteristics of 5G technology, giving full play to the advantages of cloud network integration, and highlighting the feature of "5G+e Cloud+AI", China Telecom actively expanded 5G applications in the fields of industrial Internet, transportation and logistics, smart energy, smart health care, smart culture & tourism, and rural revitalization, to empower social production and life.

Actions Taken to Promote 5G to Empower Society in 2019

Personal life	Family & community	Industrial upgrading	Social administration
Rolled out applications such as cloud games and cloud VR based on 5G to provide better experience to users	Upgraded family cloud, multi-screen interaction and other products based on 5G, and added security protection and health care factors to build smart families and communities with better experience	Promoted the application of 5G in industrial and mining enterprises, to realize networked monitoring of equipment status, multi-factory cooperation, and remote control, and improve the production efficiency and benefit	Promoted 5G to be applied in fields of municipal administration IoT, transportation, smart health care, to improve the administration efficiency and service level

On April 28 to October 9, 2019, China Telecom set up a 5G Space in the park of Beijing International Horticultural Exhibition, which provided experiences such as UAV tour, and 5G+8K ultra high definition video, received 580,000 visitors and opened more than 120 public welfare classes on 5G

On October 31, 2019, a citizen was experiencing 5G+e Cloud VR at the launch ceremony of 5G commercial use organized by the Hubei Wuhan Branch

Introduction of 5G Products Developed in 2019

Name	Function and Usage
E-surfing UHD	· Provide 4K, 8K ultra-high resolution, multi-camera, multi-view live broadcast, and support VR view
e Cloud VR	· Provide VR IMAX cinema, 360 panoramic videos and 3D interactive videos, and support 6DoF immersive interactive VR game service via VR all-in-one machine, VR box, standalone VR headset and other devices
e Cloud Games	· Provide high-quality console games and Android games that support 4K, HDR, and 60fps through mobile phones, H5, TV and other multi-screen clients
e Cloud Computer	· Integrate traditional personal computers into mobile terminals in a form of App through cloud computing mode, and users are able to access their exclusive cloud computers anytime and anywhere through 5G and other high-speed networks
5G Cloud Conference	· Rely on the HD cloud video conference platform, take 5G/private lines as the channel and e Cloud as the carrier, to provide integrated service of "5G+smart HD conference"
5G Mobile Phone Cloud Security	· Take UIM card as the carrier, to provide all-round security service solutions covering cloud, administration, terminal and chip, which can remotely manage 5G terminals, conduct U-shield identity authentication, and provide secure application data channel
5G Video CRBT (business edition)	· Customized by the called user to provide short-video ring back service for 5G or VoLTE callers
5G Private Lines	· Provide point-to-point private line, cloud access line and other functions based on 5G access, as well as customized differentiated services in terms of bandwidth, service quality, connection quantity, and connection area, and real-time adjustment can be made on demand
5G Smart Video Cloud	· Build 5G Smart Video Cloud with access cloud, storage cloud, smart cloud and view cloud to provide video monitoring and smart video application for public security, transportation, education, fire protection, finance, commerce, health care and other fields
e Cloud Business Live Streaming	· Use the live streaming platform built on e Cloud with portable live streaming terminals, mobile clients, and professional VR live streaming terminals, and provide 5G+4K/VR end-to-end enterprise level live streaming solutions

5G+Industrial Internet

TIPS

What is industrial Internet? How does 5G empower industrial Internet?

Industrial Internet is a new mode and new business form to interconnect all factors of "human, machine and object", including equipment, production lines, employees, warehouses, suppliers and products, achieve interconnection among equipment, systems, factories and regions through communications network and platform, as well as realize intelligent production, networked collaboration, personalized customization and service-oriented extension with big data, AI and other technologies. It is a product of the deep integration between industrial system and Internet system in the digital wave, a key support to a new round of industrial revolution, and a commanding height of future manufacturing competition. It is of great significance to accelerate the transformation and upgrading of economic structure and promote high-quality development.

Communications network is the foundation of industrial Internet. High speed, low latency, massive connection and other characteristics of 5G can better meet the needs of industrial Internet towards connection diversity, performance differentiation and communications diversification, and support the innovation and development of its business model.

Conch Group is one of the top enterprises in the world in terms of cement production and sales. Its production process includes mines blasting, transportation in mining area, and workshop production. Safety production management and pollution control are very important. The Anhui Branch and Conch Group established a "5G Innovation Lab of Intelligent Manufacturing" in 2019, and cooperated with Huawei and other partners to carry out an innovative 5G application pilot project in Conch cement plants in Wuhu City and Quanjiao County with 5G super uplink and other information and intelligent technologies, to help build whole-process intelligent cement manufacturing factories, which has significantly improved the working environment, better guaranteed production safety, and greatly increased production efficiency.

Examples of Pilot Intelligent Cement Production in Conch Group

· **5G+AI blasting early warning**：In mine blasting, the blasting warning coverage has been expanded from 500 meters to 2 kilometers with 5G HD video monitoring and multi-channel 4K HD video backhaul from UAVs, which improved the safety of blasting, and the mine inspection process has been shortened from 8 people in 2 hours to 2 people in half an hour.

· **5G+automatic driving of tramcar**：In the limestone mining section with complex terrain, 5G network can better guarantee real-time video monitoring, automatic driving and remote driving control of large mining vehicles and excavators.

· **5G+production safety monitoring**：Provide real-time HD video monitoring for the moving operation of stackers and reclaimers in the limestone pre-blending workshop, so as to reduce the working time of workers in harsh dust environment.

Based on 5G network, the production efficiency of cement plant in mining, transportation and production has been further improved. The super uplink technology deployed can better guarantee the high requirements of the enterprise's key businesses towards wireless network bandwidth, latency, coverage and other performance.

—— Zhu Xuhui, Director of the Technology Department of Conch Information Technology Engineering

Conch Group's cement plant in Quanjiao realized HD video monitoring of production with 5G

· 5G time sensitive networking technology ensures the low latency requirement of industrial Internet end-to-end service through high-precision time synchronization.

· 5G network slicing technology supports the isolation and protection of multiple business scenarios, multiple services and quality requirements, multiple users and multiple industries.

· 5G high-frequency and multi-antenna technology support precise localization and high broadband communications, improving the accuracy of remote control greatly.

· 5G edge computing accelerates the convergence of industrial networks, improves the performance indicators of high reliability and low latency of industrial Internet services, and optimizes resource sharing and user experience.

· 5G super uplink supports real-time HD image acquisition, improves the efficiency of AI algorithm, and realizes precise remote control linkage.

【Assist Innovation in Home Appliances Intelligent Manufacturing】

Haier is a large home appliance enterprise in the world. In recent years, Haier has implemented a network development strategy, built COSMOPlat industrial Internet platform, and promoted mass customization, on-demand design, on-demand manufacturing and on-demand distribution by using IoT, AI, big data and other technologies. In 2019, the Tianjin Branch cooperated with Haier interconnected factory in Tianjin and Haier Industry Intelligence Research Institute in Qingdao to build an intelligent manufacturing innovation base, constructed 5G network in Tianjin Park rapidly, supported the deployment of 11 applications such as unmanned forklift clamp trucks, and completed 5G smart transformation of management in both the park and production areas. On September 26, Haier 5G smart park officially opened in Tianjin, and Tianjin Haier Washing Machine Interconnected Factory was launched.

Examples of 5G Application in Tianjin Haier Smart Park

5G+unmanned forklift clamp trucks

The unmanned forklift clamp trucks can intelligently plan their routs, load and unload goods, and automatically stack, clamp and take the washing machines from the assembly line to the predetermined area. Compared with manual operation, the efficiency has been improved by 30%, the error rate reduced by 95%, and the accident rate down by 98%.

5G+intelligent security

With the application of patrol robots and panoramic AR eagle eye, the park can find out and deal with situations such as illegal parking, speeding, staff falling on the ground in time, and can accurately identify employees, visitors or illegal intruders, achieving intelligent personnel management and ensuring safety without dead ends.

5G+customized production

The factory receives orders from users directly, allocates intelligent modular production according to the model and capacity, and directly loads and delivers the products off-line. About 80% of the products does not need to be stored, and both the quality and response speed have improved by 50%.

5G+industrial visual inspection

5G industrial camera is installed in the quality control link, which conducts 5G high-speed communications with the back-end quality control platform, and uses preset algorithm to judge and detect unqualified products in time, avoiding the missed inspection caused by manual negligence or visual fatigue.

5G+AR operation guidance

The quality inspection personnel wear intelligent AR glasses, which can display the inspection process flow and key inspection points in real time. The quality inspection personnel carry out inspection of the products step by step according to the tips in the glasses, and input the electronic data in real time, which can avoid omission or deviation due to lack of experience.

The perfect combination of 5G and IoT for intelligent manufacturing promotes Haier's digital transformation and upgrading, and helps reduce costs and increase efficiency.

*—— Information Department, Tianjin Haier Washing Machine Co., Ltd.*

【Assist Intelligent Tyre Manufacturing】

Sailun Group Co., Ltd. is a tire enterprise of tire R&D, production, sales and service in Qingdao, Shandong Province. In 2019, China Telecom and Sailun jointly built a 5G industrial Internet lab for tire industry, which focuses on the problems such as delayed transmission of production data, difficult equipment maintenance and process optimization, low quality inspection efficiency, and inability to track logistics in real time, and deployed 5G network to combine AR, MR and other technologies with tire manufacturing to boost intelligent upgrading of tire manufacturing.

After the implementation of the intelligent manufacturing plan, the effect is remarkable. The labor cost has reduced by about RMB6 million a year, the standby time in tire production down by 40%, the production efficiency up by more than 25%, the equipment failure rate down by 50%, the maintenance cost down by 40-50%, the defective rate of products down by 60%, and the energy utilization rate up by 10%.

Sailun's 5G-based Intelligent Manufacturing Plan

· Real-time display and tracking of vehicle and raw material information with the help of 5G+AR, achieving real-time management and scheduling of logistics vehicles

· Intuitive display of equipment data based on 5G+AR, and carrying out equipment inspection and maintenance in time

· Real-time acquisition and processing of equipment production data through MES integrated edge computing, as well as timely optimization of process

· Achieving intelligent quality inspection of tire quality through 5G low latency transmission+cloud fault recognition platform, to reduce the rate of missed inspection

· Realizing energy monitoring, prediction and decision-making support for the industrial IoT energy management platform by interacting with NB-IoT data through 5G base stations

· Building an intelligent control brain for the factory based on 5G network, establishing a digital twin factory core platform, and exploring new intelligent applications
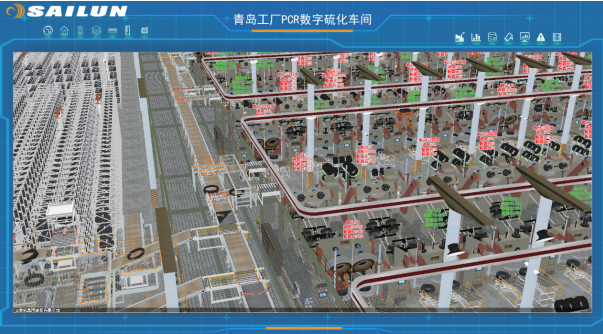
On July 26, 2019, the 3D digital vulcanization workshop of Sailun Group Co., Ltd. built a digital twin of the physical factory through digital simulation and data pivot management platform, realizing transparency on the whole business chain, during the whole time period and in the whole scene

Taking advantage of 5G and industrial Internet to build a high-quality intelligent manufacturing system is of milestone significance for the transformation and upgrading of Sailun Group.

—— Yuan Zhongxue, Executive Deputy Director of NERCRAT and Chairman of Sailun Group

【Assist R&D of 5G-based Intelligent Loader】

In June 2019, Liuzhou Branch in Guangxi Zhuang Autonomous Region opened 5G network for the International Industrial Park of Guangxi LiuGong Machinery Co., Ltd. (LiuGong) to support the research and development of unmanned loader. On September 4, LiuGong released the first commercial 5G-based intelligent remote control loader at the 15th China Beijing International Construction Machinery, Building Material Machines and Mining Machines Exhibition & Seminar. At the exhibition, the operator remotely operated the loader in Liuzhou Industrial Park based on the 5G network of China Telecom, and accurately completed a series of actions such as advancing, shoveling, running, unloading and turning, with the time delay controlled within 30 ms.

The intelligent remote control loader is equipped with intelligent shovel & loading system, which can realize the operations of pre-shovel & loading, leveling and grazing, and unloading with one button. Through 5G network connection, it can complete multi-action operation combination with one button, which reduces the workload. At the same time, the control system monitors the working state of the whole machine in real time and configures multiple security protection mechanisms to ensure the safety of remote operation process. The 5G-based intelligent remote control loader is suitable for underground, port and wharf, coal mine and other scenarios. It has great application value in the construction environment that threatens the personal safety and health of workers.

On September 4, 2019, the engineer remotely controlled the loader in LiuGong International Industrial Park 2,000 kms away from the operation console in Beijing
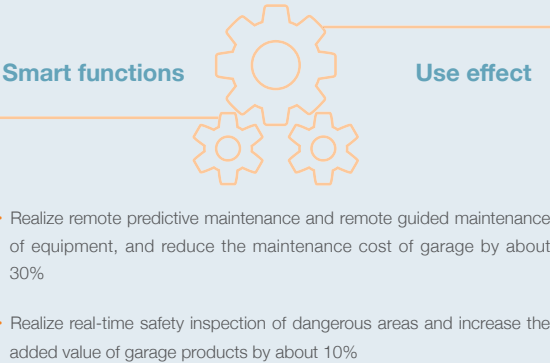
5G+Transportation & Logistics

【5G-based Smart Garage】

In order to solve the problem of urban parking, China Construction Science and Industry Co., Ltd. (formerly known as CSCEC Steel) developed and launched a smart garage product. In 2019, the Guangdong Branch used advanced technologies such as 5G communications and big data to help the company to develop a smart stereo garage product that realizes remote smart operation and maintenance and remote smart safety inspection of the garage while ensuring vehicle parking safety. By the end of 2019, the company's smart garage had been put into use in Huizhou City.

Introduction of Smart Functions of Stereo Garage

· **Remote smart operation & maintenance：** Transmit the HD video from multiple cameras in the garage and the data of equipment operation to the industrial Internet platform via 5G network for real-time monitoring and abnormal alarm

· **Remote smart safety inspection：**Conduct intelligent identification and processing of garage scenarios such as "personnel entering by mistake", "edge protection", "charging gun status", and "parking space monitoring" with 5G+video identification and sensors, if abnormal situations are detected, provide timely feedback and record alarm information

Smart functions   **Use effect**

· Realize remote predictive maintenance and remote guided maintenance of equipment, and reduce the maintenance cost of garage by about 30%

· Realize real-time safety inspection of dangerous areas and increase the added value of garage products by about 10%

On July 30, 2019, the Guangdong Branch helped CSCEC Science and Industry to roll out a 5G-based smart stereo garage

The 5G-integrated smart garage shows advantages in remote maintenance and scheduling management, and improves both safety and efficiency.

—— Jiang Guanye, Manager of the Smart Garage Department of CSCEC Science and Industry

【5G-based Smart Logistics】

Jiangsu JOYEA Joint Intellectual Manufacturing Co., Ltd. is an enterprise that provides automatic packaging technology solutions and core packaging equipment. In 2019, the Jiangsu Branch used 5G+edge computing+cloud computing technologies to support its comprehensive optimization of logistics and warehousing system, and helped build a 5G smart park. The optimized logistics and warehousing system with 32 stereo containers, only covers an area of 400 square meters (equivalent to the traditional 2,000 square meters). AGVs and containers are connected to the cloud platform and with the production system via the 5G module for real-time data interchange. It can intelligently preset parts, separate parts by project, and automatically send them to the project units to be assembled one day in advance according to the production plan. The efficiency has significantly improved.

On August 10, 2019, a 5G network-based JOYEA AGV was in operation

Under the 5G network, the delay of AGVs has reduced to 20 ms, and the packet loss rate has reduced from 15% to 0.04%. The AGVs have never stopped to look for signals, and our production efficiency has increased by 11%. The effect is very remarkable.

—— Yan Guangqing, from Jiangsu JOYEA Innovation Promotion Center

5G+Smart Energy

【5G UHV Substation】

The ±1100 kV UHVDC transmission line from Changji, Xinjiang to Guquan, Anhui is one of the UHV power transmission projects with the highest voltage level, the largest transmission capacity, the farthest transmission distance and the most advanced technical level in the world. It has a converter station in Guquan Town, Xuancheng City, Anhui Province, where there is dense power equipment, complex electromagnetic environment, and high safety level, and needs real-time, safe and reliable monitoring and control as well as operation and maintenance.

In June 2019, the "5G+ubiquitous power IoT" project constructed by the Anhui Xuancheng Branch for Guquan converter station passed the acceptance, and was used for verifying the application of 5G in UHV substation. 5G network provides a flexible, efficient, safe and reliable wireless access channel for all kinds of systems for the purpose of monitoring and control as well as intelligent operation and maintenance in the substation, realizes flexible application of large bandwidth and low latency services, real-time backhaul of 5G+4K HD monitoring video signals in the substation, and 5G remote monitoring of inspection robot, and completes the verification of "5G+key power businesses" such as accurate load control, differential protection, and emergency repair. This is also the first case in China that 5G communications technology has been formally applied to UHV substation, promoting the application of "5G+smart energy".

On June 20, 2019, technicians of the Anhui Xuancheng Branch were testing 5G base stations at Guquan convertor station

5G+Smart Health Care

TIPS   **What will 5G+smart health care bring to us?**

Relying on the communications network and information platform, smart health care is able to establish connection among patients, medical staff, medical institutions and medical equipment, realizes smart operation, management and health services for hospitals, health systems, as well as families and individuals respectively, and improves the efficiency of medical system and the quality of medical services. After the application of 5G technology, smart health care will have a lot of new application scenarios:

· **5G+emergency treatment：**5G mobile ICU can realize real-time monitoring, remote HD video consultation and remote emergency treatment on the way to hospital, greatly improving the first-aid ability.

· **5G+telemedicine:** With the help of 5G low latency, doctors in different places can carry out pathological diagnosis, medical imaging diagnosis, monitoring, consultation, outpatient service, physical examination, case discussion and other work remotely through real-time video service.

· **5G+telesurgery:** Integrating with VR, 5G can promote the application of remote ultrasonic robot and remote surgical robot.

· **5G+real-time health monitoring & management:**The large capacity feature of 5G supports the medical equipment to collect, record and analyze the patient data comprehensively and continuously, so as to recommend appropriate treatment schemes to patients.

【5G Ambulance】

In March 2019, the Anhui Branch worked with the First Affiliated Hospital of University of Science and Technology of China (USTC) to establish a 5G joint lab of smart hospital, which upgraded the mobile ICU (transfer vehicle for patients with critical illness) of the hospital, including vehicle emergency platform, 5G communications line, Internet of vehicles management platform and command center management platform, enabling real-time transmission of 4K HD panoramic images and monitoring data back to the hospital's emergency command center, and to 120 command center synchronously. Based on the network transmission of video, audio, data and other multimedia information, the hospital can conduct real-time monitoring, remote consultation, remote treatment and other work in mobile ICU, opening a new model of smart emergency treatment. By the end of 2019, the mobile ICU of the hospital had been put into use, with more than 10 times per month in average.

On April 26, 2019, the mobile ICU of the First Affiliated Hospital of USTC made information exchange and audio/video interconnection with China Telecom 5G Innovation and Cooperation Conference in Shenzhen, Guangdong on site through 5G network

The 5G transformation of mobile ICU has added an effective weapon to us, which can ensure the safety of transporting critically ill patients.

—— Zhu Yousheng, doctor from the Emergency Center of the First Affiliated Hospital of USTC

【5G Telemedicine】

In 2019, China Telecom explored 5G remote surgery and remote diagnosis and treatment with hospitals in different places to promote the sharing of quality medical resources and provide better medical services for patients.

On June 27, the Beijing Branch assisted the remote robot surgery center of Beijing Jishuitan Hospital in connecting with the Second Hospital of Jiaxing in Zhejiang and Yantaishan Hospital in Yantai, Shandong through the remote system control platform, and successfully completing a multi-center 5G remote orthopedic surgery with robots, marking a new height of 5G telemedicine and AI application in China. During the surgery, Beijing Jishuitan Hospital remotely controlled two remote robots alternately to perform 3D surgical positioning of spinal screw fixation for two patients with spinal fractures in the two places. All the 12 screws implanted were correctly positioned. This innovative exploration, which combined orthopedic surgery, AI and 5G technology, is of landmark significance for the implementation of hierarchical diagnosis and treatment system and the building of smart health care in China, and won the first prize of the "Blooming Cup" 5G application competition of the MIIT in 2019. By the end of 2019, Beijing Jishuitan Hospital had successfully completed 13 remote orthopedic surgeries with several hospitals in 6 provinces and cities.

On June 27, 2019, President Tian Wei of Beijing Jishuitan Hospital performed a remote orthopedic surgery with doctors of the Second Hospital of Jiaxing in Zhejiang and Yantaishan Hospital in Yantai, Shandong

The integration of 5G and robot has realized the transition from "remote planning" in the past to "remote operation" nowadays. Remotely controlling two robots in different places at the same time makes me feel the same as directly operating a robot in my own surgery room.

—— Tian Wei, academician of China Academy of Engineering and President of Beijing Jishuitan Hospital

On November 28, 2019, the Hubei Branch supported experts of the Hospital of Stomatology of Wuhan University to instruct Shiyan Dongfeng Stomatology Hospital to perform an apical microsurgery through 5G network

On May 10, 2019, CT Fujian Quanzhou Branch supported Quanzhou First Hospital and Huian County Hospital to conduct an experiment on remote B-mode ultrasound consultation with 5G technology, helping the medical expert in the downtown area to diagnose the illness of a patient located 30 kilometers away

Lying in the B−ultrasound room of the County Hospital, I can accept the examination by a medical expert tens of kilometers away, and enjoy the high−quality diagnosis and treatment service of expert in a Grade−A Class 3 hospital without queuing up in large hospitals. How amazing!

—— Chen Shuduan, resident of Qitang Garden in Huian County, Quanzhou City, Fujian Province

5G+Smart Culture & Tourism

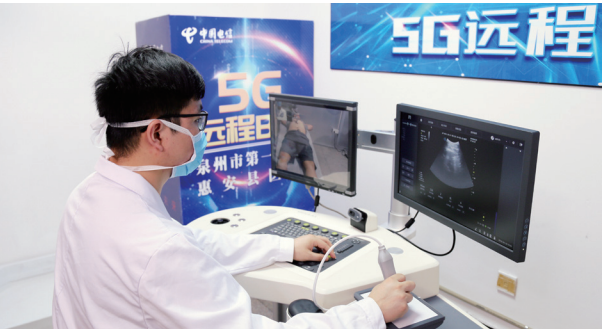## 【5G-based Live Broadcast for Cultural & Tourist Activities】

China Telecom supports large-scale recreational and sports activities, using 5G technology to broadcast HD live scenes in real time, and explores the application of 5G technology in scenic spot tourism to bring new experience for tourists.

On Chinese New Year's Eve - February 4, 2019, the Guangdong Branch supports the 5G+4K UHD live broadcasting task of CCTV Spring Festival Gala between the main venue and Shenzhen branch venue, with smooth, clear and stable video images

On March 10, 2019, the Anhui Huangshan Branch opened 5G base stations in Guangmingding and Yupinglou of Huangshan Scenic Area, realizing 5G+VR panoramic live broadcast and enabling tourists to enjoy the beautiful scenery remotely

On October 1, 2019, the Beijing Branch supported BTV with 5G network and a cloud private line to perform HD backhaul of the report of the celebrations of the 70th anniversary of the People's Republic of China

On October 20, 2019, Xi'an International Marathon was held. The Shaanxi Branch launched 8 applications, including 5G+4K real-time HD live broadcast and 5G+8K VR UHD live broadcast, to perform simultaneous live broadcast of images from multiple channels

5G+Rural Revitalization

【5G for Better Life and Production in Rural Areas】

After the establishment of 5G base stations by the Baise Branch in Guangxi Zhuang Autonomous Region in the Agaricus blazei Murill production base in Langping Town, Tianlin County in 2019, the growers can easily accept technical guidance from experts of the Microbiology Research Institute of Guangxi Academy of Agricultural Sciences through the "5G+8K poverty alleviation industry platform" built by China Telecom.

With China Telecom's "5G+8K poverty alleviation industry platform", the original worries about Penicillium, flying insects and other issues have been answered in detail by experts, and I'm finally relieved.

—— Yao Zailai, a grower of Agaricus blazei Murill in Langping Town, Tianlin County, Baise City, Guangxi Zhuang Autonomous Region

On October 12, 2019, Han Meili (first from the right), an expert from the Microbiology Research Institute, Guangxi Academy of Agricultural Sciences, explained to Yao Zailai, a grower of Agaricus blazei Murill in the production base in Langping Town, about the growth of Agaricus blazei Murrill, microorganisms and pest control through the "5G+8K" live streaming

In 2019, the Zhejiang Branch cooperated with the Educational Technology Center of the province to implement "Chunxiao Program", which organized training on IT application in education and research projects for rural schools, carried out pilot application of 5G, cloud computing, VR/AR and other new technologies in rural schools, improved the ability of rural teachers in applying information technology, and optimized the technical environment of rural schools. It also participated in the "Internet+compulsory education" partner assistance program of the provincial government, which included 1,000 primary and secondary schools, to help rural children to share the city's high-quality education resources.

Supported by the "Chunxiao Program", Fuchun No.7 Primary School in Fuyang District of Hangzhou and Baizhu Primary School in Jinyun County, Lishui have formed a teaching pair. The picture shows a scene when the students of the two schools were integrated in a same class on October 14, 2019

DEVELOP ICT SERVICES FOR A MODERATELY PROSPEROUS SOCIETY

ICT service is a foundation of a moderately prosperous society. China Telecom advances network building and universal service application in remote rural villages, accelerates infrastructure construction for new information networks such as 5G, Internet of Things (IoT) and data centers, promotes integrated development between cloud and network in an innovative way, as well as drives digital transformation, so as to provide advanced, applicable, secure and reliable services with globally leading networks and lay a solid foundation for the development of a moderately prosperous society.
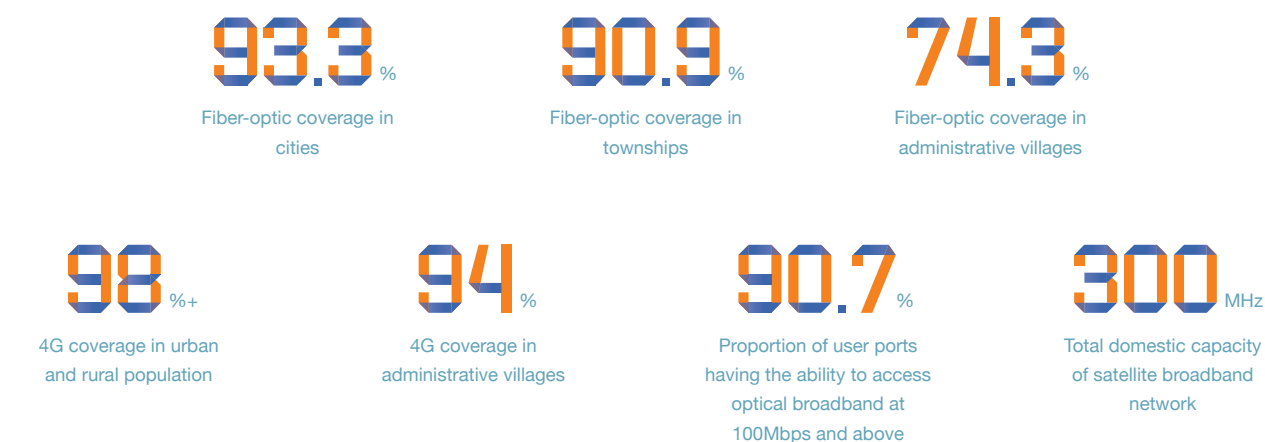
Build Developed Fundamental Networks

Expand Network Coverage

In 2019, we continued to promote rural communications network development, built rural service outlets based on local conditions, and actively promoted IT application and e-commerce development in rural areas, to help rural revitalization. We expedited the universal service project for remote and poor rural areas, have undertaken the tasks of constructing more than 11,000 4G base stations for the 4th and 5th batches of universal service projects, and completed in advance the 4th batch of construction task of about 4,500 4G base stations for universal service within the year.

Network Coverage in 2019

93.3%
Fiber-optic coverage in cities

90.9%
Fiber-optic coverage in townships

74.3%
Fiber-optic coverage in administrative villages

98%+
4G coverage in urban and rural population

94%
4G coverage in administrative villages

90.7%
Proportion of user ports having the ability to access optical broadband at 100Mbps and above

300 MHz
Total domestic capacity of satellite broadband network

The diagram shows:
1. Build developed fundamental networks
2. Promote cloud-network integrated development
3. Secure unimpeded networks
4. Improve customer service

【Overcome Difficulties to Promote Universal Service】

The Guangxi Branch took the initiative to undertake all the pilot projects of universal service in border areas and administrative villages in 2019, covering nearly 400 base stations in 9 cities including Baise and Fangchenggang, and completed all construction tasks in October 2019, three months in advance.

The Xinjiang Branch took on the fourth and fifth phases of national universal service projects in 2019, including 474 base stations in 10 areas such as Kashgar, Hotan and Tacheng. Kupu Township of Tuoli County in Tacheng Prefecture is located in the northwest mountainous area of Junggar Basin where it is difficult to reach some villages with optical cables. Engineers and technicians even used horses to transport equipment, and employed new microwave technology to set up a 24-meter high tower on the Huoyitasi Dongwozi Grassland of Saerwozike Village, making the network cover more than 20 km, and solving the communications problem for 360 households of herdsmen in five surrounding villages. Since then, the herdsmen's mobile phones having no signals after snow in winter has become a history.

In 2019, the Tibet Branch launched a "three over 90%" target project to contribute to the building of a moderately prosperous society in all respects (the coverage rate of optical fiber broadband and 4G network in administrative villages to be more than 90% respectively, and the 4G network coverage rate of national highways and important scenic spots to reach 90%), and by the end of the year, the 4G coverage rate of administrative villages reached 91%. All of the 95 national highway coverage points and 21 administrative villages optical broadband points undertaken by the Ngari Prefecture Branch are located at places more than 4,600 meters above the sea level. Engineers and technicians overcame construction difficulties and completed the project on November 5 as scheduled.
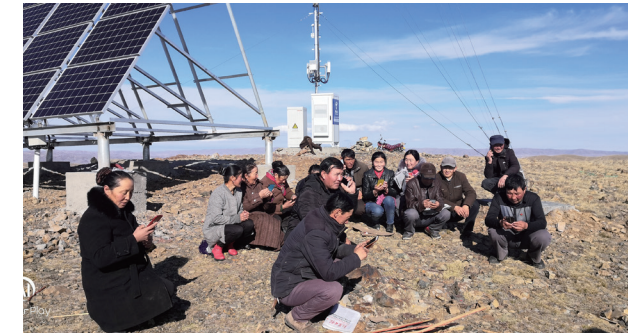
On October 27, 2019, the base station of Huoyitas Dongwozi Grassland in Saerwozike Village, Kupu Township, Tuoli County, Xinjiang Uygur Autonomous Region was officially opened, and local herdsmen/herdswomen were making calls

【Provide Communications Service for Special Areas】

Kekexili National Nature Reserve in Yushu Tibetan Autonomous Prefecture of Qinghai Province covers an area of 4.5 million hectares. It is one of the nature reserves with the largest area, the highest altitude and the most abundant wildlife resources in China, and has been listed in the World Heritage List. In 2019, China Telecom helped to build satellite fixed stations in the area to provide Tiantong mobile satellite phone service. Now, if there is any danger in the station or mountain patrol work, you can immediately contact the outside world for rescue. If you find poaching or illegal mining, you can report to the administration immediately. The scientific research work such as environmental monitoring, gene collection and geological exploration also can get better communications support.

China Telecom has provided a new model for the construction and ecological protection of Kekexili park with new technologies, which has helped the IT application of the national park.

—— Luo Yanhai, Deputy Director of Kekexili Administrative Office, Yangtze River Source Park, Sanjiangyuan National Park Administration

The offshore platform of China National Offshore Oil Corporation (CNOOC) located in Liaodong Bay was not covered by 4G network, which made it inconvenient for operators to contact their relatives. The Liaoning Huludao Branch actively communicated with the company to carry out network construction, and opened the first offshore base station on May 17, 2019, which realized 4G network coverage of 26 manned platforms, and 15,000 square kilometers of sea area. It not only enables local CNOOC employees and fishermen to experience stable and smooth communications service, but also provides communications guarantee for the local to carry out maritime wind rescue, emergency relief and medical assistance.

After working at sea for 16 years, I finally use 4G, and can make video calls with my relatives and friends at will.

—— Li Shiyuan, from Liaodong Operation Company of CNOOC Tianjin Branch Company

On July 3, 2019, the Liaoning Huludao Branch opened 4G base station and installed indoor distribution system on the oil production platform of Liaodong Operation Company of CNOOC Tianjin Branch

Support and Serve Major Construction Projects

China Telecom actively supported major construction projects including the Beijing-Tianjin-Hebei coordinated development, the Guangdong-Hong Kong-Macao Greater Bay Area construction, and the integrated development of the Yangtze River Delta according to the arrangement of the national regional coordinated development strategies.

Examples of Actions Supporting Regional Construction in 2019

Beijing-Tianjin-Hebei coordinated development

- Communicated with Xiongan New Area Management Committee, Xiongan Group and other institutions and enterprises to support the construction of a smart city in the New Area, established a 5G scale networking and application demonstration project with 150 5G base stations, made a plan on super cloud data center building, and implemented several demonstration projects
- Completed the construction of an information cloud platform, a data network and a flight display system for Daxing International Airport
- Implemented the communications support requirements for the 2022 Beijing Winter Olympic Games, and built networks covering Olympic venues, surrounding scenic spots, hotels, high-speed railways, highways, provincial roads and other areas in Beijing and Zhangjiakou of Hebei Province
- Prepared to build a Beijing-Tianjin-Hebei Data Center in Tianjin Wuqing Economic and Technological Development Zone, to enhance the ability of Beijing-Tianjin-Hebei cloud-network integration service and provide enterprises with high-quality information infrastructure
- Promoted the integrated networking of ChinaNet backbone network among Beijing, Tianjin and Hebei, which enabled the regional IDC to trans-provincially connect with core nodes upward and made access more convenient

Guangdong-Hong Kong-Macao Greater Bay Area construction

- Worked out the Guangdong Branch Action Plan for Information Infrastructure Construction 2019-2022, coordinated the construction of a new generation of information infrastructure in the Greater Bay Area, and prepared for the construction of "China Telecom Guangdong-Hong Kong-Macao Greater Bay Area Data Center"
- Jointly implemented an action of "Co-building 5G Smart City Cluster and Helping the Development of the Greater Bay Area" with Guangdong provincial government, realized continuous coverage of 5G base stations in the core urban areas of Shenzhen and Guangzhou, and boosted the practice of 5G+industry application in nine cities, covering 10 industries including smart transportation, intelligent manufacturing, smart police, and smart health care
- Improved the international outlet bandwidth of the Greater Bay Area, opened a dedicated channel for Qianhai international data, and started the construction of a dedicated channel for international Internet in Hengqin New Area
- Launched more favourable day data packages for Hong Kong/Macao and integrated Guangdong-Hong Kong-Macao data packages

Integrated development of the Yangtze River Delta

- Assisted Qingpu District of Shanghai, Jiashan County of Zhejiang and Wujiang District of Suzhou, Jiangsu building demonstration areas for integrated green development in the Yangtze River Delta by taking "cloud-network integration and cloud-digital linkage" as the framework and focusing on 5G and government cloud
- Cooperated with the construction of "Beidou+5G+AI" spatio-temporal information network and high-precision spatio-temporal data center in the Yangtze River Delta integrated green development demonstration areas, to develop cloud service capability and "intelligent+" application service platforms for multiple industries
- Cooperated with CCTV Yangtze River Delta headquarters and Shanghai station to jointly promote the smart application of new media
- Signed strategic cooperation agreements with nine cities in the Yangtze River Delta to co-build a 5G+intelligent manufacturing demonstration area of the Yangtze River Delta technological innovation corridor

【Help the Construction of Daxing Airport】

Beijing Daxing International Airport may influence Beijing, Xiongan New Area, Tianjin and other areas. It is an important aviation hub for the coordinated development of Beijing, Tianjin and Hebei, and plays an important role in promoting the traffic integration among Beijing, Tianjin and Hebei.

During the construction of Daxing International Airport, China Telecom System Integration Co., Ltd. undertook the task of building an information cloud platform, a data network and a flight display system for the airport, so as to build the "most powerful brain" and an "information highway" for it; customized cloud management, situation awareness, automatic operation and maintenance platforms for Daxing Airport, and helped the airport become the first "smart airport" in China whose all production systems are on the cloud in the civil aviation industry.

The smart airport IT application solution provided by China Telecom System Integration Co., Ltd. for Beijing Daxing Airport won the 2019 "Best Industry Solution Award" of the ICT China Innovation Award by China Association of Communication Enterprise.

Daxing International Airport was officially open to air traffic on September 25, 2019

Introduction of the Information System Built by China Telecom for Daxing Airport

An integrated platform

A basic cloud platform that integrates cloud computing, network, security and automatic operation and maintenance, to build the neurons and transmission center of the airport "brain", manage all kinds of resources, carry various production systems, and ensure stable operation 7 * 24.

A smart network

Improve the efficiency of business data forwarding and the safeguarding ability of security with software defined network (SDN), cloud-network integration and other technologies, and share information among and comprehensively coordinates internal and external units, airlines and passengers. Passengers may enjoy more convenient and environmentally friendly travel after the "certificate+face" matching is successful.

A network security system

Thoroughly supervise the airport security equipment, business processes and resources via the security situation awareness platform, and use big data and AI to achieve intelligent operation and maintenance management and smart security protection, so as to ensure that the airport operation information and passengers' personal information data are not lost.

China Telecom Guangzhou cloud computing data center, located in Haizhu District, Guangzhou City, Guangdong Province, is one of the important network and data nodes for South China and the Guangdong-Hong Kong-Macao Greater Bay Area. On November 19, 2019, the newly-built Shaxi IDC room was delivered for use

On November 2, 2019, the Shanghai Branch signed a cooperation agreement with Qingpu district government, China Beidou Industrial Technology Innovation West Hongqiao Base and CETC Software & Information Service Co., Ltd. to provide "Beidou+5G+AI" spatio-temporal information network and high-precision spatio-temporal data center services for Beidou Yangtze River Delta integrated application services
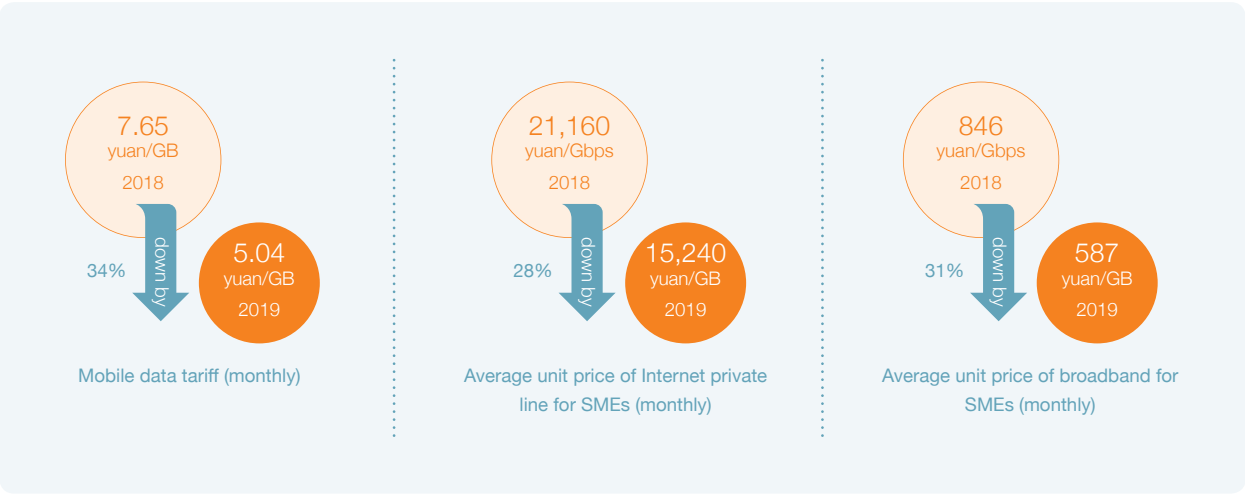
Speed Up and Fees Down

In 2019, we were active in implementing State Council and MIIT requirements, further raised broadband Internet access speed and reduced the tariff, to benefit wide users.
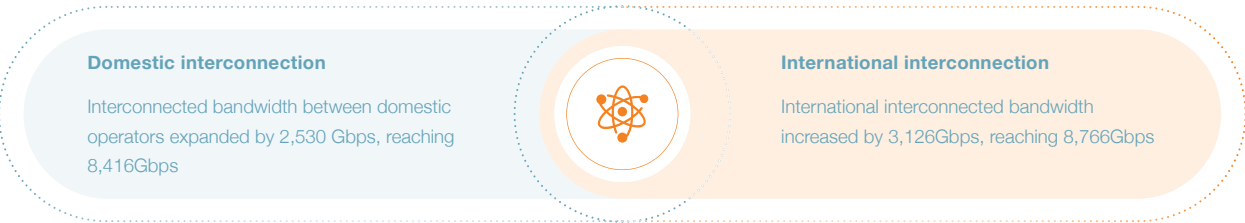
Main Actions for Speed Up and Fees Down in 2019

Area	Main Actions
Mobile business	• Enhanced the depth of 4G network coverage level, and adopted the method of dynamic expansion of base stations on a monthly basis to improve the network quality in traffic and voice intensive areas such as high-speed railways, expressways, universities, high-density residential areas, high-traffic commercial areas, and subways • Full commercial use of VoLTE (4G network-based voice service) • Simplified the tariff structure, reduced the number of packages, lowered down the charge of data traffic beyond the mobile phone package to no more than RMB0.03/MB, and launched preferential traffic products
Wired broadband	• Improved the coverage of fiber optic broadband network in urban and rural areas • Proactively deployed gigabit fiber optic broadband network • Lowered the standard tariff for Internet private lines

Main Results of Speed Up and Fees Down in 2019

7.65 yuan/GB 2018 → down by 34% → 5.04 yuan/GB 2019

Mobile data tariff (monthly)

21,160 yuan/Gbps 2018 → down by 28% → 15,240 yuan/GB 2019

Average unit price of Internet private line for SMEs (monthly)

846 yuan/Gbps 2018 → down by 31% → 587 yuan/GB 2019

Average unit price of broadband for SMEs (monthly)

Capacity Expansion Results of Internet Backbone Network in 2019

Domestic interconnection

Interconnected bandwidth between domestic operators expanded by 2,530 Gbps, reaching 8,416Gbps

International interconnection

International interconnected bandwidth increased by 3,126Gbps, reaching 8,766Gbps
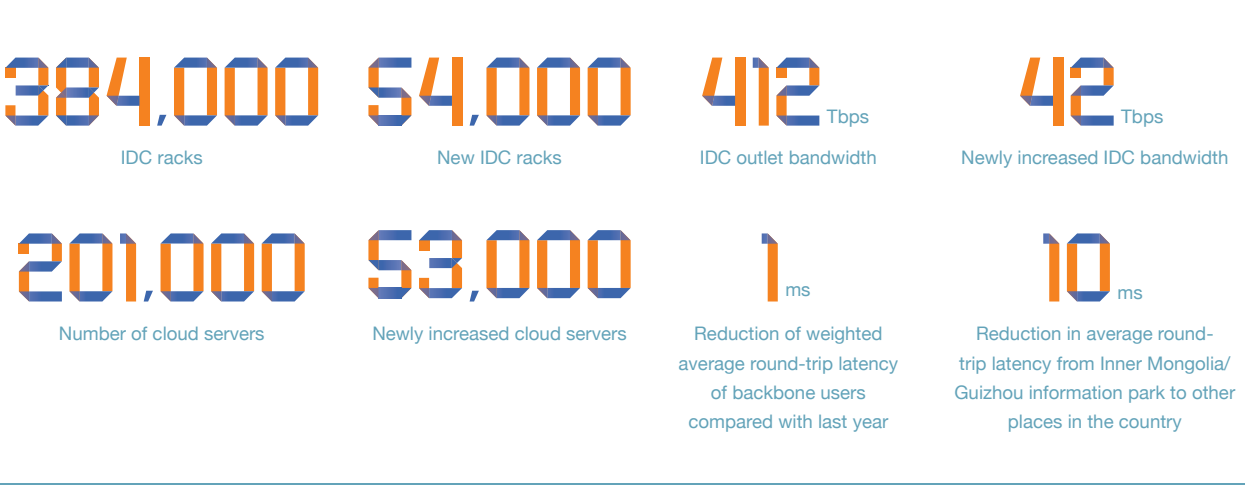
Promote Cloud-Network Integrated Development

China Telecom has strengthened researches, testing and deployment of key technologies in cloud computing, big data and AI, and accelerated the integration of cloud and network, with the aim to build a more intelligent network.

Overview of Cloud-Network Integration Promotion in 2019

Area	Actions and Progress	Significance
Experiment	• Field test and verification of 5G core network element (NE) virtualization deployment in 12 cities • Resolved problems for a batch of PaaS core technologies, developed 21 capability components in an innovative way and applied them in the business system	• Explored network element virtualization • Realized the cloud-based development of its core IT system, and promoted the upgrading of IT architecture
Scale deployment	• Expedited the building of IDC and cloud resource pool • Built a private optical transport network (OTN) covering government & enterprise customers in 128 cities in 31 provinces and key cloud resource pools, which is safe and reliable, and has the ability of fast service provision, flexible scheduling and optional bandwidth, and further reduced the latency • Scale deployment of cloud-network integration products, promoted the construction of intelligent private lines, completed the deployment and installation of the first batch of on-demand network in 10 provinces, and realized on-demand bandwidth, multi-purpose usage of one line, and automatic opening of the virtual Overlay Network	• Consolidated and improved the service capability of public cloud • Preliminarily realized network change following the cloud and laid a foundation for the further integration of cloud and network • Further reduced network delay
Product R&D and promotion	• Developed software-defined WAN (SD-WAN) capability and achieved access at 19 PoPs • Developed integrated object storage products to realize seamless access of multi-protocol storage for file, block and object • Made go live and loading of 7 database products and 5 middleware products • Developed and made go live an "E-surfing MR" (MapReduce) product to provide users with large-capacity data storage and analysis abilities	• Provided customers with more diversified cloud products and services

Overview of Cloud-Network Integration Capability Improvement in 2019

384,000
IDC racks

54,000
New IDC racks

412 Tbps
IDC outlet bandwidth

42 Tbps
Newly increased IDC bandwidth

201,000
Number of cloud servers

53,000
Newly increased cloud servers

1 ms
Reduction of weighted average round-trip latency of backbone users compared with last year

10 ms
Reduction in average round-trip latency from Inner Mongolia/Guizhou information park to other places in the country

Secure Unimpeded Networks

Safeguard Network and Information Security

China Telecom complies with the laws and regulations on network and information security such as the Cyber Security Law of the People's Republic of China, conscientiously implements relevant national requirements on cyberspace security, fulfills duties, actively does a good job in corporate network security governance, continues to improve the corporate network security ability, safeguards the security of services provided to customers, and strives to create and protect cyberspace security.

Main Actions in Safeguarding Network and Information Security in 2019

Area	Main Measures	Results
Organization and institution building	• Set up a separate Department of Network and Information Security Management • Implemented security requirements and measures during business operation and maintenance of systems and platforms	• The management system, the responsibilities and the institutional norm have been further enhanced, fulfilled, and improved
Capacity building	• Built technical capabilities in security protection, intrusion prevention, security monitoring, risk diagnosis, and emergency response • Monitored, traced and shut down Botnet, Trojan horse, worm, malicious programs, malicious domain names and malicious URLs • Provided denial of service attacks, domain name security, website security, data security and other real-time monitoring and protection capabilities	• Built a "carrier level" network attack protection platform • The network security protection and service platform has supported nearly 30 major activities and successfully handled sudden malicious attacks for many times • Have provided network security services for thousands of customers in the fields of the Party and government, finance, education, Internet and so on
Hidden danger prevention and active service	• Discovered and rectified hidden dangers from the perspective of actual combat • Strengthened threat management, carried out risk vulnerability scanning, and conducted mass testing in an innovative way • Deepened information security assessment of new Internet technologies and businesses, did a good job in identifying, warning and reporting illegal and harmful information, and constantly improved internal risk control measures	• Carried out risk scanning timely, with the timely disposal rate reaching 100% • Assisted customers in discovering and intercepting malicious links, malicious codes, fraud information, phishing websites and other behaviors spreading through the network, and disposed of more than 13,000 phishing and fraud websites • Completed more than 600 business security assessments, and the business security level has been significantly improved

【Optimize and Promote Intelligent Number Service】

China Telecom Best Tone Information Service Co., Ltd. rolled out a security alert product of intelligent number, to help users identify calling enterprises in real time, effectively prevent fraud and harassment, as well as help government agencies and enterprises reduce communications costs and improve efficiency. In 2019, the company optimized the product according to the feedback from users, and won the Gold Award for technological innovation of employees in the 29th Shanghai excellent invention selection competition. By the end of the year, the product had been promoted to apply in 31 provinces/autonomous regions/municipalities directly under the central government, with 5 million enterprise users and nearly 300 million individual users covered by security alert. In 2019, it had sent enterprise identity reminders to individual users for more than 1 billion times.

Function Optimization	Optimization Results
• **Increase the quantity threshold of harassment number alerting:** user can define the number marking threshold, and when the number has been marked more than this value, a flash message will be sent • **Add alerted number type:** alert according to the number label selected by the user • **Add gray list marking function:** user can add a label to unfamiliar number, and when the number has been marked for certain times, it will be identified as one in the gray list to alert	• The alerts received by users have been greatly increased, which effectively reduces the risk of harassment • The number marking type includes "real estate agency", "express/food delivery", "transportation" and other specific labels, which are easy for users to understand and identify • User can select a label for alert according to the need • User can add a label to help other users identify a number as harassment if no flash message had been sent for alert before he/she answered the call but found that it is a harassing call or belongs to another label after answering the call

After using the caller tags service, our telephone connection rate is very high now, which is of great help to our service.

—— Zhu Xinhua, Director of Post/Delivery Department, Jianhu County Post Office, Yancheng City, Jiangsu Province

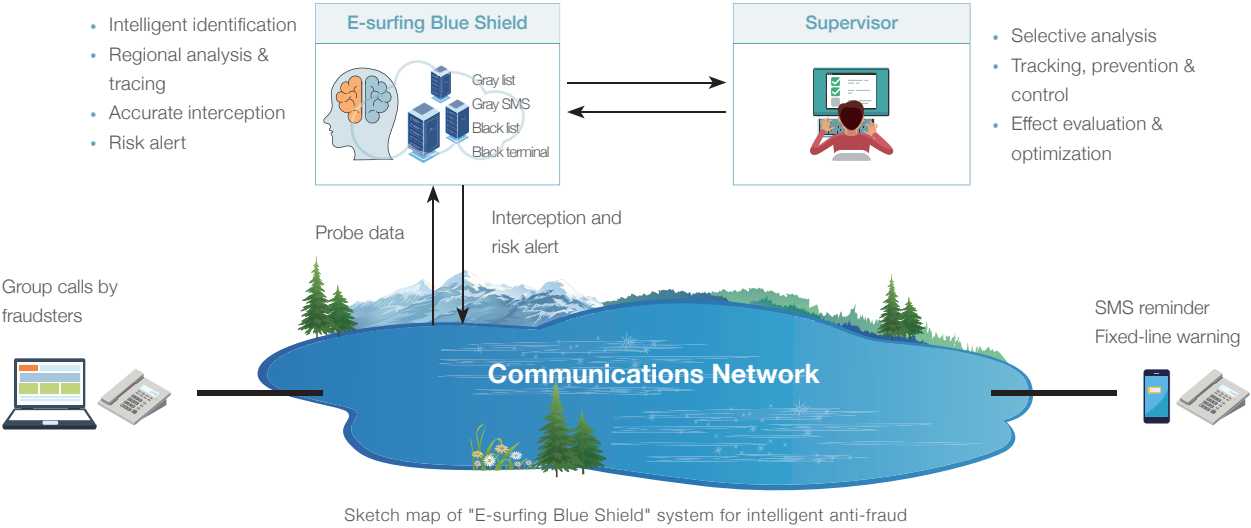### 【Special Rectification of Nuisance Calls】

In 2019, China Telecom thoroughly implemented requirements of the MIIT and other ministries and commissions on comprehensive rectification of nuisance calls, and established a security prevention and control system for spam/nuisance and fraud information, which includes terminal risk alert, access authentication control, network behavior detection, and system analysis and control, striving to create a safe and healthy information consumption environment.

Measures & Results of Nuisance Calls Rectification in 2019

Measures	Actions	Results
Enhanced communications resource management	• Enhanced control of private voice lines, 95/96 and 400 services, as well as access management of communications resources • For resources, strictly implemented the white list mechanism of outbound calls, strengthened the supervision of users in compliance use, and resolutely closed or dismissed users who are found to have illegal use behaviors	• Shut down more than 30,000 illegal relays and 277 numbers beginning with 400/95
Strengthened the prevention of abnormal voice calls	• Established an abnormal voice calls prevention system and an interception system for inveracious overseas roaming • Improved big data analysis and prevention & control abilities, to automatically identify and intercept nuisance calls • Fully closed down the caller concealing function of private voice lines to prevent false number from entering the network	• Achieved automatic identification and handling of abnormal voice calls such as unwanted calls that keep calling, ring and hang up immediately, and malicious group calls • Able to intercept foreign bad numbers
Fast handling of complaints against nuisance calls	• Improved the mechanism of fast handling nuisance call complaints on 10000 service number platform and MIIT's 12321 complaint and report platform • The Group company and provincial branches established a linked response system to verify and handle complaints in time and dispose of confirmed nuisance calls	• In the second half of 2019, the quantity of reported complaint numbers was at a low level in the industry
Enhanced user terminal alerts	• Sent security alerts to users against suspected bad calling numbers through flash messages or SMS messages	• Sent 84.63 million pieces of SMS messages and 624 million pieces of flash messages

【Prevent Communications Information Fraud】

The "E-surfing Blue Shield" system developed by the Guangdong Branch is based on communications network's dynamic data, and integrates big data technology, network positioning, network control and user contact technology. It can analyze and identify all kinds of abnormal voice communications such as malicious websites, nuisance messages, high-quality fake numbers, fraud and illegal numbers, so as to realize one-stop intelligent anti-fraud service based on active defense. In 2019, the Maoming Branch optimized the anti-fraud system, performed in-depth data mining against fraud numbers, and increased the frequency of automatically kicking abnormal numbers out of the network from 72 times to 168 times a day.

- Intelligent identification
- Regional analysis & tracing
- Accurate interception
- Risk alert

E-surfing Blue Shield

Gray list
Gray SMS
Black list
Black terminal

Supervisor

- Selective analysis
- Tracking, prevention & control
- Effect evaluation & optimization

Probe data

Interception and risk alert

Group calls by fraudsters

Communications Network

SMS reminder
Fixed-line warning

Sketch map of "E-surfing Blue Shield" system for intelligent anti-fraud

Danzhou City in Hainan Province was once one of the 13 high-risk areas of fraud cases listed by the Inter-ministry Joint Conference Office of the State Council for overhaul. After buying SIM cards from other places, fraudsters stayed at their dens in Danzhou to send fraud messages and perform Internet loan fraud. The Network Monitoring and Maintenance Center of the Danzhou Branch cooperated with Danzhou Public Security department according to law to make anti-fraud model analysis based on the characteristics of fraud, and strengthened monitoring, while timely identified fraud messages sent by overseas users, and intercepted them in real time, effectively helping users avoid losses. In 2019, more than 72,000 suspected fraud numbers, more than 27 million fraud calls and more than 110,000 fraud SMS messages were intercepted.

Your company's experts have devoted themselves to the overhaul of fraud related numbers, which has laid a solid foundation for work in this field, and reflects a high sense of social responsibility.

—— Excerpted from the thank-you letter from Danzhou Public Security Bureau of Hainan Province to CT Hainan Branch in May 2019

Full Support to Emergency Communications

China Telecom has faithfully fulfilled its mission of ensuring safe and unimpeded communications, spared no effort to fight against earthquakes, typhoons, floods, landslides and other natural disasters, and safeguarded major activities. In 2019, we successfully completed emergency communications guarantee for natural disasters fighting such as the forest fire in Liangshan Yi Autonomous Prefecture and Changzhi City of Shanxi Province, Changning earthquake of magnitude 6.0 in Sichuan Province, and the super typhoon Lekima, as well as the communications guarantee for events such as the activities celebrating the 70th anniversary of the founding of the People's Republic of China, the 7th Military World Games, the Horticultural Expo 2019 Beijing, and the 2nd Belt and Road Forum for International Cooperation, the 2nd China International Import Expo, Conference on Dialogue of Asian Civilizations, celebrations of the 20th anniversary of Macao's return to China, and World Internet Conference.

Overview of Emergency Communications in 2019

69,000+ person-time
Emergency communications supporters dispatched

22,000+ vehicle-time
Emergency communications vehicles dispatched

17,000+ set-time
Emergency communications equipment dispatched

79+ pieces
Emergency public service messages sent

【Fully Support Disaster Rescue & Relief】

On August 10, 2019, super typhoon Lekima landed in Chengnan Town, Wenling City, Zhejiang Province. The maximum wind force near the center reached scale 16, which affected nearly 14 million people in Zhejiang, Jiangsu, Anhui, and Shandong provinces, and the communications service was interrupted to a large extent. Relevant CT companies/branches organized forces to devote to rescue and relief work as soon as possible. In Zhejiang, we dispatched personnel for more than 25,000 person-time, emergency recovery vehicles for more than 5,900 vehicle-time, and diesel generators for more than 3,700 unit-time, and used 91 satellite phones. After three days and two nights of emergency repair, communications service was basically restored. In Nanji Town, Ningguo, Xuancheng City, Anhui Province, Huang Dehe, an installation and maintenance engineer, rushed to the computer room at the earliest time on the day of typhoon arrival, started diesel generators to ensure mobile communications signals, and bought valuable time for local rescue work.

They are our backbone and backer! I'm so moved by CTers who rushed to repair the network!

—— Chen Jiangfeng, Shangrenshan Guesthouse operator in Danzhu Town, Xianju County, Taizhou City, Zhejiang Province

On August 11, 2019, affected by typhoon Lekima, Shangren Bridge in Danzhu Town, Xianju County, Taizhou City, Zhejiang Province was closed as it had a collapse risk. The emergency repair personnel set up high-altitude sliding ropes to pass

On August 20, 2019, flood and debris flow disasters occurred in Wenchuan County and Lixian County, Aba Tibetan and Qiang Autonomous Prefecture, Sichuan Province. The Sichuan Branch quickly restored the communications business in the affected areas. The picture shows the rescue personnel crossing a river with the help of an excavator to repair the damaged communications facilities on August 21
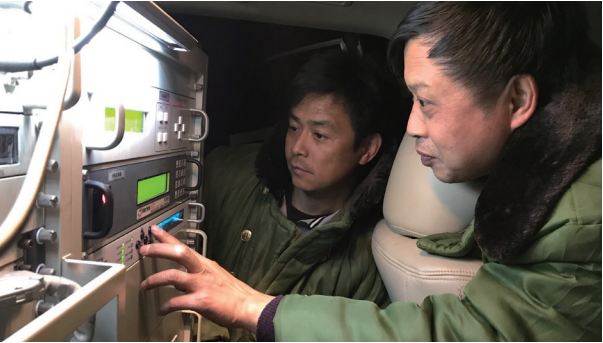
On March 29, 2019, a forest fire broke out in Wangtao Town, Qinyuan County, Changzhi City, Shanxi Province. The Shanxi Branch immediately dispatched an emergency communications support team, and mobilized satellite communications resources by coordinating with CT Satellite Communications Company, to fully support communications

【Fully Support MWG】

On October 18 to 27, 2019, the 7th Military World Games (MWG) was held in Wuhan, Hubei Province. More than 9,300 soldiers from 109 countries participated in the games. It is the largest in scale and the most influential one with the largest number of participants in the history of MWGs. China Telecom constructed advanced information infrastructure that covered all venues with all means and services, such as dual Gigabit optical cable, mobile communications, private network for competition, and satellite communications, and provided smart information solutions and network information security safeguards to fully support the success of the games.

On October 27, 2019, the MWG was successfully concluded, and some members of CT expert service team took a group photo

China Telecom gave full play to its technical advantages in cloud-network integration and security and credibility, successfully completed a number of support tasks, ensured the safety, stability and smooth operation of the event's information system, and demonstrated the responsibility and accountability of a state-owned enterprise with practical actions.

—— Excerpted from the Thank-you Letter from the IT Department of the Executive Committee of the 7th Military World Games

Improve Customer Service

China Telecom has a deep understanding of customers' needs. While striving to provide customers with various communications and information application services, the Company attaches great importance to protecting their rights and interests, strengthens the building of service capability, promotes smart service, and supports number portability, continuously improving service quality and service level.

Protect Customers' Rights & Interests

China Telecom has earnestly implemented the Law on Protection of Consumer Rights and Interests, the Advertisement Law and other laws and regulations on protection of customers' rights and interests, insisted on providing products and services in accordance with laws and regulations, strictly reviewed the compliance status of advertising and publicity, continued to standardize the management of business tariffs, promptly responded to and dealt with problems reported by users, enhanced protection of users' personal information, and carried out rectification work in depth.

On March 15, 2019, the Baise Branch in Guangxi Zhuang Autonomous Region participated in the activity of Consumer Rights and Interests Protection Day sponsored by the Municipal Administration for Industry and Commerce, received public consultation on the spot, and made publicity on prevention of communications information fraud

On August 29, 2019, Li Zhe (first from the right), General Manager assistant of the Jingdezhen Branch in Jiangxi Province, listened to customers' opinions personally on the "General Manager Reception Day"

Intensify Handling of Hot Issues

In response to consumers' complaints, we focused on the rectification of problems such as "complex packages making it difficult for users to select, and marketing infringement of value-added business", "nuisance calls and spam SMS messages harassing users" and "excessive collection and illegal use of users' personal information data" in 2019, and made remarkable results. Among them, the number of packages on sale, the number of complaints about value-added services, and disputes involving unclear fee deduction decreased significantly year on year, and indicators such as complaints of nuisance calls and spam SMS messages and the complaint rate of one million users reported by the MIIT were at a low level in the industry.

Enhance Personal Information Protection

China Telecom has thoroughly implemented the provisions on protection of personal information in the Cybersecurity Law of the People's Republic of China and other laws and regulations, fulfilled relevant regulatory requirements of the government, continuously improved the management system of user personal information protection, and strengthened the work in this aspect. In 2019, we urged companies/branches at all levels to fulfill their responsibilities in protecting user personal information, and "all of the business unit, the operation unit, and the system unit should be responsible for protection"; to effectively standardize the collection, storage, transmission, use and destruction of user information, and strictly control the authority of business service personnel in user information query and handling based on the principle of "collection with basis, storage for proper use, use with records, and accountability for abuse".

Main Measures Taken to Enhance Compliance Management of the Enterprise Apps in Collecting & Using Personal Information in 2019

- Real-time display by virtue of 5G+AR
- Formulated regulations such as "Specification for China Telecom Apps in Collecting and Using Personal Information" and "Compliance Management Measures for Customer-oriented Apps in Collecting and Using Personal Information" to improve the app compliance level from the aspects of standard specification, implementation, education and training, technical support and establishment of long-term mechanism
- Comprehensively sorted out and checked the self-owned customer-oriented apps, and carried out risk assessment and problem rectification
- Organized compliance management training on app collection and use of personal information, conducted app spot check and evaluation, and closed down unqualified apps and turned over to other apps
- Established a compliance management platform for enterprise apps in collecting and using personal information, to make technical tests on use authority and personal information collection, regulate the behavior of self-operated apps in obtaining personal information, and improve the efficiency of compliance management

Advance Number Portability

In 2019, we put into practice the arrangement and requirements of the MIIT on implementing number portability nationwide, promoted transformation of network, business platform and management system, formulated business management specifications and service rules, carried out intra- and inter-network business testing, and provided number portability service as scheduled. In accordance with the principle of "user-friendly, fair and just, honest and trustworthy, and collaborative", we continued to improve relevant services and strove to ensure that users can switch from one operator to another at a fast speed and use the service well.

Overview of Number Portability Action Implementation in 2019

- **Raised understanding & awareness**：Strengthened the sense of responsibility and ensured full understanding and implementation
- **Tightened up service management**：Standardized service behavior, to protect users' rights and interests and service quality
- **Provided high-quality products**：Increased service value, improved customer experience and customer satisfaction with more high-quality and efficient integrated intelligent information service
- **Strengthened operation and maintenance**：ensured smooth operation of the network system for number porting, and safeguarded communications quality and network information security
- **Enhanced social cooperation**：strove to realize seamless switch and connection of communications and information services for users switching operators with the same phone number

200+
NEs transformed

800+
APIs upgraded & transformed

300+
Business platforms upgraded and transformed

300,000+
Tests conducted

1 million+person-time
Staff training

Carry out a Special Action on Service Improvement

In 2019, in combination with the theme education of "Remaining true to the original aspiration and keeping the mission in mind", we actively practiced the service philosophy of "people's posts and telecommunications for the people", and carried out a special activity of "keeping the original aspiration and undertaking the mission, all staff service in action", to enhance the ideological and action consciousness of all employees in serving the people, continuously improve the service ability and quality, and strive to create a new and better information life for the people.

Main Contents of the Special Action on Service Improvement in 2019

General managers talk about service	Listen to customers' opinions	Training for service personnel	Commend outstanding service deeds
General managers of provincial and municipal branches gave lectures to employees and guided them to have service in mind and in practice	Managers at all levels went to the grassroots to listen to customers' opinions, and did substantive work to solve their problems	Improved their service skills to provide users with sound services	Commend outstanding service deeds: Carried out service deeds selection, and guided the staff to "learn from the outstanding employees, align with them, and strive to be a model in serving the public"

【General Managers Talk about Service】

General managers of provincial and municipal branches personally explained to employees the tradition of China Telecom in serving the public, exchanged their understanding of and experience from service work, discussed how to do a good job in customer service, and promoted employees to understand the original aspiration of the Company, fulfill the mission, and keep the service culture of China Telecom in mind and implement it in action.

> Service is a business, a product and a foundation of sustainable development.
>
> —— Qin Xueshou, GM of the Gansu Branch

> Service is not a cold number, but a vivid scene, and emotional communication. It is a matter related to every business line and every employee.
>
> —— Tang Xiaowen, GM of the Qinghai Branch

> Keep in mind the original aspiration and mission of the posts and telecommunications industry, focus on customer perception from aspects that bring inconvenience to and make customers unhappy and dissatisfied, and solve service problems.
>
> —— Shao Xinhua, GM of the Xinjiang Branch

> When doing service work, you should always be sincere, think in others' shoes, and "don't do to others what you don't want others to do to you".
>
> —— Zhang Yuheng, GM of the Jilin Branch

> We shall keep the philosophy of customer service deeply in mind and customers have the final say about whether our service is good or not.
>
> —— Chen Zhiran, GM of the Guangdong Branch

> An excellent enterprise will have excellent service, and excellent service will make an excellent enterprise.
>
> —— Zheng Chengyu, GM of the Sichuan Branch

【Listen to Customers' Opinions and Solve Problems】

The Zhejiang Branch set up a "General Manager Supervision Hotline" to listen to complaints from unsatisfied customers. In 2019, 800 calls were put through in average per month, and 350 complaint work orders were handled in average per month. A total of 45 typical cases were analyzed, 76 problems were discovered and 42 reasonable suggestions were put forward.

In view of the problem reported by the customer service number 10000 that customer's network access fee for the first month was too complex, the Guangdong Branch organized several departments to analyze the disputed cost scenarios in depth, made an online promise to customers that "no use, no charge; refund immediately what should not be charged", and provided a service of quick claim payment for petty sum, enabling customers to know their consumption clearly and get assured.

In response to the problems of "inconvenience, slowness and dissatisfaction" reported by customers in new installation of broadband, the Xinjiang Branch has made four promises: "delivery on the same day of ordering, 100% satisfaction of online service, inquiry of broadband order on the same day, and 'installation on the same day of ordering, repair on the same day of ordering, and compensation for slowness' for broadband installation and maintenance service, to improve customer satisfaction.

On November 1, 2019, the Vice General Manager of the Jilin Branch Mr. Zhang Zhexin and others were listening to customers' opinions at the working site of custom service hotline 10000

【Commend Outstanding Service Deeds】

Under the unified organization of the Group Company, more than 100,000 front-line employees participated in service study & discussion and mass selection of outstanding service deeds. Through a series of selection, 31 employees won the gold and silver awards of "Outstanding Service Deeds Selection among All Staff".

On January 3, 2020, the Group Company held the final of "Outstanding Service Deeds Selection among All Staff", and 10 contestants won the gold awards. They are: Ye Hongyi of the Anhui Branch, Shen Yang of the Jiangsu Branch, Wu Linna of the Guangdong Branch, Zhang Yan of the Guizhou Branch, Cao Tian of the Fujian Branch, Li Shuman of the Hubei Branch, Gao Min of the Hebei Branch, Hua Shuming of the Shanghai Branch, Zhang Kang of the Zhejiang Branch and Feng Jianyuan of the Tianjin Branch.

Ye Hongyi: Line maintainer who has walked in the mountain for 20 years

Fuling Town of Jixi County, Xuancheng City, Anhui Province, is the starting point of Hui-Hang Ancient Path. It is located in the mountainous area and has inconvenient transportation. Ye Hongyi of Fuling Rural Business Department of the Jixi County Branch is engaged in line maintenance service locally. He is responsible for 40 kilometers long of communications pole lines, and serving more than 700 households of users in an area of 35 square kilometers. Local users are scattered, and the fiber optic cable and installation tools can only be transported with hands and shoulders. In the past 20 years, from fixed-line telephone, broadband to 4G, Ye Hongyi has always served mountain village users on foot, and safeguarded the communications network along the Hui-Hang Ancient Path with youth.

On October 16, 2019, Ye Hongyi was walking on the Hui-Hang Ancient Path deep in mountains to provide communications line installation & maintenance service

> As a CT employee, my mission is to help people living in the mountains to be able to use telephones, broadband and E-surfing mobile phones, and enable them to enjoy the convenience brought by information. I will keep going at the thought of users in this mountainous area trust China Telecom.
>
> —— Ye Hongyi, from the Jixi County Branch in Xuancheng, Anhui Province

Wu Linna: Intelligent customer service agent trainer who devotes heart and emotion to training

In response to the problem that customers were not satisfied with the navigation of interactive voice response (IVR) by customer service 10000, the Guangdong Branch tried to develop an intelligent customer service agent "Xiaozhi", using AI technology to innovate services and improve customer perception. Wu Linna, the operation manager and chief experience engineer of the 10000 intelligent voice team of the Guangdong Branch, adopted "PASS rule" to design the process (Promptly, responding to customers in time; Actively, making targeted prediction and recommendation for customers; Smoothly, smooth switch between service modes; Simply, simple and clear service) during the function design and optimization process she undertook. After the intelligent customer service agent "Xiaozhi" was launched and went through repeated training and continuous iteration and optimization, it promoted the linear increase of usage. The average time length of customers getting services has been compressed by 46 seconds, and the net promoter score (NPS) is as high as 53.6%, becoming the most popular intelligent customer service of China Telecom.

Every phonetic and semantic training of "Xiaozhi" is listening to the opinions of customers; every trajectory analysis is understanding the needs of customers; I have always found that the details of service are not perfect in every training; and I expect the next version of Xiaozhi to be more convenient and more user−friendly!

−− Wu Linna, operation manager and chief experience engineer of the 10000 intelligent voice team of the Guangdong Branch

On June 18, 2019, Wu Linna was training the intelligent customer service agent

Hua Shuming: Broadband installation & maintenance engineer who practices the spirit of craftsman

Hua Shuming, head of quality youth studio and an installation and maintenance engineer of the Shanghai Branch, devotes himself to providing excellent broadband service for customers. In the process of providing private video line service for government and enterprise customers, responding to the issue that customers were not willing to buy routers by themselves, he conducted in-depth investigation for more than 10 times, broke through the traditional networking mode, eliminated router terminals, and shortened the installation and debugging time from 2 hours to 10 minutes. In the process of providing smart home business, he recorded the problems encountered at any time, summarized the solutions by classification, and formed a normative operation manual, driving the team of smart home engineers to jointly provide high-quality services for customers.

I will share my experience with every partner around me, and turn my detour into their straight path; I will also give full play to the spirit of young craftsmanship and unite with the front− and back−end youth for joint innovation.

−− Hua Shuming, broadband installation & maintenance engineer of the West District Telecom Office of the Shanghai Branch

On December 19, 2019, Hua Shuming was debugging and testing the links of a private network in the computer room

BOOST ECONOMIC TRANSFORMATION AND UPGRADING TOWARD A MODERATELY PROSPEROUS SOCIETY

The digital economy is an important driving force for a moderately prosperous society. China Telecom promotes smart operation at greater depth, cooperates with various industries, actively engages in the upgrading toward "new consumption" with "new infrastructure", and innovates and expands the application of the new generation of ICTs. These efforts facilitate the transformation and upgrading of traditional industries, improve the capability of undertakings for public well-being, connect all walks of life in their development, promote green development, and push the development of a moderately prosperous society toward higher quality.

① Expedite Smart Operation

② Drive Industry Upgrading

③ Facilitate Undertakings for Public Well-being
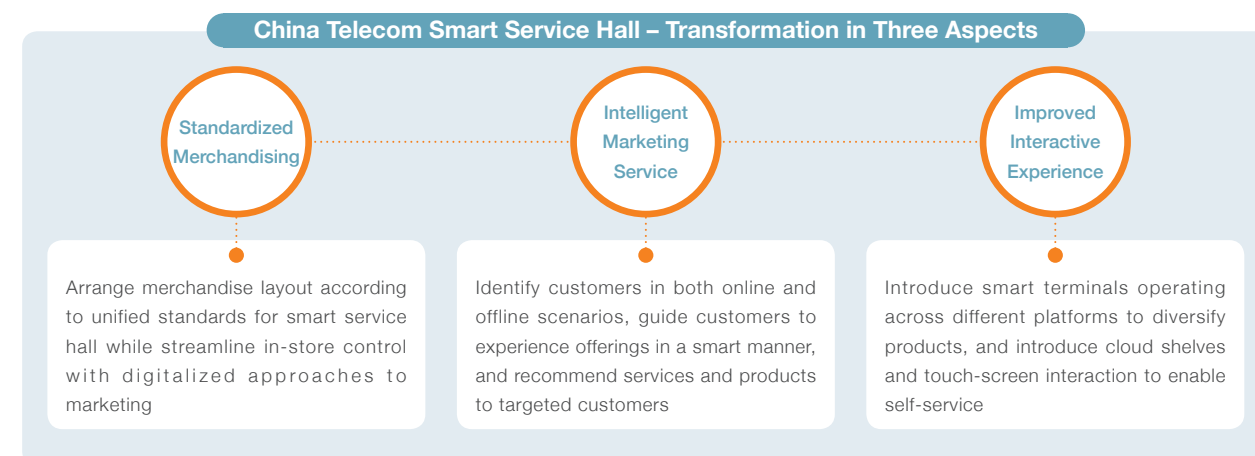
④ Practice Green Development

Expedite Smart Operation

As a key player in the development of the digital economy, China Telecom has accelerated its own digital transformation, actively applied smart technologies in its operation and innovated operation approaches and models to continuously improve the level of lean operation, precise management, precision marketing and individually tailored services. In 2019, the "Empowerment through Artificial Intelligence for Comprehensive Improvement in Service Capabilities" project won the first prize of the 16th Award for Innovation in Corporate Management Modernization for the Communication Industry issued by the China Association of Communication Enterprises, the "Exploration of MSS in Smart Operation" was rated as the best case in the "2019 Typical Examples of ICT Application by Central SOEs" by the State-owned Assets Supervision and Administration Commission of the State Council, and its WeChat & Weibo official accounts for customer care were awarded as the "Most Influential New Media Secondary Account of Central SOEs in 2019" by the News Center of the State-owned Assets Supervision and Administration Commission of the State Council.

【Build Smart Service Halls】

China Telecom takes the initiative to adapt to new retail trends through improving capabilities in such scenarios as smart customer identification, smart experience, precision marketing and fast-track service, as well as optimizing the merchandising, service process and user experience in service halls. In 2019, it built more than 400 smart service halls nationwide, increased customer visits to business outlets by 45% and witnessed remarkable raise in its service level and customer satisfaction. At the TM Forum Excellence Awards 2019, China Telecom's smart service hall innovation was honored with the "Outstanding Customer Centricity Award".

China Telecom Smart Service Hall – Transformation in Three Aspects

Standardized Merchandising

Arrange merchandise layout according to unified standards for smart service hall while streamline in-store control with digitalized approaches to marketing

Intelligent Marketing Service

Identify customers in both online and offline scenarios, guide customers to experience offerings in a smart manner, and recommend services and products to targeted customers

Improved Interactive Experience

Introduce smart terminals operating across different platforms to diversify products, and introduce cloud shelves and touch-screen interaction to enable self-service

China Telecom Research Institute and the Guangdong Branch launched the "AI-enabled unmanned service hall" in a pilot in 2019, using artificial intelligence for "identity authentication+face recognition+liveness detection" in a one-stop manner to realize efficient service offering and enhance customers' technology experience.

Examples of New Experiences in the AI-enabled Unmanned Service Hall

· Users can complete all processes for card issuance in 2 minutes with automatic activation so the card can be used immediately once inserted in place.

· Users can make appointments online to choose their mobile number and then pick up the cards offline; they can also redeem points or gifts by "showing their faces for verification"

· As for customer pain points resulted from long queues during peak hours in large business outlets, remote customer service has been designed to extend business hours

· In places without any business outlets such as airports, railway stations, campuses and shopping malls, on-premise smart terminals are put in place to provide convenience to self-service customers

On May 13, 2019, the Guangdong Branch launched the "AI-enabled unmanned service hall" pilots in VIVO and OPPO flagship stores in PASO Plaza, Baiyun District, Guangzhou

An unmanned facility where you never feel any inconvenient! There are customer receptionists on the video to answer questions online and their service is always considerate.

——He Yixin, Administrative Director, Guangzhou Four Leaf Management Co., Ltd.

【Innovation in Mobile Internet Self-Service】

In 2019, the Anhui Branch developed and launched three functional modules of mobile Internet self-service – "Check by one-click", "Quick troubleshooting" and "Rich media guide", bringing new experience of smart self-service to users.

New Experience of Mobile Internet Self-Service by Anhui Branch

Check by one-click

The 10000 APP, WeChat, SMS push and other channels are used for customers to make inquiries on account status and data related to Internet surfing, voice and SMS usage with one-click free of authentication, capable of locating problems within 8 seconds and restoring user data within 2 seconds

Quick troubleshooting

Focus on five challenge scenarios - VoLTE, Internet access, signal, voice and SMS - with embedded smart diagnosis for advance handling to realize self-troubleshooting of simple issues and direct access to receptionists for complex issues, in which all processing progresses can be checked and displayed transparently

Rich media guide

Focus on hot issues that users are concerned about, push active services, and produce tutoring videos for self-service on mobile terminals to reduce problems from their source

10000 APP → **Check by One-Click** → **Self-Troubleshooting**

Access to Anhui Branch's mobile Internet self-service and webpages

Drive Industry Upgrading

China Telecom actively enhances communication with various industries to further understand customers' needs for new-generation ICTs and applications while giving full play to its own advantages in multi-faceted cooperation at different levels in varied forms to promote industrial upgrading.

Examples of Expanding Cooperation for Industry Transformation in 2019

January
Signed strategic cooperation agreement with Inspur Group on cooperation in the field of smart city, cloud computing, cloud service, big data, quality chain, Internet of Things, etc., to create secure and reliable cloud services and products

March
Worked with the Ministry of Education and launched the "E-Surfing in Digital Campus for School Connectivity" action as a series of measures to empower education to promote "Gigabit connection in schools and 100-Mega in classes" and support the development of "Internet+education"

April
Signed strategic cooperation agreement with Baidu Online Network Technology (Beijing) Co., Ltd. on in-depth business cooperation in artificial intelligence, edge computing, cloud computing, Internet of Things, smart home, etc.

May
At the "2019 World Conference on Ultra HD Video (4K/8K) Industry" co-organized by the Ministry of Industry and Information Technology, the National Radio and Television Administration, China Media Group and the People's Government of Guangdong Province, typical applications of industry video were shown to demonstrate support to build the Guangdong "Pilot Zone for Ultra HD Video Industry"

June
Released "China Telecom White Paper on Artificial Intelligence Development" at the Mobile World Congress to elaborate on its vision, top-level design and major measures to develop AI technology and promote the AI industry by working with partners in building an AI ecosystem

September
Held the DICT (Digital ICT) Application Ecosystem Forum to promote the establishment of an ecosystem with equipment vendors, cloud service providers and industry application service providers, during which agreements were signed with 36 partners on integrated and innovative products

December
Joined hands with healthcare software service providers such as Mediway and Senyint to complete compatibility testing and certification with e Cloud to support the healthcare industry to migrate to the cloud and provide customers with convenient, efficient and comprehensive information service featuring one-stop "cloud+application"

Support Traditional Industries to Upgrade

【Support to Build Smart Modern Agriculture】

Karamay in the Xinjiang Uygur Autonomous Region is a city with vast clusters of arable land. Despite of little precipitation, the city has great potential for smart agriculture relying on underground water supply systems, drip irrigation and other technologies. Driven by a complete industrial chain of corn planting, Senhe Smart Agriculture Technology Co., Ltd. aims to become a local farming leader by building a demonstration cluster of high-tech, intelligent and large-scale modern agricultural industry. After a thorough understanding of Senhe's needs, CT's Karamay Branch supported it with the implementation of "ICT Solution to Smart Agriculture" in 2019; by the end of that year, the Branch provided support to complete a testing of 1,000 mu in the first phase of the pilot project, realized planning throughout the industrial chain – before, during and after core production – and a substantial increase in productivity as well as a significant reduction in production cost, raising the yield per mu by 20%.

Examples of ICT Solution to Smart Agriculture Supported by China Telecom

Name of System	Function
Smart Water and Fertilizer Control System	• Enable time setting and quantitative estimate of fertilizer use with different options, and precisely release liquid fertilizers through remote PC control
Smart Fertilizer Tank	• Perceive the amount of liquid fertilizers in the tank with remote, smart management of statistics related to the in-flow, use and storage of liquid fertilizers
IoT-based Remote Monitoring System	• Observe crop growth at any time and make preliminary judgments on crop pest situation to enable experts to remotely guide field management
Smart Water Valve with Remote Control	• Realize precise remote control of irrigation valve
Drone Operation for Crop Protection	• Formulate targeted prevention and control plans based on pest situation map & data and send instructions through cloud platform for drones nearby to perform comprehensive prevention and control tasks in real time

IoT-based remote monitoring system in the ICT solution to smart agriculture by Senhe Smart Agriculture Technology Co., Ltd.

China Telecom's ICT solutions act like a pair of smart wings to traditional agriculture and help my dreams to take off.

——Shen Hongbing, General Manager, Senhe Smart Agriculture Technology Co., Ltd.

【Support to Digitalization of Featured Agriculture】

Dried tangerine peel (chenpi) produced in Xinhui, Jiangmen City of Guangdong Province is a well-known agricultural specialty product and those "aged for one hundred years are as precious as thousand-year old ginseng". In order to help the development of Xinhui Chenpi Industry Park, the Jiangmen Branch provided support by building the "Big Data Platform for Smart Agriculture in National Modern Agricultural Industry Park of Xinhui Chenpi". The platform digitizes Xinhui's chenpi industry, helps local government and associations use data to fully understand current industry situation, accurately calculates and monitors industrial indicators such as planting intention, yield forecast, pest/plant disease development trends and cost efficiency. Moreover, it can apply big data to the supervision of the entire industrial chain to effectively protect the public brand of "Xinhui Chenpi". As of the end of 2019, more than 6,700 companies had registered on the platform, achieving a brand value of 12.6 billion yuan.

The Xinhui Chenpi Industry Park cooperated with China Telecom in the smart agricultural big data project and built a digital platform for precision−based planting, saving over 50% of water, 60% of fertilizers and 50% of pesticides with traceability across all processes.

——Excerpt from a presentation by Ye Zhenqin, Member of the Standing Committee of the Guangdong CPC Committee, at a forum during the China International Agricultural Trade Fair on November 15, 2019

Support to Integrated Development of Industrial Clusters

【Support to Digitalization of Amination Production】

Original Force Animation Production Corporation in Jiangsu (hereinafter referred to as Original Force) is a large-scale, digital entertainment content provider with a wide range of services to global film and gaming industries. With the rapid development of the animation market, animation production materials have exploded with geometrical growth. Original Force thus subtracted its orders to downstream partner businesses, strengthened subcontracting cooperation and provided necessary production assistance to SMEs. In response to Original Force's needs in development and external collaboration, China Telecom offered cloud-network-integrated ICT solutions that combined cloud-based storage, rendering, office work and collaboration for high-level digitalized production and management which helped drive digitalization among downstream SMEs, facilitating integrated development of large, middle and small enterprises in the digital entertainment industry.

Problems Faced by Original Force		Services Provided by China Telecom	Results
Storage	• Quickly growing number of animation materials imposes high pressure on local storage and disaster recovery in local computer rooms	• Migrate data to the cloud and provide large-capacity e Cloud storage with supportive services • Provide dedicated, high-speed data transmission line with 24-hour online technical support	• Routine design and office work can be done online • Data storage cost reduced • Service pressure on original platform relieved
Rendering	• Local rendering takes too much time and host expenditure becomes heavy due to constantly increasing requirements on equipment configuration for better rendering effects	• Provide cloud GPU host with high configuration • Deploy Gigabit dedicated line featuring cloud-network integration to provide a high-speed, secure and stable rendering environment	• Project cycle shortened and cost of time lowered • Reduced financial pressure on self-purchased host
Office Work	• Office and production systems are segmented and inefficient	• Implement integrated cloud migration and intensive management targeting both the headquarters and branch offices, and provide employees with cloud workstations • Build new production platform on the cloud to synchronize modification to local resources with those on the cloud	• Each branch office can easily access resources on the cloud • Office work can be done anytime anywhere, improving work efficiency
Collaboration	• Production systems and data information are deployed independently by each partner, inconvenient for overall collaboration	• Original Force's production platform provides cloud desktops to downstream businesses and personnel under project outsourcing so that they can directly access materials via cloud for production	• Resources along the industry chain are interconnected so that downstream businesses no longer build their complete production systems, reducing labor and time costs

On August 9, 2019, the Nanjing Branch in Jiangsu Province signed an agreement with Original Force Animation Production Co., Ltd. on e Cloud host/GPU cooperation

I never expected that China Telecom could provide such in−depth services to a private company like ours...After seeing China Telecom's unique cloud−network integration, we had no hesitation in deciding to gradually move all our services to China Telecom's cloud platform.

−− Zhao Rui, Chairman of Original Force Animation Production Co., Ltd.

【Support to Smart "Entrepreneurship & Innovation" for Businesses in Industry Park】

Chuzhou Economic and Technological Development Zone in Anhui Province is a national-level development zone hosting over 7,000 enterprises of various types and has nurtured such pillar industries as smart home appliances, electronic & information, automobile & advanced equipment manufacturing, and green food. It is one of the key demonstration bases supported by China Telecom for "entrepreneurship and innovation". Since 2019, China Telecom has leveraged its advantages in network and e Cloud to support businesses in the park campus to realize smart "entrepreneurship & innovation".

China Telecom Action to Support Chuzhou Economic and Technological Development Zone for Smart "Entrepreneurship & Innovation" and Results

Area	Actions and Results
Fundamental Network	• Fiber coverage in the campus to upgrade dedicated lines and broadband connectivity to over 100Mbps, and to provide Gigabit access to the Internet • Mobile communication to secure high-speed wireless connectivity • Full coverage of NB-IoT network, capable of providing access to tens of millions of terminal device
Cloud-enabled Upgrading	• Build cloud computing center and cloud computing platform in the Zone to provide businesses with cloud host, cloud desktop, cloud storage and other services
Service for Entrepreneurship & Innovation	• Support to the establishment of service platform for entrepreneurship & innovation and to the command center to realize centralized management and use of all kinds of comprehensive information and data, improving campus management efficiency and brand image

China Telecom's ICT services provide businesses in the campus with efficient and convenient production and operation management approaches and environment for R&D and innovation, reduce the cost of businesses and related industries, and support the development of upstream and downstream MSMEs. In the YAIR campus, once the smart monitoring system by China Telecom was put in operation, employees could check campus situation on their mobile phones, saving money, manpower and material resources. In Anhui Konka Electronic Corporation Limited, NB-IoT technology was applied to remote monitoring of product parameters and status and product fault information was sent back in real time, making the optimization of product quality and design more convenient.

There are several factories in our campus which usually took a few hours to check on the spot. With cloud−based smart monitoring system, now we can perform routine checks on our mobile phone anytime and anywhere. It is really much more efficient.
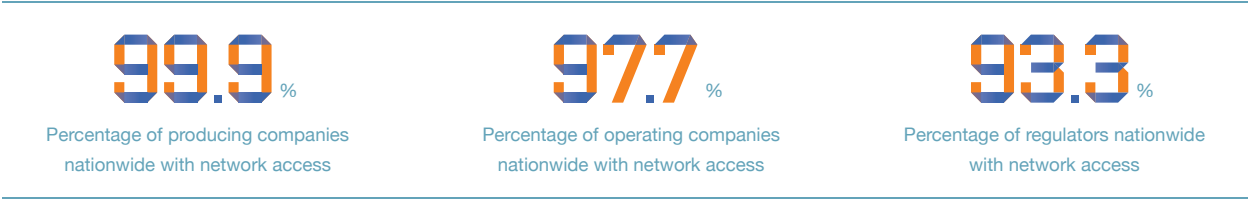
−−Cheng Guowen, Deputy Director for ICT, YAIR Corporation

Support to Innovation in Industry Management Models

【Support to National Veterinary Drug Regulation】

In 2019, China Telecom supported the Ministry of Agriculture and Rural Affairs in the third phase of the National Veterinary Drug Traceability Platform. The platform pools national veterinary drug regulation resources, connects veterinary drug review, inspection & testing, supervision & examination and other services, and integrates provincial veterinary drug regulation platform to further standardize and promote traceability of veterinary drug production and operation; helps breeders participating in the pilot to reduce antimicrobial drug use to enable traceability during the application process as an approach to "vaccine administration before subsidy" and zero growth of antibacterial drugs, forming a closed traceability loop. Meanwhile, the e Cloud enables real-time database backup and separated data access and writing to ensure information security of the traceability system, enhance service stability and improve data service efficiency.

Effectiveness of the National Veterinary Drug Traceability Platform (by the end of 2019)

99.9%
Percentage of producing companies nationwide with network access

97.7%
Percentage of operating companies nationwide with network access

93.3%
Percentage of regulators nationwide with network access

【Support to Smart Campus Management】

Tongxin County in Wuzhong City of Ningxia Hui Autonomous Region is a poverty-stricken area. The Tongxin Industrial Park under construction focuses on the development of featured agricultural and sideline product processing, oil and gas, chemical and coal chemical industries. Industry-specific campuses in the park are segmented and there is urgent need to apply ICTs to improve management and service. In 2019, the Wuzhong Branch took advantage of its network and cloud computing resources and integrated big data and IoT applications to support the building of an integrated management information platform. After that, park planning and construction, production safety, environmental monitoring, scheduling and commanding, investment attraction and routine management could be done in a digitalized, smart manner. By doing so, China Telecom supported the implementation of new development philosophy and accelerated the transformation and development of regional economy. By the end of the year, 71 enterprises settled in the park, with an annual output of 4.1 billion yuan.

Modules of Integrated Management Information Platform of Tongxin Industrial Park

Comprehensive Service Portal	Data Center	Big Data Analysis	Safety Monitoring	Environment Monitoring
Video Conference	Asset Management	Integrated OA	Investor Service	Smart CPC Team Building

Support to Upgrading of Financial Service Industry

【Promote Financial Inclusion】

China Telecom actively promotes BestPay product series and expands services for public convenience in diverse scenarios such as supermarkets, catering and entertainment, transportation, e-commerce and payment of utility and communication bills to bring inclusive finance into people's daily consumption.

In 2019, the Ningxia Branch strengthened collaboration with supermarkets for joint marketing through online and offline sales channels, achieving two-way customer recruitment across different brands. It also enhanced support to merchants in aggregated payment technology and marketing resources so that physical stores could provide BestPay financial service. By the end of the year, BestPay pooled together 14,000 merchants with an annual transaction volume of 194 million yuan, or 20% year-on-year increase.

In 2019, the Xinjiang Branch pooled together online and offline merchants, financial institutions, channel providers, technology providers, data service providers and other businesses in multiple forms including partnerships, alliances and franchising to promote the development of BestPay ecosystem for inclusive finance. By the end of the year, the BestPay ecosystem had aligned 62,000 merchants, serving more than 15 million BestPay users with an annual transaction volume at 1.79 billion yuan, or a year-on-year increase of 60%.

On January 26, 2019, China Telecom Xinjiang Branch signed a contract with its BestPay ecosystem partner

BestPay enables resource sharing between customers of both parties. It's a convenient, easy and affordable service that are widely recognized by consumers and is a win-win-win for PetroChina, China Telecom and customers.

――Zhang Liangwen, Xinjiang Branch of China National Petroleum Corporation

Mobile payment not only changes consumption patterns, but also gradually transforms business models of various industries.

――Xun Zhijian, Xinjiang Institute of Finance

BestPay Co., Ltd. continues to promote "Orange Installment" business to expand financial services to small and micro merchants. In 2019, "Orange Installment" covered 230,000 stores and served more than 13 million users with an annual transaction volume at 7.5 billion yuan and a year-on-year increase of 152%. After the launch of "Orange Installment" in 2019, the Tibet Branch witnessed a growth in mobile phone sales and wide acceptance by local service halls. By the end of the year, the "Orange Installment" covered 570 stores with 43,000 transactions throughout the year, generating a transaction volume of more than 46 million yuan.

In the golden autumn season of 2019, residents of Changdu, Tibet Autonomous Region applied for "Orange Installment" at local service halls

【Support to Financial Companies】

China Telecom supports financial companies to improve ICT adoption so as to provide better services to MSMEs.

At the end of 2018, the Qinzhou Branch in Guangxi Zhuang Autonomous Region cooperated with Municipal Finance Office and the Bank of China to build a government-bank-business financing information service platform to align financing needs of businesses with banks and solve financing availability and affordability concerns of SMEs. As of the end of 2019, a total of 789 companies registered as platform users, of which 658 applied for financing through the platform and 557 applications were approved with the amount totaling 5 billion yuan.

Since the launch of the platform, SMEs like us can publish financing demands via the platform to solve the problems of financing availability and affordability.

――Yu Xianbin, Deputy General Manager, Guangxi Qinzhou Nanfang Computer Co., Ltd.

In order to promote healthy development of wealth management business, China Minsheng Bank intends to monitor the overall call-out performance of its wealth management team through an information system in order to check the capabilities and business skills of its staff, verify the authenticity of telephone communication by the wealth management team, and avoid disclosure of customers' phone numbers. Drawing upon its capabilities of intelligent voice cloud service, China Telecom provides comprehensive services such as work phone number, phone recording, mark-free service and flash SMS message to wealth managers, small and micro banks, private banking and other business channels for Minsheng Bank to better perform wealth management service.

With China Telecom's work phone number and supportive services, it's possible to have internal supervision and management of telemarketing, which facilitates quality improvement for communication and marketing by wealth managers.

――Wang Peipei, Project Manager, Personal Finance Department, China Minsheng Bank

Facilitate Undertakings for Public Well-being

China Telecom dives further to better understand the needs to develop undertakings for public well-being in a moderately prosperous society, actively supports government to deepen "Internet+government service" to improve public management and service levels, helps local smart security projects, "Internet+education" for greater adoption, smart communities, develops smart elderly care, innovates smart home products and services, and helps the whole society realize secure and convenient public services featuring mutual assistance, harmony, sharing and hapiness.

Support to Smart Governance

【Support to Government Migration to Cloud】

In 2019, the Anhui Branch assisted the provincial and local governments to implement "government cloud", undertook 28 customer cloud projects at provincial and department level, built government cloud in 22 cities/counties, and supported 149 government bodies at municipal, county, committee, office and bureau level to migrate to the cloud. In these programs, the advantages of cloud-network integration and e Cloud information security were fully utilized to ensure timely prevention and controllable system security, which effectively saved the operating expenditure of the government information system. Once government services were migrated to the cloud, citizens could enjoy more convenient public services "instead of applying to different agencies on premise".

It's very convenient to complete procedures when your kid is going to preliminary school after kindergarten. All things can be done on your mobile phone. No need to line up. And you don't have to worry about forgetting to bring any material.

――Zhang Ming, resident in Wuhu County, Wuhu City, Anhui Province

China Telecom Branch in Qiannan Buyi and Miao Autonomous Prefecture in Guizhou Province assisted local government to build the "Smart Qiannan" comprehensive platform in 2019, connecting public service network interface to break the information silos between departments so that "everything could be done with one network"; local Internet companies could enjoy the convenience of connecting their application platforms to the mobile portal to provide third-party online payment services. Now, citizens can download the "Colorful Guizhou on the Cloud" APP to their mobile phones to apply for services "via just one portal" and to pay for utility bills and digital TV service.

With the "Colorful Guizhou on the Cloud", we can use our mobile phones to report community safety hazards and file complaints as well as demands. All these are well-documented with time stamps, pictures and videos. It's so convenient for us.

——Zheng Can, resident of Jinqilin Community, Gongren Road, Duyun City, Guizhou Province

【Support to "12345" Hotline Service】

The Fujian Branch supported 8 cities to establish the "Unified 12345 Hotline Service Platform". In 2019, the Branch set up professional call support team and also assisted Nanping, Xiamen and other cities to build visualized platform for 12345 hotline to display call status in real time. By the end of the year, the province's 12345 hotline received over 1.95 million complaints from the public, with a satisfaction rate of 99.1%. The 12345 hotline in Xiamen was granted the "2019 Excellent Service Award" by the "dsf3.com" evaluation platform.

The "12345" public service hotline platform in Nanchang, Jiangxi Province integrates 111 various government hotlines into one as a unified service window to answer citizens' calls 24 hours a day and provide comprehensive services such as submission acceptance, forwarding, review and call-back. The professional operation team of the Nanchang Branch is fully designated to perform local "12345" government hotline service. In 2019, it accepted more than 620,000 requests and generated over 600,000 valid trouble tickets with 96% on-time completion and 95.8% public satisfaction. The Branch was awarded as "Outstanding Service for the Public" and "Best Service Case" at the National Government Hotline Development Summit.

The Nanchang Branch in Jiangxi Province supported the "12345" hotline to function as the "government spokesperson and direct access to public service for people's well-being"

With the business system for the hotline platform, we can handle public complaints anytime and anywhere. All evidences are documented throughout the whole process and you can track the handling process and feedback results in a timely manner. The public satisfaction rate has been significantly improved.

——Yang Xianggui, Hotline Office staff, Donghu District, Nanchang City, Jiangxi Province

Support to Smart Security

【Support to Build the "Smart Jiangxi (Zhigan) 119" Fire Control Platform】

Fire prevention is a challenge in urban management. In 2019, the Jiangxi Branch actively responded to the provincial government's requirements on the promotion of smart fire suppression, and deeply integrated IoT, cloud computing, big data, mobile Internet and other technologies into fire control to help build the "Smart Jiangxi (Zhigan) 119" Fire Control Big Data Platform for "dynamic monitoring, intelligent judgment and hierarchical early warning" functions and multiple smart fire control applications.

Introduction to Functions of the "Smart Jiangxi (Zhigan) 119" Fire Control Big Data Platform

- Online monitoring, smart analysis and hierarchical early warning of IoT data
- Assessment of fire risks among key industries and units with clearly defined main responsibility for fire safety and industry supervision responsibilities
- Community-specific sub-platforms to interact with property service providers and mini fire stations to strengthen granularized fire control
- Fire risk evaluation system to guide insurance funds to participate in joint insurance and market-based operation & management, and to mobilize relevant players
- Firefighting equipment maintenance sub-platform to promote timely maintenance of firefighting facilities and improve maintenance quality

By the end of the year, the platform launched pilots in 4 cities and connected 20,000 NB-IoT devices. In the future, firefighting departments at provincial, municipal, county, township/community level and other industry administrations will be gradually covered for fire control approaches to become more technology-driven, information-based and intelligent.

Support to Smart Education

【"Internet+Education" Penetration】

The Guangxi Branch has accelerated the construction of campus information network facilities and educational cloud facilities of "10 Gigabit backbone, Gigabit to school, and 100 Mb to class", and promotes the implementation of educational public service platforms to schools and classes. As of the end of 2019, more than 17,000 schools have been reached with fiber-optic broadband, fiber-optic networks have been opened in 110,000 classrooms, and regional education clouds in 29 counties (districts) in 5 prefectures and cities have been built. The applications have covered more than 6,600 schools, 37,000 classes, 94,000 teachers and 1.55 million students, helping the balanced development of local compulsory education.

In June 2019, students from Chengnan Experimental Primary School and Siming Primary School in Sipai Town, Luzhai County, Liuzhou City, rely on the Internet to take Chinese classes together

The organic combination of information technology and education and teaching can effectively promote key schools to play a leading role in radiation, and effectively promote the sharing of high-quality educational resources.

——Su Min, Deputy Director of Liuzhou Education Bureau, Guangxi Zhuang Autonomous Region

In 2019, the Hunan Branch launched a program to build dedicated education networks in Hengyang, Changde, Shaoyang, Chenzhou, Loudi and other cities to provide ICT applications for smart education, enabling fiber-optic access in classes, class-to-class connectivity, and inter-school access. By the end of the year, the program covered more than 170 remote townships, over 500 schools, over 9,000 classes, and incremental users of 500,000 students under compulsory education scheme. Educational resources of urban schools can be shared with students at local schools in remote areas through "dual-teacher classrooms" so that they can also enjoy high-quality education.

It feels quite novel. The teachers in e-classes are nice and kind and we have the opportunity to experience different teaching methods from different teachers.

——Zhang Ningning, Primary School Student, Shatang Middle School, Shuangfeng County, Loudi City, Hunan Province

Support to Smart Elderly Care

【Support to Smart Elderly Care Service】

In 2019, the Yunnan Branch supported the Provincial Department of Civil Affairs to build an "Internet+Smart Elderly Care" platform, including call centers, data centers, and smart elderly care management platforms and smart elderly care service platforms. General public-oriented elderly care service as well as IT-based management of elderly care institutions and available accommodation have been preliminarily provided and achieved. By the end of the year, the platform had settled in more than 3,800 institutions, generated more than 130,000 bed QR codes for more than 2,000 elderly care institutions, and provided check-in services for more than 26,000 elderly people.

On August 8, 2019, the "Internet+Smart Elderly Care" platform of Yunnan Province was launched

Yunnan "Internet+Smart Elderly Care" platform is an information platform, service platform, data platform, and work platform for the elderly, elderly care institutions, management departments, and surrounding businesses. It provides real-time, fast, efficient, and low-cost, IoT, interconnected and intelligent elderly care services.

——Wang Jianxin, Deputy Director of the Civil Affairs Department of Yunnan Province

We will use the power of Internet information technology to help integrate medical, insurance, education, culture, communications and other industry resources to create an elderly care service system in Yunnan.

——Wang Hong, General Manager of China Telecom Yunnan Branch

The Zhoushan Branch of Zhejiang Province helped the Civil Affairs Bureau to improve the level of elderly care services. In February 2019, the Zhoushan Islands New District Elderly Service Center, which was upgraded to Smart Elderly Service Version 2.0, was officially put into use. Upgraded smart elderly care services are embodied in two aspects: smart connection and smart services. The promotion of smart monitoring terminals with physical signs sensor bracelets, etc., establishes a basic information database of more than 250,000 elderly people in the city and a database of elderly care service agencies and businesses. Relying on the 24-hour service hotline, the elderly can enjoy "one-stop" services such as emergency help, lost positioning, security monitoring, life services, property maintenance, spiritual comfort, and health services.

On August 9, 2019, Lin Xueying from Huni Community, Xiazhi Town, Putuo District, Zhoushan City (first from right), under the guidance of the staff of the elderly care center, used a one-touch mobile phone to talk to relatives outside the city

Support to Smart Community

【Support to Smart Communicty Renovation】

The Hangzhou Branch in Zhejiang Province actively supports the transformation of smart communities, launching information services such as smart rental housing management, video surveillance, smart patrols, smart access control, portrait recognition, smart fire protection, automatic vehicle identification, and smart community services. There are more than 5,000 residents in Xiangshu Garden in Xiaoshan District. In the past, there were problems such as poor public order, prominent fire hazards, and backward services. After the implementation of the smart community renovation, the total police situation decreased by 34% year on year, and the criminal case dropped by 80%. A decrease of 50%, no fire accident occurred, and the efficiency and level of serving residents have been significantly improved, bringing an artificial intelligence revolution to the lives of community residents.

● **Examples of Xiangshu Garden Smart Community Applications**

Face Recognition System
If criminals on the "blacklist" enter the community, they will be quickly locked and alarmed in real time

Video Surveillance System
It not only solves the problem of parabolic throwing at high altitude, but also prevents the privacy of residents from being spied on

Smart Property System
Residents can report for repairs through the system if they find faults in facilities and equipment

Smart Patrol System
Inspectors receive tasks through the system and conduct inspections according to the inspection standards provided by them

Smart Fire Control System
Real-time monitoring of the operation status of fire-fighting facilities, early warning of dangers found, and notification of hidden dangers

The integrated intelligent parking IoT information platform built by the Fuzhou Branch of Fujian Province provides car owners with services such as free parking space search, parking guidance, and billing payment, and realizes the intelligent perception, scheduling and service of parking resources. It was launched in October 2018. Since then, the use and turnover rate of parking spaces have been increased, and problems such as parking difficulties and random parking have been effectively alleviated. As of the end of 2019, the platform has covered more than 15,000 parking spaces, served 950,000 car owners, and the number of parking turnover has increased by 2.5 times compared to before the launch.
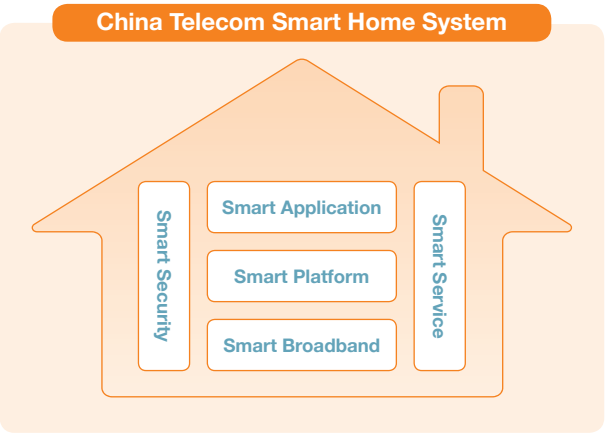
The Urumqi Branch of the Xinjiang Uygur Autonomous Region organically integrates high-definition iTV and a smart community service platform to realize community government affairs, convenience services, elderly care services, ordering and distribution, and education services on TV. Since the promotion in April 2019, it has covered 550,000 families in 900 communities. Now, the payment service of iTV can facilitate residents to pay electricity bills, purchase gas, and recharge bus cards without leaving their homes. The convenience phone bar of iTV can facilitate residents to obtain community service information; in the 10 communities of the Shuitashan Area Management Committee in Shuimogou District , the elderly can also order meals online through the iTV "Community Ordering Service" platform.

On November 27, 2019, residents of Huoshan South Community in Urumqi Economic and Technological Development Zone learned to use the "smart community" convenience service function

Develop Smart Home

China Telecom improved its smart home products and service system in 2019, and worked with partners to enrich the digital and intelligent home life experience.

China Telecom Smart Home System

Smart Security | Smart Application | Smart Platform | Smart Broadband | Smart Service

On May 30, 2019, China Telecom released the Smart Home White Paper, expounding the smart home "intelligence in five aspects"

Brief Introduction to China Telecom Smart Home "Intelligence in Five Aspects"

System	Content and Functionality
Smart Broadbandd	• Composed of intelligent dual gigabit (fiber broadband, 5G) and home cloud, relying on cloud network integration to achieve intelligent speed-up and application acceleration, home cloud provides data storage, application deployment, business management and other functions
Smart Home Platform	• Different brands and different terminals are connected on the platform according to a unified standard interface to achieve interoperability • Gather all kinds of smart home applications, realize one-point access, whole network service, and fast loading of content
Smart Application	• Relying on the Zhijia platform, users can enjoy ultra-high-definition video, cloud games, VR/AR, review, photo albums and other applications with one terminal • Integrate industry chain resources to provide cross-vendor smart home applications such as smart housekeeping, smart security, home appliance control, and environmental monitoring
Smart Security	• Realize intelligent security in four aspects of terminal, access, application and cloud storage, provide vulnerability security detection, software and hardware encryption, set WiFi device black and white list, data encryption transmission, privacy access control, encrypted storage, disaster recovery backup, intrusion detection and defense functions or services
Smart Service	• Whole house WiFi: provide intelligent detection of WiFi signal, personalized home networking solution design services • Whole house intelligence: provide services such as intelligent hardware identification, rapid configuration, on-site installation, networking, and commissioning of intelligent equipment • Xiaoyi Butler APP: Manage and control various smart home terminals, realize convenient configuration management of home network, IPTV service multi-screen interaction, smart home linkage configuration and other functions, and provide online self-service

【Promote Smart Home Products and Services】

In 2019, the Guizhou Branch trained more than 3,000 smart home sales personnel and engineers, and the number of household users exceeded 2 million. Among them, it provided more than 200,000 households with whole-house WiFi coverage optimization, and provided more than 80,000 households with home appliance intelligent control services. Provide housekeeping services for 50,000 families.

The Hainan Tibetan Autonomous Prefecture Branch of Qinghai Province, in response to the needs of local farmers and herdsmen's family production and life, promotes E-surfing housekeeping service. Farmers and herdsmen can conveniently look at family, vehicles, property, farm tools, food, cattle and sheep, and tourists through mobile phones. The number of users reached 150 by the end of 2019.

In 2019, the Shaanxi Branch carried out 300 smart home solutions into 10,000 homes activities, and 3,700 engineers took the initiative to provide services. The picture shows that on May 29, the smart home engineers and sales staff of Weinan Branch entered the community to carry out service activities

Practice Green Development

China Telecom practices the concept of green development, promotes green networks, green operations, green projects, and green offices, and actively uses information technology to help customers save energy and reduce emissions, and contribute to the construction of ecological civilization.
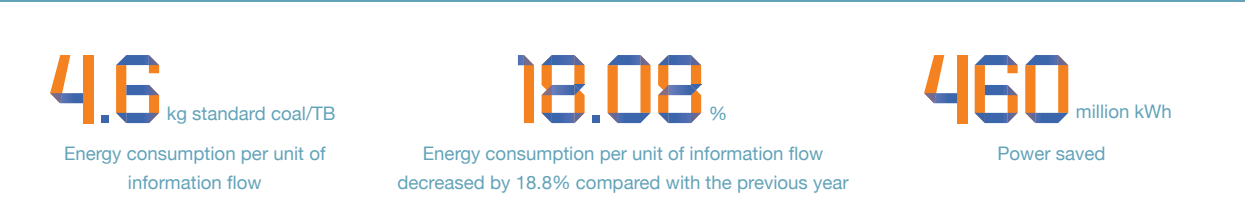
Build Green Network

In 2019, we strengthened overall planning for energy conservation and emission reduction, further promoted energy conservation transformation, built a more energy-saving and environmentally friendly network, to reduce energy consumption. On September 17, 2019, participated in the Climate Change Initiative led by the Global System for Mobile Communications Association (GSMA), and pledged to actively disclose energy and greenhouse gas emissions, and actively save energy and reduce emissions.

Main Actions to Promote Energy Efficiency and Emission Reduction in 2019

Category	Main actions and progress
Management on energy efficiency and emission reduction	• Compiled a three-year rolling plan for energy conservation and emission reduction, and clarified the goals and key measures for "dual control" of total energy consumption and energy intensity • Carried out the assessment of energy-saving and emission-reduction target responsibility system, implemented saving rewards and excessive penalties, and promoted the deepening of refined management of electricity bills • Strengthened the capacity building of energy conservation and emission reduction teams, and trained 7,970 person-time • Implemented the requirements of the State-owned Assets Supervision and Administration Commission of the State Council of "Statistical Report on Energy Conservation and Ecological Environmental Protection of Central Enterprises", and improved the basic statistical system for energy conservation and emission reduction • Carried out energy conservation publicity week and national low-carbon day activities to promote themes such as "green development, energy conservation first" and "low-carbon action to defend the blue sky"
Eliminate out-dated production capacity	• Optimized network structure and network resources, and orderly promoted the clean-up of inefficient equipment and the withdrawal of 2G and 3G equipment from the network • Optimized the configuration of computer room infrastructure, carried out de-redundant transformation, reduced 80 diesel generators, 437 special air conditioners in the computer room, and 109 high and low voltage power distribution equipment
Promote renovation for energy-saving	• Promoted new energy-saving and emission-reduction technologies for Internet data centers, computer room air conditioners and other facilities • Promoted excellent cases and models of energy consumption management and energy-saving technological transformation, and actively used contract energy management models to introduce social capital and technology to carry out energy-saving transformations

Main Achievements in Energy Efficiency and Emission Reduction in 2019

4.6 kg standard coal/TB
Energy consumption per unit of information flow

18.08 %
Energy consumption per unit of information flow decreased by 18.8% compared with the previous year

460 million kWh
Power saved

【Examples of Energy Efficiency and Consumption Reduction by Provincial Branches】

In 2019, the Anhui Branch continued to implement energy-saving measures such as the withdrawal of old high-energy-consuming equipment, the introduction of low-energy equipment, the optimization of airflow organization in the computer room, and the transformation of typical iron tower scenes. The Zongyang County Branch of Tongling City saved 3.52 million kWh of electricity by carrying out AG computer room (access point computer room) and outdoor IAD node (integrated access equipment) withdrawal from the network. The Lu'an City Branch adopted special air conditioners for the computer room to replace the original old air conditioners, combined with the optimization of airflow organization in the computer room, saving 430,000 kWh of electricity.

The Chongqing Branch used the wireless big data platform to independently develop a program to ensure that network coverage is not affected and user service quality is not reduced, combined with changes in communication traffic in the base station coverage area, intelligently control the turn-on and turn-off of some carrier frequencies of the base station, accurately realize the energy saving and emission reduction of base stations. Since its implementation in more than 8,000 cells in 2019, it has saved 280,000 kWh of electricity.

Promote Green Supply

China Telecom actively promotes the supply chain to jointly respond to climate change, insists on applying green procurement indicators to the procurement process, and preferentially selects resource-saving and environmentally friendly products. In 2019, environmental impact factors were included in the scores of procurement projects to identify and control products that may have environmental risks in the production process, and promote suppliers to improve environmental protection awareness and capabilities. High-efficiency and energy-saving power modules accounted for 100% of the DC power modules purchased centrally throughout the year, and the energy consumption per unit capacity of key professionally purchased equipment such as mobile equipment and computer room air conditioners decreased by 4.0% compared with 2018.

Promote the standardized recycling, disposal and utilization of waste batteries, waste cables, and waste terminals. While continuing to purchase green and environmentally friendly battery products, we strictly implement the recycling and disposal of waste batteries to prevent environmental pollution. Implement closed-loop management of fixed-line terminals and encourage refurbishment. For waste materials with no recycling value, fully consider the impact of material disposal on the environment, and properly dispose of them in strict compliance with the relevant national environmental protection regulations. More than 100,000 tons of various wastes were recycled and processed throughout the year.

Waste recycled and disposed of by third parties in 2019

Category	Weight (ton)	Value (10,000 yuan)
Battery cell	18,025	12,290
Communication device	14,802	7,563
Cable	62,233	158,026
Terminal	1,349	2,592
Others	9,625	5,611

Promote Green Projects

China Telecom earnestly implemented the "Implementation Opinions on Promoting the Co-construction and Sharing of Telecom Infrastructure" by the Ministry of Industry and Information Technology and the State-owned Assets Supervision and Administration Commission of the State Council, and cooperated with telecom operators and China Tower Corporation to actively promote the development of base stations, pipelines, and poles. Co-construction and sharing can effectively reduce redundant construction, protect the natural environment and landscape, and save the consumption of land, energy and raw materials. In response to issues such as farmland protection, equipment pollution, construction impacts and electromagnetic radiation that are of concern to the government and the public, corresponding environmental protection measures shall be implemented in project construction.

China Telecom Environmental Protection Measures for Network Construction

Public concern	Environmental protection measures in network construction
Cultivated land protection	• Priority is given to the original houses and wasteland in the site selection of the base station, and in principle, no additional farmland will be occupied
Equipment contamination	• Priority is given to equipment with no noise, no electromagnetic radiation, and no pollutants
Construction impact	• Field communication route survey actively avoids mineral deposits, forests, grasslands, wildlife, natural relics, cultural relics, nature reserves, scenic spots and other areas • Try to avoid changing the surrounding environment when laying fiber optic cables
Electromagnetic radiation	• Carry out monitoring and evaluation of the electromagnetic environment around the base station, strengthen communication with the community, and accept public supervision • Strictly control the quality of networked equipment and strictly control from the source • Actively adopt advanced technology and refine the layout of base stations to ensure that electromagnetic radiation indicators are better than national standards

Infrastructure Co-investment and Sharing in 2019

Category	Unit	Joint investment	Share facilities
Pole Lines	Kilometer of lines	8,687	26,000
Ducting	Kilometer of lines	8,098	1,665
Indoor Distribution	Set	7,356	721

【Redesign Pole Line-up for "Wireless" Beauty】

The Jiangxi Branch actively responded to the call of the local government, and the provincial, municipal and county branches jointly carried out the improvement of the pole line to beautify the living environment of the residents and promote the development of the tourism economy. In 2019, the rectification of communication lines in 811 streets (scenic areas), 570 administrative villages, and 470 natural villages was completed, and a total of 5,957 kilometers of lines were renovated. Among them, 36 rural tourism and beautiful and livable demonstration villages have been renovated.

In 2019, the Gucheng District Branch of Lijiang City, Yunnan Province responded to the municipal government's call to create a "civilized city" and actively carried out line improvement, solving the problems of 95 points in 12 areas. Among them, 63 electric poles were removed and the line was 25,310 meters. There are 884 fiber splitting boxes and 14 light transfer boxes, improving the environment.

In October 2019, the Jinjia Village, Gucheng District in Yunnan Province after the Lijiang Branch finishing line renovation in Jinjia Village, Gucheng District, , Yunnan Province

Promote Green Office

China Telecom actively advocates and promotes water conservation and paper conservation. Strengthen the management of the use of water resources, actively promote the popularization of water-saving appliances, carry out sewage discharge treatment, promote the recycling of production water, and actively use reclaimed water to replace tap water under the conditions of meeting water requirements. Actively take measures to reduce the use of paper in terms of technology and systems. In 2019, we continued to promote the electronic management of accounting files, electronic ordinary VAT invoices, electronic bills and paperless business, and comprehensively promoted the electronic reimbursement of electronic invoices and the automation of tax declaration. The promotion of VAT electronic ordinary invoices was praised by the State Administration of Taxation, and won the second-class achievement award of the 15th Enterprise Management Modernization Innovation in the communications industry. The practice of electronic invoice reimbursement, recording and archiving is the first batch of pilot units in the country to promote electronic invoices and electronic archives, and successfully passed the acceptance inspections by the National Archives, Ministry of Finance, State Administration of Taxation and other relevant ministries and commissions.

【Issuance of E-Invoice on Mobile Phone】

With the support of the Municipal Taxation Bureau, the Zaozhuang Branch of Shandong Province implemented the task of "issuing electronic invoices by mobile phones for agents" in 2019. Through the establishment of a commission and invoice push system for agents, the collection of tax information, the verification of tax invoices, tax declaration, as well as reimbursement and payment have been connected, and agents have changed from issuing paper invoices to the tax authorities to directly issuing electronic invoices through registered mobile phones, which not only achieves paperlessness, but also improves efficiency.

Using the commission and invoice push system eliminates the need to go to the tax bureau and telecommunications companies to submit invoices back and forth, and I feel the convenience brought by informatization.

――Zhao Xinru, an agent of the 18th Senior High School Area, Shizhong District, Zaozhuang City, Shandong Province

Promote Green Applications

【Support to Smart Water Management】

The Hangzhou Branch of Zhejiang Province supported the implementation of the smart water management project in Xihu District in 2019, using emerging technologies and methods such as smart sensing, Internet of Things, geographic information, animation simulation, satellite remote sensing, etc. to build an omnidirectionally interconnected and coordinated effective water environment governance system to realize the "intelligence of infrastructure", "automation of data collection", "high efficiency of supervision and maintenance", "refined urban management" and "scientific command and dispatch" of water control in Xihu District, significantly improving the efficiency of urban water control and environmental protection.

Brief Introduction to Functions of Smart Water Management System of Xihu District of Hangzhou

- Realize visual control of urban management base map, flood prevention situation, drainage pipe network, river network & water system, actual landscape survey, emergency defense, etc., making comprehensive analysis and service decision-making more scientific
- Real-time grasp of the work trajectory of the maintenance unit and the maintenance and illegal problems found in the inspection, combined with big data analysis, accurately guide the prevention and investigation of problems
- Cooperate with relevant departments of urban management, supervision and law enforcement to establish a coordinated supervision mechanism to deal with water incidents immediately
- Realize the visualization and full monitoring of flood prevention emergency plan, command and dispatch, and assist the research and judgment of emergency situation and rescue dispatch plan

The project has effectively promoted the smart, unmanned and refined transformation of water control work in Xihu District, and established a good model for promotion.

――Zhang Wei, Deputy Director of the Urban Management Bureau of Xihu District, Hangzhou City, Zhejiang Province

【Support to Supervision of Pollution-Generating Enterprises】

In 2019, the Jiangxi Branch supported the Provincial Department of Ecology and Environment to build the "Automatic Monitoring System for Pollution-Generating Enterprises in Jiangxi Province", realizing automatic supervision of 1,094 pollution-generation enterprises, 935 wastewater, and 546 exhaust gas monitoring points in the province, helping environmental protection departments improve management and decision-making levels, and improve the environment of the province.

Brief Introduction to Functions of the Automatic Monitoring System for Pollution-Generating Enterprises in Jiangxi Province

- Master the pollution data of pollution-generating enterprises in the whole province, and supervise the pollution behavior of those enterprises
- Help pollution-generating enterprises to grasp pollution information in real time, shift from passive supervision to active prevention, and actively save energy
- It is convenient for third-party operation and maintenance units to grasp the pollution discharge information and daily operation and maintenance status of the enterprises they serve, handle abnormal events in a timely manner, and improve operation and maintenance efficiency

The automatic pollution source monitoring system operates stably, helping us to effectively monitor and count the pollution source data of enterprises.

--Tan Wenjin, Information Center of Jiangxi Provincial Department of Ecology and Environment

SYNERGY TO PROMOTE CIVILIZATION DEVELOPMENT IN A MODERATELY PROSPEROUS SOCIETY

Civilization development is an important goal of a moderately prosperous society. China Telecom stands firm to take people's aspiration for a better life as the direction of its endeavors, and makes every effort to help alleviate poverty, engages in charitable undertakings, cares for our employees, stringently performs compliance management and actively fulfills social responsibilities overseas as an approach to working with all stakeholders to contribute to the development and progress of social civilization.

① Support to Poverty Alleviation
② Enthusiasm in Charitable Undertakings
③ Support to Employee Development
④ Stringent Compliance Management
⑤ Fulfill Overseas Responsibilities

Support to Poverty Alleviation

It is our Party's solemn commitment to bring the poor and poverty-stricken areas to join the whole country into a moderately prosperous society. Following General Secretary Xi Jinping's important expositions on poverty alleviation, China Telecom takes full advantage of its own strength with a high sense of responsibility to continue its investment in talents, capitals, technologies and other resources to help the poor and poverty-stricken areas get rid of poverty as soon as possible and embrace a moderately prosperous society.

Win the Decisive Battle against Poverty

The year 2019 is a crucial year to win the decisive victory over poverty reduction. The Party Leadership Group of the Group Company thoroughly studied and followed the important expositions of General Secretary Xi Jinping on poverty alleviation, and held 9 meetings to convey and learn the spirit of the central government on poverty alleviation for further implementation of the central government's decisions and deployments. Guided by the targets in connectivity for poverty alleviation, branches at all levels made coordinated efforts to advance poverty alleviation through ICT adoption, industry development, employment, consumption, education and charitable undertakings, and dispatched over 3,000 full-time/part-time officials to implement various poverty alleviation measures based on local conditions. Leaders of the Group Company had visited poverty alleviation areas to supervise and inspect related work for 9 times throughout the year. As for fixed-point poverty alleviation areas in Yanyuan County and Muli County in Sichuan Province, Shufu County in Xinjiang Uygur Autonomous Region and Tianlin County in Guangxi Zhuang Autonomous Region, as well as Banbar County in Tibet Autonomous Region and Jiuzhi County in Qinghai Province under counterpart assistance (referred to as "4+2" poverty alleviation counties), full coverage of field study was realized to ensure targeted poverty alleviation measures with tangible results. The Group Company launched a selection of outstanding models in poverty alleviation, in which 12 outstanding organizations and 102 outstanding individuals were awarded honorary titles.

Continuing to innovate supportive and assistance measures, China Telecom's efforts in poverty alleviation has been spoken highly of by local Party committees, governments, officials and residents in poverty-stricken areas including counties for fixed-point poverty alleviation and counterpart assistance. Our actions have been recognized by ministries and commissions and we were invited by the MIIT, the Sichuan Provincial Government, and the government of the Tibet Autonomous Region to share experience at three national poverty alleviation conferences. The Group Company was once again rated as "good", the highest level of evaluation in the performance assessment on designated poverty alleviation by Central Units in 2019.

From October 23 to 25, 2019, Ke Ruiwen, Secretary of the Party Leadership Group and Chairman of the Group Company, went to visit Shufu County in Xinjiang Uygur Autonomous Region to learn about the implementation of assistance projects. Chairman Ke visited poor households to understand their difficulties and needs for assistance, and discussed with local officials in charge on supportive measures. The picture shows Ke Ruiwen (first from right) in his visit to the poor households in the 9th village of Sayibag Township

Overview of Support to Poverty Alleviation in 2019

Category	Main Actions	Major Progress
Poverty alleviation through connectivity	• Promoted universal service in remote and poor villages • Implemented special projects for upgrading connectivity in "4+2" poverty alleviation counties	• Accumulatively undertook the construction tasks of over 11,000 4G base stations for the fourth and fifth batches of universal service, and completed the fourth batch of about 4,500 base stations ahead of schedule • In the "4+2" poverty alleviation counties, the "double 100%" coverage of fiber broadband and 4G network in administrative villages was realized
Poverty alleviation with ICTs	• Supported the construction and operation of a national-level poverty alleviation information system • Targeted poverty alleviation packages for poverty-stricken households • Helped poor counties implement ICT projects	• Supported the State Council Leading Group Office of Poverty Alleviation and Development (LGOPAD) in the construction and operation of the information system for poverty alleviation and development, the big data platform for poverty alleviation and other systems. The big data platform for poverty alleviation served more than 39 million poor residents in over 1,030 counties in 16 provinces • Launched preferential poverty alleviation packages and credit packages for poor households, with annual discounts of over 600 million yuan • Accelerated network speed and increased network quality for 256 schools in "4+2" poverty alleviation counties • Safe cities, video command systems for poverty alleviation, office and government coordination platforms, smart forestry information management platforms and network speed upgrading for medical institutions and other programs were launched in Yanyuan, Muli, Shufu and other counties
Poverty alleviation through industry development	• Directed more capital donations toward poverty alleviation projects through industry development • Assisted in introducing third-party enterprises to invest in poverty alleviation projects through industry development • Promoted the rural e-commerce model of "tyfo.com+ynw360.com+rural ICT services+Information Officer" to help the sales of specialty products from poor areas • Motivated users and employees to purchase agricultural and sideline products from poor areas	• Accumulatively invested 556 million yuan in subscription to the Industrial Investment Fund for Poverty-stricken Areas of Central SOEs • Assisted in poverty alleviation projects such as Agaricus blazei Murill planting, walnut deep processing, transformation of low-yielding camellia, broiler breeding and used the tyfo.com platform to provide e-commerce services to help create popular poverty alleviation brands such as Yanyuan Apple, Muli Morchella, Tianlin Agaricus Blazei Murill and Shufu Dates-in-Walnut • Assisted in introducing 6 companies for an external investment of 76.9 million yuan to implement labor-intensive industrial projects such as non-staple food production and clothing processing • The case of Poverty Alleviation Model of "tyfo.com+ynw360.com+rural ICT services+Information Officer" was selected as "Top 50 Cases of Targeted Poverty Alleviation" by the LGOPAD
Poverty alleviation through employment	• Formulated special policies for poverty alleviation through employment • Implemented the "Poverty Alleviation Plan for Employment of Thousands of Residents in One Hundred Villages" in 4 designated poverty alleviation counties	• Priority was given to the recruitment of applicants from poor families in the employment market and to college graduates from poor areas in campus recruitment • Undertook the task to organize the "Special Recruitment Campaign Targeting College Graduates from Tibet, Qinghai and Xinjiang by Central SOEs", during which 171 graduates were pre-recruited • Set up information service outlets in 517 administrative villages of 4 designated poverty alleviation counties, employing 517 residents nearby
Poverty alleviation through consumption	• Promoted the new model of poverty alleviation through e-commerce consumption as a support to industrial poverty alleviation projects • Advocated consumption for poverty alleviation among employees and users to help boost the sales of agricultural and sideline products from poor areas	• Adopted the "tyfo.com+rural ICT services" model in all aspects of e-commerce operations and provided direct supply and marketing services to poor villages in poor counties, introducing over 600 types of commodities from more than 300 cities in 18 provinces and helping nearly 100 businesses from poverty-stricken counties settle in the platform • Advocated the purchasing of poverty alleviation products among subsidiaries and employees with a total worth of nearly 60 million yuan • Utilized tyfo.com and other self-owned e-commerce platforms, and worked together with the Social Participation in Poverty Alleviation and Development of China to help in the sales of nearly 38 million yuan of poverty alleviation products
Poverty alleviation through education	• Supported the LGOPAD in the "Speak before Going to School" program • Provided training for officials and technicians in poor areas	• Participated in the construction of the platform for the "Speak Mandarin before Going to School" program for poverty alleviation through education in Liangshan Yi Autonomous Prefecture, Sichuan Province, covering over 530,000 preschool children and more than 14,000 homeroom teachers • Trained more than 6,000 grassroots officials and technicans in 4 designated poverty alleviation counties
Poverty alleviation for public good	• Used employee donations to help improve education and medical services in "4+2" poverty alleviation counties	• Sponsored registered poor students and teachers in the "4+2" poverty alleviation counties, and rewarded outstanding teachers • Continued the "New Diet Plan against the Kashin-Beck Disease" campaign in Bianba County to replace highland barley with rice in people's daily recipe

SYNERGY TO PROMOTE CIVILIZATION DEVELOPMENT IN A MODERATELY PROSPEROUS SOCIETY

Fixed-Point Poverty Alleviation and Counterpart Assistance

In 2019, China Telecom invested 128 million yuan in donations to the "4+2" poverty alleviation counties and implemented 31 targeted projects to help local improvement in production and living conditions, develop local economy, expand employment and support poor residents toward stable poverty alleviation.

Officials Dispatched to Fixed-Point Poverty Alleviation and Counterpart Assistance Counties in 2019

Wang Chao Deputy Head of Yanyuan County	**Wang Ping** First Secretary of Paoerwan Village of Yanjing Township in Yanyuan County	**Liu Guoping** Deputy Head of Muli County
He Fuyong First Secretary of Mihe Village of Xiqiu Township in Muli County	**Rexiati Abulimiti** Deputy Head of Shufu County	**Nong Guoning** Member of Standing Committee of CPC Tianlin County Committee and Deputy County Head
Ma Xianyuan Deputy Party Secretary of Banbar County Committee	**Chen Feng** Member of Standing Committee of CPC Bianba County Committee and Deputy County Head	**Ren Kebo** Member of Standing Committee of CPC Jiuzhi County Committee and Deputy County Head

Examples of Projects in Counties for Fixed-Point Poverty Alleviation and Counterpart Assistance in 2019

Name of County	Project Name	Main Progress and Results
Yanyuan County	Aid in the new playground project of the Minzu Middle School	• Improved the teaching and sports facilities and other conditions for 5,200 students in the Minzu Middle School, benefiting over 1,500 poor students
Muli County	Donation to the county's e-government information platform project	• Improved governance and office management level throughout the county
Shufu County	Aid to new projects to improve the living environment in poor villages	• Solved the problems of poor living conditions such as earthen houses and earthen sleeping beds to create happy and beautiful new village featuring "blooming flowers, fragrant fruits, shades of trees and comfortable life", benefiting more than 3,200 households
Tianlin county	Aid to build and repair public service facilities owned by village-level organizations	• Transformed public service facilities owned by village-level organizations to village centers for activities, convenience services, entertainment and sports to enrich the spiritual and cultural life of the people
Banbar County	Aid to build teachers' homes for schools	• Constructed teachers' homes and carried out talent training in 14 schools, benefiting over 38,000 poor residents and over 5,900 students
Jiuzhi County	Assistance to the construction of clinics in poor villages	• Standardized clinics established in 16 administrative villages, equipped them with relevant devices, medicines and patrol motorcycles, to address lack of access to healthcare services for over 16,000 residents

【**Targeted Assistance to Poverty Alleviation**】

In 2019, China Telecom worked hard to help poor areas make up for their shortcomings, develop specialty industries, improve self-development capabilities, and consolidate the effectiveness of poverty alleviation.

The Sichuan Branch implemented special poverty alleviation projects in Yanyuan County, Muli County and Leibo County in Liangshan Yi Autonomous Prefecture. More than 1,300 construction workers overcame difficulties such as high altitude, high elevation and inconvenient transportation. After 8 months of strenuous efforts, they managed to build 707 kilometers of poles, 4,257 kilometers of optical cables and 307 base stations. All projects were completed on June 30, 2019, providing a solid network guarantee for the implementation of various assistance measures such as e-commerce, education, industry, and tourism. In Muli County, after the access to fiber-optic broadband and 4G communications fully activated in 113 administrative villages, villagers could enjoy the same level of communications services as those in developed cities, making the project recognized as the "most popular project for the people" by local residents.

In 2019, China Telecom assisted the construction of educational and teaching facilities such as the dormitory building and multi-functional activity center of Yanyuan Minzu Middle School, the teaching complex of Yanyuan Teachers' Training School, and the Social Training and Practice Building of Yanyuan Vocational and Polytech School. The picture shows students in the Minzu Middle School studying in spacious and bright classrooms

Zunmao Hotel, a subsidiary of BestTone Holdings, leverages its advantages in hotel management to help Muli County explore guesthouse resources and promote the development of culture and tourism sectors. In 2019, it held a guesthouse management training camp in Muli County and trained 18 students. 3 Muli B&Bs signed a free franchise agreement to export hotel branded standards

In Tianlin County, Baise City, Guangxi Zhuang Autonomous Region, China Telecom worked with partners to implement a number of industrial poverty alleviation projects such as the Agaricus blazei Murill planting project in Langping Town, the transformation of low-yielding Camellia project in Pingbu Village, and the Mango Industrial Base project in Naguang Village, and used online sales through tyfo.com. In Langping Village and Tanghe Village of Langping Town, a total of 555 Agaricus blazei Murill greenhouses were built, becoming a large-scale Agaricus blazei Murill planting and development base in the country. It is expected that the output value will reach 25 million yuan in 2020, innovating a new approach to efficient agricultural development in deserted areas. In Pingbu Village, Yao Nationality Township, Lizhou, the Camellia planting project, low-yielding sugarcane project and other modern agriculture projects for high yields and high efficiency were implemented. After 1,000 mu of Camellia plantation is harvested, the average annual income of farmers participating in the project is expected to increase by 15,000 yuan; after sugarcane planting transformation, the average income per household can be increased by 4,000 yuan. A 100-mu Mango Industrial Base was built in Naguang Village and once entering the high yield stage, it can increase the income of the village collectively by more than 600,000 yuan each year, while mobilizing farmers in the village to plant 1,200 mu of mango.

China Telecom joined hands with Huawei, ZTE and other partners to build the Agaricus blazei Murill production base in Langping Town, Tianlin County

In Shufu County, Kashgar City, Xinjiang Uygur Autonomous Region, China Telecom focused on solving outstanding problems such as "worry-free in two aspects with three guarantees", and implemented human settlement improvement projects in 13 poor villages to solve housing and drinking water safety issues. In accordance with the principle of "one plan for one household", comprehensive renovation around the house was launched, farmers were guided to demolish and transform earthen sleeping beds and houses, and rationally design their courtyard layout based on the separation of living, planting and breeding areas, effectively expanding courtyard space utilization for courtyard economy and benefiting more than 1,800 households and 7,100 people living in poverty. The local Muyage apricot industry, known as the "king of Chinese apricots", began to take shape. After China Telecom built the original apricot natual drying plant in 2018, it signed an order and sales contract in 2019 with Kashgar Jiangguoguo Agricultural Technology to use tyfo.com and other online sales platforms to sell local high-quality dried apricots to Beijing, Shanghai, Guangdong and other places, helping local residents increase their income. The Muyage apricot "known to nobody" in the past has become a pillar industry to secure stable income growth as the e-commerce poverty alleviation moves towards a broader market.

On July 6, 2019, Abdukremu Toheti, a Muyage apricot grower in Shufu County, held fresh apricots in his hands and enjoyed the joy of harvest

The apricots I grew used to be dried on the roof and in the courtyard and the quality was not good. Now, the drying plant constructed by China Telecom is provided for free for us to use. The quality of dried apricots has improved and this year I sold them for more than 10,000 yuan. I am so happy!

——Abdukremu Toheti, Muyage apricot grower in Shufu County

In Banbar County, Tibet Autonomous Region, in response to poor people's difficulty in seeing a doctor, China Telecom built a comprehensive central health center in Lazi Township at an altitude of 4,200 meters. It has a maternal and child health care department, an immunization department, a pharmacy, a treatment room, a delivery room, a medicine warehouse, microwave therapy machine, B-ultrasound and other medical equipment. Clinics were set up in 12 administrative villages in the township, which solved the problem of health care accessibility for more than 4,000 local residents so that residents "don't have to go outside their villages to see doctors for minor diseases".

In Jiuzhi County, Qinghai Province, China Telecom has built a 32-mu comprehensive industry base featuring organic fertilizer production workshop, fermentation workshop and supporting infrastructure. The project uses livestock manure and biogas residue to process organic fertilizers, which solves the environmental pollution problem caused by solid wastes such as farm manure, turns excess cow manure into "treasure" for planting flowers, fruits, vegetables and food, and provides guarantee for the sustainable development of the farm. The project's annual output of organic fertilizer is about 30,000 tons, benefiting more than 1,500 poor households, with the average household income expected to increase by over 1,600 yuan.

The Central Health Center in Lazi Township, Banbar County built with the assistance from China Telecom

Jiuzhi Organic Fertilizer Industry Demonstration Base supported by China Telecom

Support to Local Poverty Alleviation

While strengthening assistance to "4+2" poverty-alleviation counties, China Telecom also actively undertakes assistance tasks in 132 counties and 1,204 villages designated by governments at all levels, and strives to help poor households in local poor villages get rid of poverty.

【Support to "Speak Mandarin before Going to School】

In order to help minority children to use national common language to communicate before receiving compulsory education and think in common language as well, the LGOPAD and the Ministry of Education launched the "Speak Mandarin before Going to School" program in 2018. China Telecom was entrusted by the LGOPAD to build an information management platform for the program and included it as a major project in poverty alleviation priorities in 2019 with a total investment of more than 26 million yuan and over 500 staff to develop, test, deploy the platform and provide trainings. By the end of 2019, the platform covered over 3,900 preschool education centers, kindergartens and other educational institutions with over 530,000 preschool children and more than 14,000 homeroom teachers, helping preschool children understand, dare to speak and know how to speak Mandarin in an idiomatic manner. The pilot project team for the "Speak Mandarin before Going to School" program in Liangshan Prefecture won the National Poverty Alleviation Award for Innovation in 2019.

Using online resources in teaching, the kids will speak more standard Mandarin language.

——Luo Ying, homeroom teacher of Jiebanada Preschool Education Center in Saladipo Township, Zhaojue County, Liangshan Yi Autonomous Prefecture, Sichuan Province

On May 30, 2019, at the Preschool Education Center in Dashanping Village, Mahu Township, Leibo County, Liangshan Yi Autonomous Prefecture, Sichuan Province, children were guided by their homeroom teacher to learn courses on the "Speak Mandarin before Going to School" APP

【Leverage Advantages in Targeted Assistance】

The Hetian area in Xinjiang Uygur Autonomous Region is one of the most impoverished areas in China. The local government has introduced a number of breeding enterprises and adopted the model of "enterprise+industry base+cooperative+farmer" to encourage local residents to breed rex rabbits and other livestock and poultry to increase income. Aiming at the problems of scattered residence of farmers, lack of technicians, and difficulties in communicating in Mandarin, the Xinjiang Branch developed and launched argicultual ICT solutions: (1) provide farmers with agricultural technology videos to improve the level of planting and breeding; (2) use the agricultural big data platform to facilitate the matching between enterprises and farmers for the processing and packaging of agricultural products; and (3) connect farmers to e-commerce platforms to promote the sales of agricultural products. At the same time, it developed a "new farm tool - cloud mobile phones", which is convenient for farmers to learn and practice standardized planting and breeding techniques and interact with each other. These phones were called as "rabbit phones" and "pigeon phones" by local residents based on their purposes. As of the end of 2019, the Xinjiang Branch cooperated with local governments and enterprises to distribute 11,000 "new farm tool" mobile phones to poor households in Hetian for free. In the future, experts and technicians will be invited to enrich relevant applications.

In the past, farmers didn't know any technology, so they couldn't and dared not raise rabbits. With the cloud mobile phone, more and more farmers have increased their income and got rid of poverty.

——Simayijiang Wubuli, First Secretary of Kumyayilake Village, Yingyeer Township, Moyu County, Hetian Prefecture, Xinjiang Uygur Autonomous Region

Yongjin Village, Barigastai Township, Horqin Youyiqian Banner, Xing'an League, Inner Mongolia Autonomous Region, suffers from inconvenient transportation and poor natural conditions. The local villagers grow corn and soybeans as their main source of income. In the event of drought, production and life will be more challenging. The Inner Mongolia Branch coordinated with the Inner Mongolia MECA Group to purchase soybeans from villagers at a price of 0.4 yuan/kg, a price higher than the local market, and sell them through the China Telecom BestPay platform. It cooperated with the village committee to guide professional cooperatives to transfer 800 mu of arable land, and use the technology of returning straw to the field to plant soybeans, which has increased farmers' income by about 150 yuan per mu. In response to the scarcity of water and irrigation well around Simajia Village, it helped drill 3 drought-resistant wells to ensure spring sowing production for more than 100 farmers; it also reconstructed water supply pipelines for the Xingfuyuan community so that people can drink water without any health concern.

The Henan Branch builds poverty alleviation service stations in poverty-stricken villages, provides free training to registered poor households in e-commerce and WeChat-commerce operation, free services for e-merchants related to online store setup, decoration, product launch and business consultation, as well as free third-party e-commerce procurement and sales services, and assists in the promotion of telemedicine, new education, smart elderly care, smart tourism and other applications for public welfare. As of the end of 2019, 150 poverty alleviation service stations had been constructed and operated in Anyang, Shangqiu, Xinxiang, Kaifeng, Jiaozuo, Puyang and other places, covering 920 poor villages, providing over 130 e-commerce trainings to more than 4,400 people, and offering assistance in opening 22 online stores in Taobao and other platforms. In Liyuan Township, Puyang County, the poverty alleviation service station helped open the Taobao store of "Puyang Liyuan Store" in 2019, which mainly sells special products such as hand made vermicelli from "Zhongshizhai" with a transaction volume reaching 44,000 yuan.

Enthusiasm in Charitable Undertakings

China Telecom is enthusiastic in participating in social welfare undertakings. Following the principles of "being voluntary, non-remunerated, clear powers and responsibilities, acting within the limit of resources, being honest and trustworthy", the Company donated money and materials, and provided free services to help the disabled and the weak, support the development of the science, education, culture and health courses, spread civilization, and encourage employees to actively participate in voluntary service activities.

Support to Disadvantaged Groups

【Smart Care for the Disabled】

The Kunming Branch of Yunnan Province cooperated with the Municipal Disabled Persons' Federation to complete the third generation of the disability certificate (intelligent) management and assistance system in 2019, and launched the smart disability care APP to provide mobile office services for the staff of the Disabled Persons' Federation. It carried out the "Love Is around Us" campaign in the city, offering the disabled with a free "SIM Card for Care" with 1GB domestic data and 100 minutes of domestic calls to help the Municipal Disabled Persons' Federation provide fast and accurate information services for the disabled. By the end of the year, more than 26,000 disabled people had claimed the SIM card.

Following the pilot of sign language video services in 2017, the Shanghai Branch continued to optimize and improve its offerings, providing more convenient and human-centric public services to more than 72,000 certified persons with impaired hearing and language skills and other hearing impaired persons.

On May 13, 2019, the first day of the Shanghai Handicapped Week, the Shanghai Branch and the Municipal Disabled Persons' Federation formally launched the sign language video service seats for the 12345 hotline

【Care for Disadvantaged Children】

Tianyi Terminal Company has continued voluntary services for children with cerebral palsy since 2017. It has visited Chenguang Cerebral Palsy Children's Rehabilitation Center in Chaoyang District, Beijing for 9 times, and brought care to the children by assisting in cleaning, spending time together and donating. The picture shows a visit by its employees on March 21, 2019 to the rehabilitation center in voluntary service activities

On May 31, 2019, on the occasion of Children's Day, the employees of the Customer Service Department of the Guangxi Branch went to Zhile Children's Rehabilitation Center in the "E-surfing's Care for Children" activity, during which they made holiday greeting cards with the children there, played games together and donated stationery supplies to the center

Support to Science, Education, Culture and Health

【Protect and Pass on Industrial Cultural Heritage】

The industrial cultural heritage of the ICT industry has vividly demonstrated the history of China's ICT development in multiple dimensions, from scratch to basic shape, from small size to large, and from weakness to leadership. It serves as the records of hard-working generations in the ICT sector to contribute to national development under ambitious aspiration and strong sense of responsibility. On October 18, 2019, 11 industrial cultural heritages of China Telecom were included in the list of industrial cultural heritages of central SOEs released by SASAC of the State Council.

Selected China Telecom Industrial Cultural Heritage of the ICT Industry

Hankou Telegraph Bureau	Site of Nanjing Telecom Bureau
Shanghai Telecom Museum	Site of Yongning Telegraph Bureau
Hangzhou Telecom Exhibition Hall	Kunming International Radio Branch of the Ministry of Communications
Former site of Chongqing Radio Telephone Station	Kushui Site of Hami Transmission Branch
Xi'an Newspaper Building	Sichuan International Radio Site
Lhasa Telecom Building	
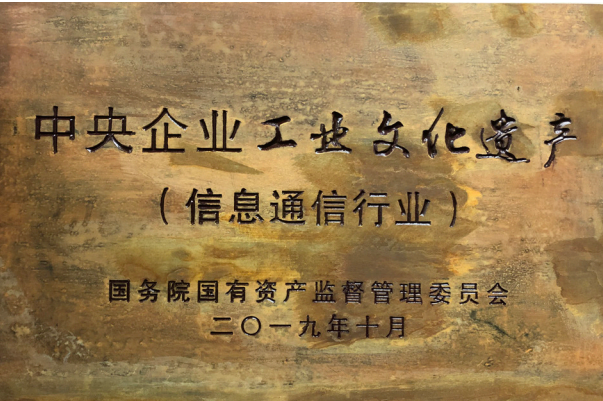
The picture shows the plate issued to Shanghai Telecom Museum. The museum's rich historical materials and physical objects show the history of Shanghai's telecommunications industry for more than 100 years, reflecting the changes and development of telecommunications productivity. China Telecom meticulously protects them and gives play to its cultural function and social value

【Support to Developing Science and Education】
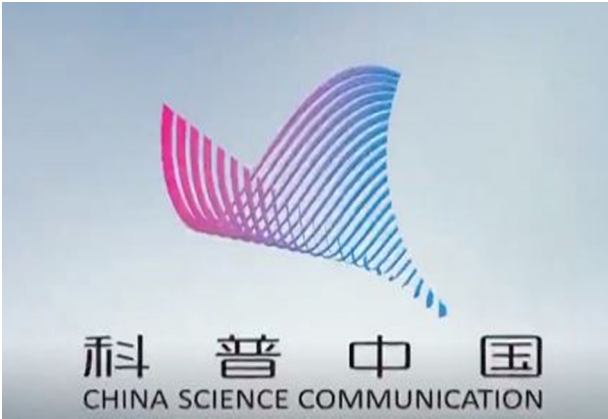
On January 30, 2019, the Hainan Branch cooperated with Hainan Association for Science and Technology to launch a "China Science Communication" column on the IPTV platform, covering 1.21 million users across the province, to disseminate popular science knowledge in a new way

The Xining Branch of Qinghai Province cooperated with Qinghai Industrial Vocational and Technical School to implement the enterprise-school "dual teacher and apprenticeship" system, select technical backbones to teach in the school, and lead students in their internships. The picture shows students of Qinghai Industrial Vocational and Technical School were learning the process of how to open fiber broadband services at the Network Operation and Maintenance Center of the Xining Branch on October 17, 2019

Promote Social Virtues

【Blood Donation】

China Telecom's companies and branches at all levels actively organize voluntary blood donation activities. In Guangxi Zhuang Autonomous Region, the Nanning Branch has organized blood donation activities for nearly 10 years. A total of 488 people participated, and the total amount of blood donation reached more than 150,000 ml. In Jiangsu Province, employees from branches in Suzhou, Nantong, Lianyungang, and Yancheng actively participated in voluntary blood donation. In Henan Province, the Shangqiu Branch organized 33 staff to participate in the voluntary blood donation in the "Show Love and Care with E-surfing" campaign on May 17, 2019.

On April 12, 2019, Qu Guoren (first from left), General Manager of the Songyuan Branch, Jilin Province, led 34 volunteers to the blood station in the city center for blood donation

On May 28, 2019, Xin Ligang (first from right), Director of the Shedong Operation of Sheyang Branch in Yancheng City, Jiangsu Province, donated 306 ml of stem cells at the Zhongda Hospital Affiliated to the Southeast University, and was awarded by Hematopoietic Stem Cell Management Center of the Provincial Red Cross Society with a Certificate of Honor and a commerate medal

【Care Stations】

Branches of China Telecom have set up "Care Stations" in their service halls to provide free rest places for outdoor workers. Under the guidance of the Municipal Federation of Trade Unions in Hebei Province, the Shijiazhuang City Branch built "Care Stations" in 110 self-owned service halls in 2019, equipped with tables and chairs, heating and cooling equipment, drinking fountains, emergency medicine boxes, and other materials. The "Care Stations" built by the Chuzhou Branch of Anhui Province provide services such as free drinking water, mobile phone charging, temporary rest space, free WiFi, umbrellas, convenience service boxes, and microwave ovens. The Jiujiang Branch of Jiangxi Province built 96 "Xiangdong Care Stations" in 2019, providing outdoor workers such as sanitation workers, taxi drivers, traffic police coordinators, urban management personnel, express deliverymen, municipal maintenance workers with drinking water, eating and resting functions. The Rizhao Branch of Shandong Province was awarded the "Care Station" unit by the Municipal Labors' Union, with 6 "Care Stations" built by the end of 2019.

On July 31, 2019, a volunteer of the Huai'an Branch in the service hall at the Shuidu Plaza, Jiangsu Province delivered drinking water to a sanitation worker

Support to Employee Development

China Telecom protects the rights and interests of employees in accordance with the law, pays attention to the establishment of harmonious labor relations, supports trade unions in performing their functions, encourages employees to participate in management, actively helps employees improve their capabilities, and strives to achieve common growth between employees and the Company.

Safeguard Employees' Rights & Interests

China Telecom earnestly abides by the Labor Law of the People's Republic of China, Labor Contract Law of the People's Republic of China, Trade Union Law of the People's Republic of China and other laws and regulations related to labor and employee rights and interests protection, implements employees' rights & interests in labor, democracy and spiritual culture in accordance with the law, and continues to build harmonious labor relationship. The Company strengthens labor management, uses labor in accordance with the law, regulates labor use, ensures that contract employees have signed labor contracts, as well as pays salaries and social insurance in full and in time. We adhere to employment policies such as gender equality and equal pay for equal work, protect employee privacy in accordance with the law, and implement a paid vacation system for employees. We sign dispatch agreements with labor dispatch units, inspect and urge the dispatch units and employees to sign labor contracts, pay salaries and social insurance on time, and safeguard the rights and interests of the outsourced labor. The use of child labor is prohibited in the Company in accordance with the law and forced labor is prevented.

Companies at all levels continue to strengthen the construction of trade unions, with more than 1,900 grassroots trade unions; actively support trade unions to perform their functions in accordance with the law, and support trade unions to play a full role in contacting the masses of employees, strengthening grassroots democracy, safeguarding the legitimate rights and interests of employees, and promoting enterprise stability. In 2019, trade unions at all levels assisted in providing legal advice to employees for more than 2,900 person-times.

Facilitate Employee Development

In 2019, China Telecom strengthened capacity building for its management teams and promoted younger talents to higher positions; pushed forward the "talent-driven enterprise building" project, and enhanced the training of the expert talent team to support transformation; continued to strengthen employee training through various forms of competitions for employees to improve and demonstrate their skills.

Main Results in 2019 of Encouraging Employee Development

1,300+
Built employee innovation workstations

4
innovation workstations were named "Innovation Workstations by Model Workers and Skilled Talents" by China Trade Union of National Defense and Post and Telecommunications

2,500+
innovative achievements were commended and promoted

29
employees won national honors

256
employees won provincial and ministerial honors

280+
employees were selected as Group-level experts

3 people including Xu Jun from the Shanghai Branch and Qiang Ningjian and Tian Ning from the Jiangsu Branch were awarded as "Top 100 Outstanding Professionals of Central SOEs" by SASAC of the State Council

Major Actions Taken to Promote Employee Development in 2019

Target	Main Actions
Leaders	• Implemented the standards for good cadres in the new era, improved the cadre work system of quality training, knowledge, selection and appointment, strict management, and positive incentives, and built a loyal, clean and responsible team of high-quality professional managers • Strengthened the capacity building of outstanding young managers at all levels, improved and optimized the pool of outstanding young managers, enhanced training for and preference of young managers in selections, and strengthened evaluation, supervision and dynamic management
Professional talents	• Implemented the "Top 100, 1,000 and 10,000 Experts and Talents Project", and employed 1 China Telecom scientist, 8 chief experts and more than 800 senior experts to promote the capacity building of provincial-level branch expert teams • Intensified the training of talents at different levels, carried out high-end talent training schemes, accelerated the training of leading talents in 5G, cloud computing, big data, etc., launched the knowledge update program for experts and talents, and strengthened the training of young talents • Innovated talent selection and retention mechanism, supported the Company's key projects with mechanisms such as the "talent zone", "talent workstation" and "talent cloud" platforms to provide a stage for talents to make contributions
Ordinary employees	• Revised the "China Telecom Employee Honor System" and strengthened incentives for small CEOs at the grassroots level and employees to encourage their enthusiasm and abilities • Organized various forms of technique competitions, skill competitions and knowledge contests, gave full play to the role of innovation workstations, encouraged employees to innovate based on their responsibilities, and promoted the spirit of model workers and craftsmanship • Implemented targeted training courses for capacity improvement according to the needs of employees at different levels and positions

【Patents from Five-Year Exploration】

The wireless maintenance team of the Tianjin Branch's network monitoring center often encounters complaints about unstable mobile communication signals and unsatisfactory network speeds in their daily work. After repeated investigations, the team found that the traditional measurement method used to measure the antenna angle in the high magnetic area was not accurate, resulting in significant errors; moreover, the technicians had to frequently climb up base stations for commissioning, which caused high security risks and high costs.

In order to quickly adjust the angle of the base station antenna, it is necessary to collect a large amount of data, establish an accurate antenna angle data file, and obtain the best angle through simulation. Since 2014, the wireless maintenance team has used their spare time to carry out special research while completing its own work, and had explored a set of "data-based" and "systematic" antenna direction angle measurement methods, so that the consistency ratio between actual and planned antenna angle in a high magnetic environment was increased from the previous 23% to 99%, serving as a more accurate tool for optimizing the antenna angle. In November 2019, the research results of the "antenna direction angle measurement method and device" proposed by the wireless maintenance team passed the review and authorization for national invention patents and was promoted nationwide.

On November 5-7, 2019, the Group Company held the Fifth "i-Innovation" Black Horse Competition & the Final Contest for the First Youth Innovation and Creativity Competition. Representatives from Shaanxi, Jiangsu, Guangdong, Sichuan, Shanghai, Beijing and other provincial branches won First Prizes in 7 disciplines including 5G and cloud network integration

On April 25, 2019, the Nantong Branch of Jiangsu Province held a salon under the theme of endeavoring youth. Branch company leaders, outstanding small CEOs and technical experts communicated face-to-face with more than 50 new employees to brain storm and talked about future growth

Employee Engagement in Management

China Telecom respects and actively implements the employees' right to know, participate and supervise, unblocks employees' appeal channels, puts into practice democratic management systems such as workers' congress and open factory affairs, and encourages employees to participate in corporate management. In 2019, employees' knowledge of appeal channels reached 92%, timely feedback of employee appeals reached 96%, and perception of employees care by trade unions reached 97%.

Outline of Employee Participation in Corporate Management through Staff Representative Conference

Indicator	Unit	2017	2018	2019
Proposals from employee representatives	Piece	1,353	2,108	1,956
Training for employee representatives	Time	59	64	55

【Proposals from Employee Representatives Produce Practical Results】

In 2019, in accordance with the requirements of the Group Company's Notice on Soliciting Proposals from Employee Representatives of the Group Company, the Tibet Branch conducted in-depth investigations in combination with work deployment and hot and difficult issues that employees were concerned about, and submitted the Proposal Regarding the Deployment of Oxygen-Generating Equipment for Branches at High Altitude.

Problem

The Tibet Branch has 71 county branches and teams located at an altitude of more than 3,500 meters. The number of front-line employees who stay committed to service in high altitude areas and suffer from altitude sickness due to chronic cold and hypoxia increased.

Suggestion

To further improve the working and living conditions of employees in high-altitude areas, and uniformly build oxygen supply facilities in offices, dormitories, and employee homes in high-altitude areas to alleviate the difficulties of employees in high altitude and hypoxia.

After in-depth investigation, the Group Company's trade union coordinated and allocated 22 million yuan to build oxygen supply facilities for 110 grassroots branches located 3,500 meters above sea level in Tibet, Qinghai, Sichuan, Gansu, Xinjiang and other provinces (autonomous regions), which were praised by local employees. The proposal was rated as one of the "Top 100 Employee Representative Proposals" by the National Factory Affairs Disclosure Coordination Group and the All-China Federation of Trade Unions as a result of accurate topic selection, focused content, dedicated discussion on each topic, and completeness.

The Group Company equipped operations at high altitude with oxygen production equipment. It's a strong support and guarantee for the work and life of front-line employees and we are very excited and moved by this decision.

——Qionda Tsering, employee of Damxung County Branch in Lhasa, Tibet Autonomous Region

Care about Employees' Life

Operations at all levels combine the demands of their employees to continuously improve working and living conditions, provide mental health assistance, enrich employees' spiritual and cultural life, help needy employees and special groups, and demonstrate care for retired staff.

Improve Working and Living Conditions at Grassroots Level

In 2019, China Telecom further improved the dining, entertainment and rest conditions of frontline employees at the grassroots level, built more than 1,700 "small facilities in four types" (small canteens, small bathrooms, small toilets and small activity rooms), while enhanced and upgraded more than 4,400 old ones. The Group Company held the fifth "Book-Loving Family" writing activity and the "Rereading Classics to Better Understand China" reading activity, collecting more than 2,700 video works from employees showing reflections after reading books.

【Work-from-Home Seats for the Benefit of Female Employees】

There are more than 700 female employees in the customer service center of the Anhui Branch. Since the office is far from the main urban area, there are many inconveniences in the work and life of female employees during pregnancy and lactation. Since June 2017, the Anhui Branch opened work-from-home seats for female employees in special periods, and then gradually expanded to women employees living far away from office, having limited mobility, or having no one to look after their children. The work-from-home seat establishes a secure connection with the internal operating system of the Anhui Branch through virtual private network (VPN), and uses a firewall to control access to internal and external networks, which not only guarantees high-quality customer service, but also solves the actual difficulties of female employees. By the end of the year, 251 employees had applied and used work-from-home seats, with the service volume accounting for 25% of the total, and 98.5% of user satisfaction, more or less the same as on-site seats.

On October 25, 2019, Jiang Shenfang, a customer service center employee of the Anhui Branch served customers through a work-from-home seat

The Aksu Branch in Xinjiang Uygur Autonomous Region repaired 47 staff dormitories, 9 staff canteens, and 5 office toilets in 2019. The picture shows the staff dormitory after renovation

The Guilin Branch in Guangxi Zhuang Autonomous Region distributed books to grassroots staff in 2019, and hold reading contests and other activities from time to time to create a cultural atmosphere of "book-loving branch"

On September 21, 2019, the Yanbian Korean Autonomous Prefecture Branch in Jilin Province held a fun sports meeting for employees under the theme of "Release Passion and Challenge Yourself"

On January 11, 2019, the Sichuan Branch held the first employee canteen cooking competition under the theme of "Better food for employees", and 26 participating teams demonstrated their culinary skills on site

Strengthen Safety and Health Management

China Telecom conscientiously implements the Production Safety Law of the People's Republic of China, fulfills the main player responsibility, establishes a sound accountability system, implements safety responsibilities at all levels, strictly evaluates production safety, and continuously strengthens the foundation for production safety management. We continue to carry out production safety supervision and inspection of all units and disciplines, and timely rectify and correct hidden dangers. We organize extensive training and awareness activities related to production safety regulations and safety knowledge, and continuously improve employees' safety awareness and emergency response skills. We strengthen the safety management of engineering projects, strictly implement the certification system for special operations personnel, and improve emergency plans and drills. In 2019, there were no serious production safety accidents or at higher levels, the death rate per one thousand employees was 0, and the grievous injury rate per one thousand employees was also 0.

The Company earnestly implements occupational health management system, regularly organizes the supervision and inspection of the employees' work sites, and urges the design and construction units to design and install in accordance with indoor light illuminance, noise, temperature and humidity and other standards; we continue to improve the working environment and conditions of employees, effectively preventing occupational diseases. We conduct inspections of the work site from time to time, urge employers to distribute necessary labor protection products to employees in accordance with regulations and standards, and request employees to wear and use them correctly. We provide free physical examinations to all employees every year, with a coverage rate of 100%. We actively help employees relieve stress, and continue to provide employee mental health consultation and assistance. In 2019, the Company conducted more than 200 health lectures.

Care and Help for Employees

Leaders of the Group Company and branches at all levels make normalized visits to show support to the front-line employees, employees with difficulties, and outstanding model employees. During the Spring Festival Eve in 2019, the Group Company paid visits to over 90,000 front-line staff on duty to secure services. In 2019, the trade union of the Group Company granted support funds to branches in 14 provinces, including Sichuan and Zhejiang, which suffered earthquakes, typhoons, floods and other natural disasters to show its care for disaster-stricken families and front-line employees who devoted in earthquake relief and emergency communications support.

On July 8, 2019, the trade union of the Jiangsu Branch opened a summer day care program for employees' children in the office building of the provincial branch to help employees in need to solve their headaches in taking care of their children during summer vacation, and provided diverse activities to enrich the summer life of employees' children

The Jiangxi Branch established an employee home visit system in 2019. Executives at all levels listened to the opinions and suggestions of employees' family members during their visits to help solve practical difficulties. The picture shows Luo Jiufa (first from right), Deputy General Manager of the Xinyu Branch, in his employee home visit on August 5

Stringent Compliance Management

China Telecom insists on operation with integrity and legal compliance, and continues to strengthen audit supervision, Party discipline, clean governance and social responsibility management to ensure its sustainable and healthy development.

Promote the Rule of Law

China Telecom conscientiously implements the central government's strategic deployment of comprehensive rule of law, deepens the implementation of requirements from SASAC of the State Council on legal compliance by central SOEs, and promotes the main player responsibility of key management teams of companies/branches at all levels to promote corporate legal compliance for operation under the rule of law and regulated management. In 2019, in combination with changes in business operation, China Telecom continued to improve systems for internal control, audit supervision, corruption prevention and comprehensive risk management; fulfill commitments and contract obligations; standardize the disclosure of corporate information, and accept government and social supervision.

China Telecom Guangdong Branch has been rated as "Enterprise of Observing Contract and Valuing Credit" by Guangdong Provincial Market Supervision Administration for eight consecutive years

Compliance Training

Program	Unit	2017	2018	2019
Number of compliance training	Session	7,779	8,273	8,290
Number of participants in compliance training	Person-time	497,911	506,876	508,712

Compliance with Industry Regulations

China Telecom adheres firmly to the requirements of building national cyberspace strength, implements speed up and fees down, maintains network information security, and improves service levels. We resolutely implement the national 5G deployments with accelerated network construction and business promotion. We intensively carry out the work in industry discipline, strengthen the protection of users' personal information, deepen universal telecommunications service, and effectively promote number portability. We also improve service capabilities in network security support, cooperate in preventing and combating telecom frauds, and effectively clean up illegal and improper information on the Internet. We continue efforts to expand interconnection bandwidth between operators, improve the quality of inter-carrier connection, and collaborate with partners to curb vicious competition.

Strengthen Audit Supervision

China Telecom conscientiously implements the new requirements from the central government on internal audit with an aim to "ensure accountability, promote implementation, guard against risks, and improve value" so that the audit work can play a better role in preventing and resolving major risks and promoting high-quality development. In 2019, the Company carried out more than 290,000 audit projects, putting forward over 3,100 management recommendations and over 2,000 proposals on institutional enhancement.

- Regarded the supervision and inspection of the implementation of major national policies and measures as well as decisions made by the Group Company as the top priority, organized auditing around targeted poverty alleviation, network information security, debt clearing of private enterprises, and control on "prohibited funding in two aspects", and promoted the performance of central SOE responsibilities at all levels

- On the basis of comprehensive audit coverage, auditing priorities were identified with continued enhancement in the audit and supervision of key areas, units and elements and factors that affect the quality and efficiency of enterprise development

- Firmly carried out internal control evaluation and promoted compliance with regulatory requirements of the country and the capital market; performed investigations into accountability for illegal operations and investments in accordance with laws and regulations

- Effectively strengthened audit-based rectification and application of results, implemented the main player responsibility in rectification and supervision and established major event reporting, coordinated rectification and other mechanisms to improve the effectiveness of auditing

- Deepened the intensive management of the audit system, improved the ability of ICT-enabled auditing, and continuously raised the standardization level of auditing

Strengthen Party Discipline and Clean Governance

China Telecom has coordinated the promotion and active implementation of its responsibility in strict Party governance, and achieved remarkable results in Party discipline, clean governance and anti-corruption.

- Actively cooperated with the central inspection team and supervised the performance in rectification and themed education for rectification as required by the central inspection team

- Adhered to the principle of seeking progress while maintaining stability, seeking truth from facts, compliance with regulations, laws and rules, and perseverance in integrity and discipline, promoted anti-corruption efforts in an all-round manner, and continued to consolidate and expand progress made in Party discipline and clean governance, with staged results in "reducing existing malpractices while curbing future ones"

- Perseveringly solidified and expanded the implementation of the eight regulations and implementation rules made by the CPC Central Committee, resolutely cracked down on formalism and bureaucracy, and addressed malpractices and corruption in poverty alleviation at greater depth

- Made full use of the "Clean Telecom" public WeChat account, centralized publicity and other channels and methods to strengthen integrity education and the nurturing of a clean culture, guide Party members and officials in self-discipline, honesty and clean governance, and create a favorable atmosphere featuring compliance and entrepreneurship

- Continued to deepen inspections and advanced reforms of the discipline inspection and supervision system in an orderly manner to secure firm, stable, solid and effective progress toward high-quality development

Development of Party Discipline and Integrity Education

Indicator	Unit	2017	2018	2019
Number of integrity education activities carried out	Session	11,478	20,242	25,457
Number of people receiving integrity education and training	Person-time	598,778	782,658	799,356

Strengthen Responsibility Management

China Telecom earnestly implements the requirements of the CPC Central Committee, the State Council and various ministries and commissions on corporate social responsibility, continues to integrate social responsibility into its development strategy, daily production, operation and management, and actively fulfills its social responsibilities. In 2019, we selected and commended 32 outstanding CSR cases, in which the case "Leverage Corporate Strength for Enhanced Support - Six Aspects in Assistance to Help Win the Battle against Poverty" and "ITC NBB Broadband Project for Saudi Arabia to Improve ICT Level" were selected respectively into the Blue Paper on Corporate Social Responsibility of Central SOEs (2019) and the Blue Paper on Overseas Corporate Social Responsibility of Central SOEs (2019) published by SASAC of the State Council. Moreover, another 16 cases including the "Leverage Advantages of the Tiantong Communications Satellite for Social Production and Daily Life" were selected by the China Association of Communication Enterprises into its "2018 Winning Cases for CSR Practices in the ICT Industry".

The Company continues to enhance communication with stakeholders, and dynamically releases information on fulfilling social responsibilities through its official website and WeChat account. In 2019, we released the Corporate Social Responsibility Report in Chinese and English for the 9th consecutive year, and was awarded "five-star (outstanding)" by the Chinese Expert Committee on CSR Report Rating for the 8th consecutive year. We implemente closed-loop management on CSR reports and collected 203 readers' questionnaires to analyze readers' views, expectations and suggestions regarding China Telecom CSR report, providing helpful reference to improve report compilation and promote CSR-related work in 2020.

In accordance with the provisions in Appendix 27 (Environmental, Social and Governance Reporting Guide) of the Listing Rules issued by the Hong Kong Stock Exchange, Hong Kong-listed China Telecom Co., Ltd. and China Communications Services Co., Ltd. under the Group Company released their ESG (Environmental, Social and Governance) Report 2019.

Fulfill Overseas Responsibilities

China Telecom provides services to overseas customers through China Telecom Global Limited (hereinafter referred to as China Telecom Global) and China Communications Services International Limited (hereinafter referred to as CCS International, or CCSI), a wholly-owned subsidiary of China Communications Services Co., Ltd. (China ComService), and is committed to providing customers with efficient and high-quality communications solutions and comprehensive, intelligent information services, and active performance of social responsibilities in combination with the actual conditions of relevant countries (regions).

Overseas Business and Service of China Telecom Global

China Telecom Global Limited provides Internet access and transit, broadband, unified communications, cloud computing, ICT, fixed and mobile voice services and value-added services, professional and industrial solutions, as well as telecom operation consulting and service outsourcing services to international operators, multinational corporate customers and individual customers (mainly overseas Chinese). As of the end of 2019, China Telecom Global had established operations in 42 countries (regions) around the world and 200 overseas PoPs with over 55.4Tbps of international Internet bandwidth and transcontinental capacity, as well as assets in 41 submarine cables, including more than 10 cables under joint construction, and direct land cable connectivity with more than 10 neighboring countries (regions), shaping a global footprint of service outlets and network capabilities.

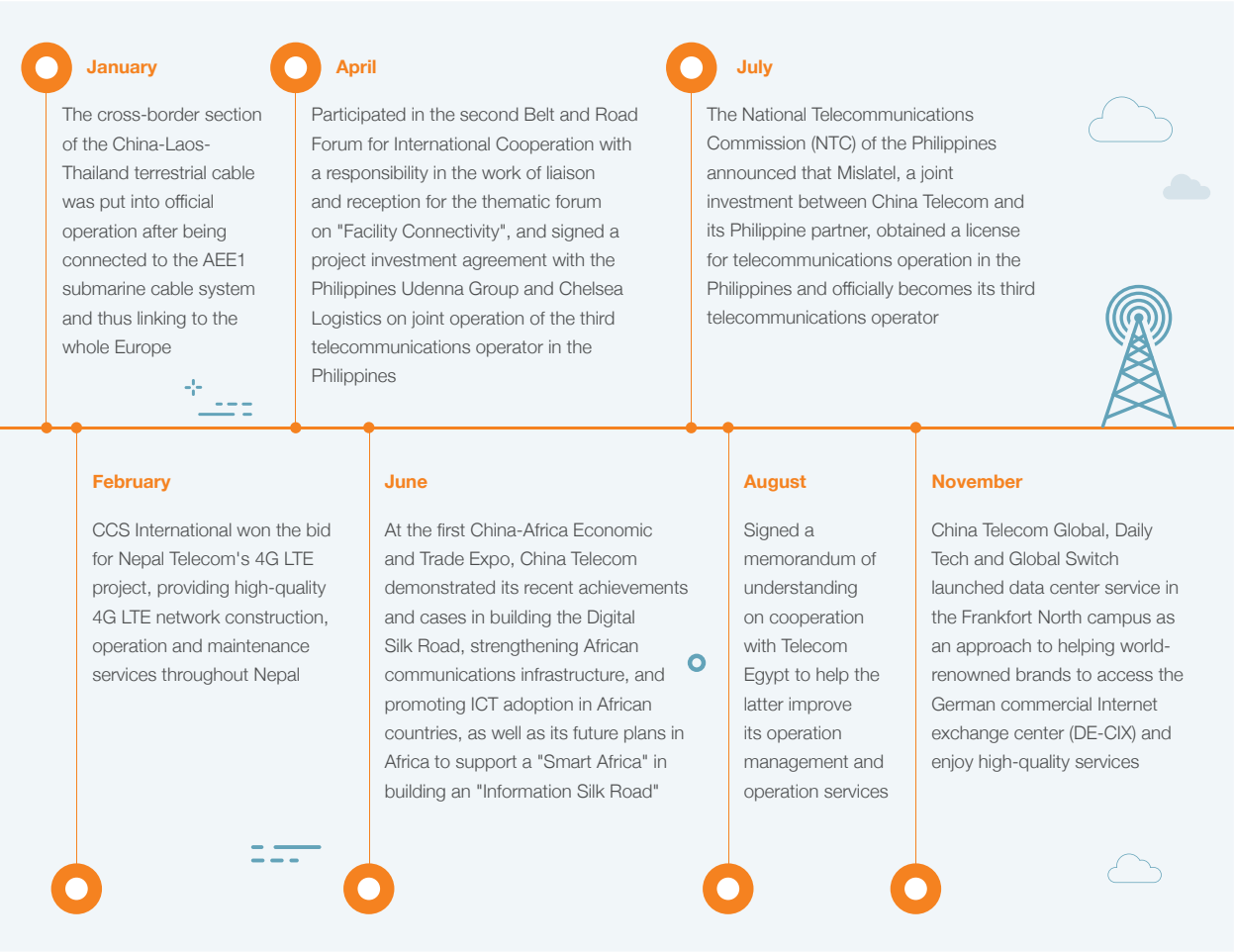## Overseas Business and Service of China ComService

The products and services of China Communications Services Co., Ltd. cover three pillars – "Telecommunications Infrastructure Service (TIS)", "Business Process Outsourcing (BPO)" services and "Applications, Content and Other Services (ACO)", including design, engineering & construction, supervision, network maintenance, channel services, facility management, IT application services, value-added voice services, value-added Internet services and other services. As of the end of 2019, China ComService had established operations in 34 countries (regions) with a focus on expanding regional business in Southeast Asia, Asia-Pacific, the Middle East and Africa to provide customers with professional, integrated, and differentiated communications construction and other related services.

China Telecom actively promotes communication with stakeholders overseas to spread its corporate image. In the Research Report on Overseas Branding Communication by Central SOEs (2019) published by the Data Research Center of haiwainet.cn (the overseas website of People's Daily), China Telecom's overseas branding communication index ranked the second among central SOEs.

Build the Belt and Road

According to the needs of countries (regions) along the Belt and Road in the development of telecommunications and ICTs, China Telecom has carried out extensive cooperation to actively assist in the construction of ICT infrastructure for better network interconnection; actively provided comprehensive industry chain services from ICT consultation, planning, construction and operation, as well as ICT application services for certain industries, to assist in cultivating professionals and promoting local ICT development.

2019 Milestones of Belt and Road Engagement

January
The cross-border section of the China-Laos-Thailand terrestrial cable was put into official operation after being connected to the AEE1 submarine cable system and thus linking to the whole Europe

April
Participated in the second Belt and Road Forum for International Cooperation with a responsibility in the work of liaison and reception for the thematic forum on "Facility Connectivity", and signed a project investment agreement with the Philippines Udenna Group and Chelsea Logistics on joint operation of the third telecommunications operator in the Philippines

July
The National Telecommunications Commission (NTC) of the Philippines announced that Mislatel, a joint investment between China Telecom and its Philippine partner, obtained a license for telecommunications operation in the Philippines and officially becomes its third telecommunications operator

February
CCS International won the bid for Nepal Telecom's 4G LTE project, providing high-quality 4G LTE network construction, operation and maintenance services throughout Nepal

June
At the first China-Africa Economic and Trade Expo, China Telecom demonstrated its recent achievements and cases in building the Digital Silk Road, strengthening African communications infrastructure, and promoting ICT adoption in African countries, as well as its future plans in Africa to support a "Smart Africa" in building an "Information Silk Road"

August
Signed a memorandum of understanding on cooperation with Telecom Egypt to help the latter improve its operation management and operation services

November
China Telecom Global, Daily Tech and Global Switch launched data center service in the Frankfort North campus as an approach to helping world-renowned brands to access the German commercial Internet exchange center (DE-CIX) and enjoy high-quality services

On April 25, 2019, China Telecom Chairman Ke Ruiwen (first from right) and Udenna Group Chairman Dennis (first from left) signed an investment agreement on the third telecommunications operator project in the Philippines at the second "Belt and Road" Forum for International Cooperation

On August 7, 2019, China Telecom and Telecom Egypt signed a memorandum of understanding on cooperation in Shenzhen, under which the Sichuan Branch will introduce its experience and models to Telecom Egypt in the fields of network planning and construction, customer service operation, business expansion and talent training

Serve Overseas Customers

In 2019, China Telecom Global continued to optimize its global network layout, strengthen the integration of network resources and cloud services, enhance ICT operation capabilities, deepen overseas mobile operations (MVNO), enrich mobile roaming portfolio, and strive to improve service levels for overseas customers. Taking advantage of its comprehensive, integrated services, China ComService has facilitated the transformation from the traditional business model of engineering, procurement and construction (EPC) to the "EPC+F (financing)+I (investment)+O (operation)+S (solution)" model to provide leading products and services while taking into account the digital needs of overseas customers.

In June 2019, the China Telecom customer service team won three awards under the category of "Global Support Service of the Year (Telecommunications)", "Integrated Support of the Year (Telecommunications)" and "Customer Service Center of the Year (Telecommunications)" in the 2018-2019 International Customer Relationship Excellence Award hosted by the Asia Pacific Customer Service Consortium (APCSC). The picture on the left is a group photo of the winning team of China Telecom

Main Customer Service Indicators of China Telecom Global

Indicator	Unit	2017	2018	2019
Timeliness of troubleshooting for international customers	%	98.3	98.8	99.2
International customer satisfaction	%	90.1	90.4	91.4
Customer recommendation	%	77.5	83.2	81.2

【Improve CTExcel Service】

In August 2019, thanks to its high-quality retail services and honest product guarantee in the mobile business in Hong Kong, China Telecom Global was approved by the Hong Kong Retail Management Association (HKRMA) as an official member. At the same time, China Telecom CTExcel was also invited to join the "No Fake" program to display a guarantee label issued by HKRMA in its stores and promise to continue high-quality services advocated by HKRMA. At present, CTExcel of China Telecom has covered Europe, North America, Hong Kong and other regions, receiving wide recognition and praise among Chinese students and overseas Chinese.

In August 2019, China Telecom Global displayed the guarantee lables issued by the Hong Kong Retail Management Association at its Causeway Bay store in Hong Kong to enhance user trust

【The First International Service Station Established in China】

On June 5, 2019, China Telecom Global established its first international service station in Chengdu, Sichuan Province. It is guided by the service needs of international companies and leverages the policy support, human resources and communication service capabilities of the area to provide one-stop communication solutions to overseas companies "going into the Chinese market" as well as one-stop, comprehensive, smart global information services featuring fast response online anytime to Chinese companies "going global".

On June 5, 2019, China Telecom International Service Station Chengdu was unveiled

【Build 4G Network for Nepal】

CCS International won the bid of the Nepal Telecom 4G LTE construction project in February 2019. As the EPC contractor, it is responsible for providing 4G LTE network construction, operation and maintenance services throughout Nepal. With the hard work of its engineering and construction teams, on December 31, 2019, more than 1,500 4G sites across Nepal were put into trial commercial operation, realizing the coverage of 4G networks in administrative areas above district and county levels as a strong support to the development of local finance, commerce, health and education sectors.

The completion of site activation beyond pre-set targets through working overtime on the New Year Eve removed our previous doubts about the competence of CCSI. It created two track records in the history of Nepal Telecom in terms of the number of sites opened in a single day and the number of sites delivered in a single month.

——Saroj Man Pradhan, former Deputy General Manager of Nepal Telecom and General Manager of the Wireless Department of Nepal Telecom

On October 2, 2019, Prime Minister Oli of Nepal attended the opening ceremony of the first batch of sites for the NT 4G project, applauding CCS's delivery progress

Support to Local Development

China Telecom adheres to the localized employment policy under the people-oriented principle, protects the legitimate rights and interests of overseas employees and focuses on building harmonious labor relations to create a healthy corporate culture and continuously improve employee satisfaction; it has strengthened employee training to assist employee development; enhanced overseas safety production management to protect the safety of employees; actively blended into the local society through communication and public welfare activities to help achieve local economic and social sustainability. In 2019, China Telecom Global's non-Chinese mainland employees reached 697 and figure for CCS International reached 3,314.

China Telecom Global provides active care to employees, communities and the environment. On May 20, 2019, it was awarded as the "Caring Company" by the Hong Kong Council of Social Service (HKCSS) for the third consecutive year

【Employee Training Overseas】

CCS International Nepal initiated a special campaign of "Security Training at the Grassroots Level" in Nepal from November 8 to December 6, 2019 to conduct safety education and training for front-line workers of communication engineering subcontractors in order to improve workers' safety awareness and knowledge base, raise the safety production awareness, safety production capabilities and communication service levels of Nepal's communication contractors, and improve Nepal's communication infrastructure construction capabilities.

I really thank CCS for its trainings. I begin to understand that safe production can not only protect my personal work, but also ensure a happy family life. In the future, I will correct my bad habits in construction sites, bear in mind operating procedures for production safety, and always check for that.

——Narendra Kunwar, local employee of CCS International Nepal

In December 2019, the UAE Branch of CCS International held an Optical Fiber Splicing Skill Competition for employees. Evaluation was made upon the speed, quality and technical proficiency of the employees in 6 operations including stripping, installation, welding, fiber coiling, packaging and cable coiling. The competition is not only a test of optical fiber splicing skills, but also a standardized training of knowledge for on-the-job practice, enhancement of skills, mutual learning and common improvement.

The site of the Optical Fiber Splicing Skill Competition for employees of CCS International UAE on December 20, 2019

From August to September 2019, China Telecom Global launched an international talent exchange training program to train employees in international business capabilities, cross-cultural leadership, overseas adaptability, language skills, etc., to help employees better qualify for overseas business development and customer service

【Cultural Exchange Activities Overseas】

On September 13, 2019, or the Mid-Autumn Day - a traditional Chinese national festival, China Telecom Europe held the first Dragon Boat Contest at London's Royal Albert Dock on the north bank of the Thames River, inviting nearly 200 local corporate customer representatives to participate and watch on the spot. The heated competition attracted a large number of local residents to take a stop and enjoy watching the game.

The China Telecom Dragon Boat Contest is a very meaningful event. As a young man working in a foreign country, I can really feel the festive atmosphere.

——Matthew Haigh, member of the Qinglong Team in the Dragon Boat Contest and representative of local corporate customer

On September 13, 2019, China Telecom Europe held a Dragon Boat Contest on the Thames in London

【Caring Activities Overseas】

CCS International South Africa actively participates in local activities for public welfare. In March 2019, with the theme of "Love Without Borders", it donated 74,000 rand (around RMB36,000 yuan) to the Transoranje School for the Deaf in Pretoria, South Africa to purchase hearing aids and other appliances for students.

I've never thought a foreign company from the other side of the world may provide such a large amount of donation to us. It's really heartwarming. We really appreciate what you have done to these kids!

——Ms. Alta Koekemoer, Director for Educational Affairs and Donation, Transoranje School for the Deaf, Pretoria, South Africa

On March 9, 2019, staff from CCS International South Africa visited students in the Transoranje School for the Deaf

In 2019, China Telecom International and the Hong Kong Employment Development Service jointly organized the "CTG Cookie Class" to help young students with learning disabilities learn baking skills. On November 9, China Telecom employees worked with "cookie class" participants to make delicious cookies as a way to encouraging them to do their best to continue learning

The Kenya LEWA Marathon promotes environment protection and raises funds to sponsor local livelihood projects related to drinking water, schools and power generation. On June 29, 2019, China Telecom (Kenya) sponsored the LEWA marathon and provided volunteer service stations.

【Environment Protection Overseas】

The location of China Telecom Europe is adjacent to the Thames branch river. Floating garbages along the river poses a threat to inhabiting poultry and aquatic life. On July 2, 2019, China Telecom Europe organized its employees in a water garbage clean-up campaign, contributing to the reduction of river pollution.

AFTERWORD

About Us

China Telecommunications Corporation Limited is an ultra-large communications operator in China. It has ranked as a Fortune Global 500 company for many years in a row. It specializes in integrated information service including mobile telecom, Internet access & application, landline, satellite communication, ICT integration with total assets of RMB 901 billion and 590,000 employees.

China Telecommunications Corporation Limited is owned by the central government and funded by the state. The State-owned Assets Supervision and Administration Commission of the State Council (SASAC) fulfills the responsibility as an investor on behalf of the State Council under authorization and dispatched personnel to set up a Supervision Committee at the Group Company. The Group has set up Board of Directors as required by the SASAC, under which there are Nomination Committee, Remuneration and Appraisal Committee, Auditing and Risk Management Committee as well as Strategy Committee.

China Telecommunications Corporation Limited has operating organizations in 31 provinces (autonomous regions and municipalities directly under the central government), America, Europe and Asia. The Group controls its listed companies including China Telecom Corporation Limited, China Communications Services Corporation Limited and BestTone Holding Co., Ltd.
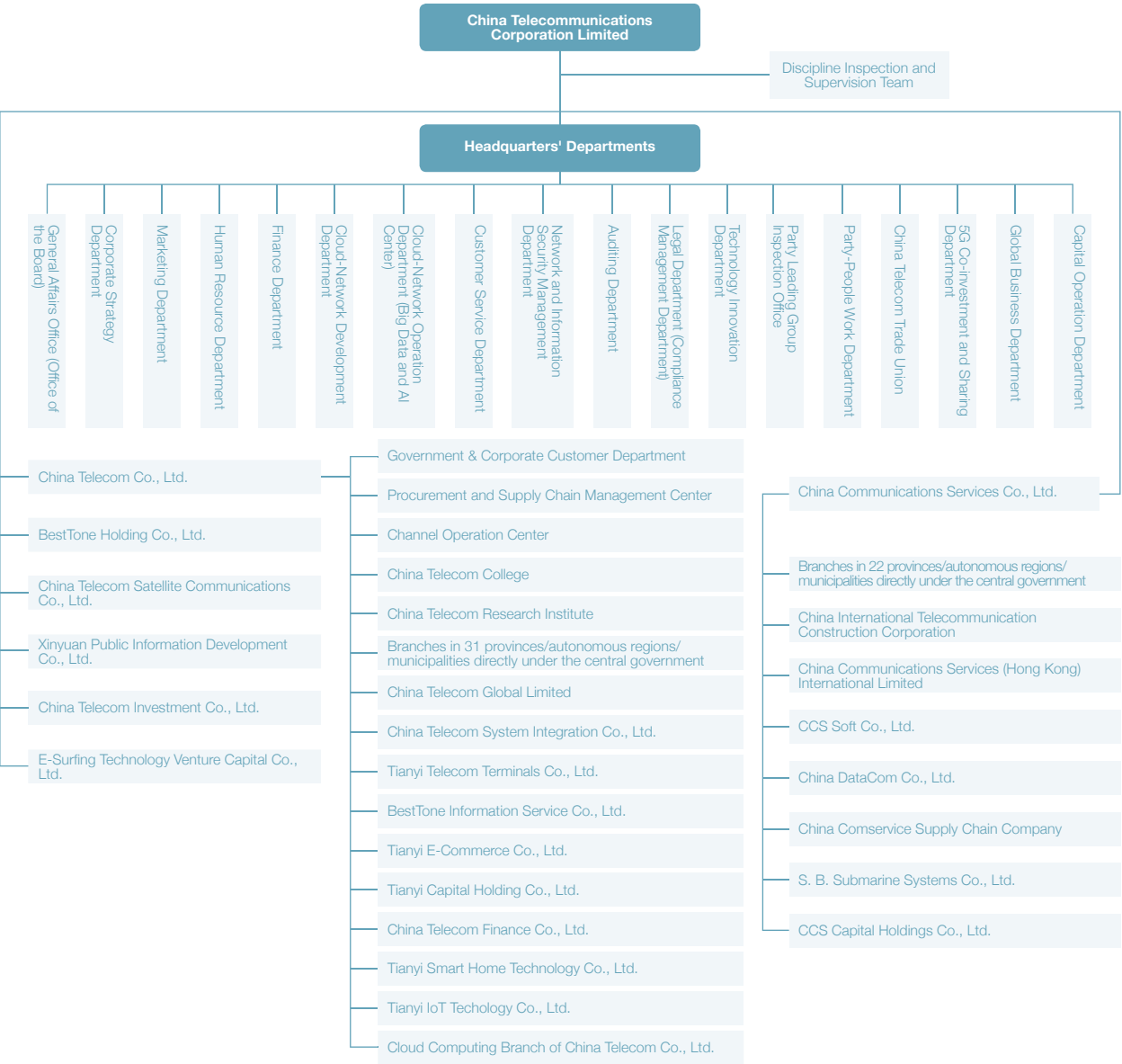
China Telecommunications Corporation Limited

Discipline Inspection and Supervision Team

Headquarters' Departments

- General Affairs Office (Office of the Board)
- Corporate Strategy Department
- Marketing Department
- Human Resource Department
- Finance Department
- Cloud-Network Development Department
- Cloud-Network Operation Department (Big Data and AI Center)
- Customer Service Department
- Network and Information Security Management Department
- Auditing Department
- Legal Department (Compliance Management Department)
- Technology Innovation Department
- Party Leading Group Inspection Office
- Party-People Work Department
- China Telecom Trade Union
- 5G Co-investment and Sharing Department
- Global Business Department
- Capital Operation Department

Subsidiaries (left):
- China Telecom Co., Ltd.
- BestTone Holding Co., Ltd.
- China Telecom Satellite Communications Co., Ltd.
- Xinyuan Public Information Development Co., Ltd.
- China Telecom Investment Co., Ltd.
- E-Surfing Technology Venture Capital Co., Ltd.

Middle column:
- Government & Corporate Customer Department
- Procurement and Supply Chain Management Center
- Channel Operation Center
- China Telecom College
- China Telecom Research Institute
- Branches in 31 provinces/autonomous regions/municipalities directly under the central government
- China Telecom Global Limited
- China Telecom System Integration Co., Ltd.
- Tianyi Telecom Terminals Co., Ltd.
- BestTone Information Service Co., Ltd.
- Tianyi E-Commerce Co., Ltd.
- Tianyi Capital Holding Co., Ltd.
- China Telecom Finance Co., Ltd.
- Tianyi Smart Home Technology Co., Ltd.
- Tianyi IoT Techology Co., Ltd.
- Cloud Computing Branch of China Telecom Co., Ltd.

Right column:
- China Communications Services Co., Ltd.
- Branches in 22 provinces/autonomous regions/municipalities directly under the central government
- China International Telecommunication Construction Corporation
- China Communications Services (Hong Kong) International Limited
- CCS Soft Co., Ltd.
- China DataCom Co., Ltd.
- China Comservice Supply Chain Company
- S. B. Submarine Systems Co., Ltd.
- CCS Capital Holdings Co., Ltd.

Table of KPIs

Essential Responsibility	2017	2018	2019
Call drop rate of mobile communication (%)	——	——	0.10
Call completing rate of mobile communication network (%)	——	——	97.57
4G base station (10,000)	117	138	159
Cities covered by 4G network	343	343	343
4G international roaming countries and regions	137	158	174
5G base station (10,000)	——	——	6
Cities covered by 5G network	——	——	50
Call completing rate for landline phones (%)	94.86	92.35	92.45
Packet loss rate of backbone network of broadband Internet ChinaNet (%)	0.02	0.06	0.03
Broadband coverage rate in administrative villages in 21 southern provinces/autonomous regions/municipalities directly under the central government (%)	95.3	95.9	96.7
Internet backbone interconnection bandwidth (Gbps)	4,656	5,886	8,416
International interconnection bandwidth (Gbps)	4,902	5,640	8,766
Emergency communication staff (person-time)	111,600	87,046	69,817
Number of rural channel outlets (10,000)	22.5	24.1	16.2
R&D input as a percentage of income (%)	1.30	1.32	1.65
Number of R&D staff	——	——	10,954
Number of new patent licensing	677	823	840
Total tax paid (RMB100 million)	124.6	105.7	101.2
Number of people employed (10,000 people)	2.3	1.8	2.1
Labor productivity of employees (RMB10,000/person/year)	109.1	116.4	119.4
Responsibility to Shareholders	**2017**	**2018**	**2019**
Total assets (RMB100 million)	8,252	8,441	9,010
Main business income (RMB100 million)	4,001	4,303	4,496
Ranking in Fortune Global 500	133	141	141
Total profit (RMB100 million)	255.7	258.1	269.0
Asset-liability ratio (%)	42.9	42.6	44.7
Value-maintained and value-added rate of state-owned assets (%)	106.4	107.0	110.3

Responsibility to Customers	2017	2018	2019
Number of mobile subscribers (million)	250.0	303.0	335.6
Among which: 4G subscribers (million)	182.0	242.4	281.2
5G subscribers (million)	——	——	4.6
Number of users of landline phones (million)	126.6	121.3	115.6
Number of wired broadband users (million)	153.5	169.8	178.8
Among which: FTTH/O users (million)	140.8	157.4	167.3
Connection number of IoT (million)	44.3	106.9	157.4
Number of IPTV subscribers (million)	97.5	121.4	130.0
Number of registered BestPay users (million)	431	609	774
Number of customer complaints (piece)	——	——	11,944
Customer complaint rate (person-time/million users)	——	——	20.9
Degree of satisfaction of mobile Internet users (points)	76.4	78.9	81.9
Degree of satisfaction of mobile voice users (points)	80.9	83.8	82.7
Degree of satisfaction of fixed Internet access (points)	75.0	79.9	79.5
Degree of satisfaction of landline voice users (points)	79.4	85.0	87.6

Responsibility to Employees	2017	2018	2019
Percentage of employees participating in trade unions (%)	99.5	99.7	100
Number of grass-roots trade union organizations	2,543	2,605	1,965
Ratio of male to female employees (male : female)	2.2:1	2.2:1	2.2:1
Percentage of ethnic minority employees (%)	4.9	5.1	5.3
Percentage of female managers (%)	20.0	19.6	20.0
Coverage of health and safety training (%)	96	98	98
Work-related injury and death (person)	1	1	0
Per capita training time (hour/person)	22.3	25.1	29.8
Employee turnover rate (%)	4.4	4.1	3.7
Funding for care (RMB10,000)	9,002	9,875	14,158

Environmental responsibility	2017	2018	2019
Consumption of electric energy during operation (hundred million kWh)	172.2	186.1	211.6
Electric energy saved (hundred million kWh)	5.0	4.9	4.6
Consumption of gasoline (10,000 tons)	13.1	13.6	12.3
Consumption of diesel (10,000 tons)	3.0	3.0	2.8
Consumption of natural gas (10,000 cubic meters)	1,644	1,860	1,791
Consumption of purchased heat (million kilojoule)	1,754,004	1,706,667	1,594,362
Greenhouse gas emission during operation (10,000 tons)	642.2	690.0	766.5
Energy consumption per unit of information flow (kgce/TB)	6.6	5.6	4.6
Number of person-time in training on energy saving and emission reduction (person-time)	984	4,995	7,970
Power consumption per carrier frequency at base station (kWh /carrier frequency)	791	717	1,096
Coverage rate of energy-saving technologies at base station (%)	67.0	63.0	79.9
Coverage rate of energy-saving technologies at communication equipment room (%)	69.3	72.0	73.1
Percentage of green procurement (%)	80	82	84
Amount of disposed waste (ton)	123,747	105,021	106,034
Income from waste disposal (RMB100 million)	26.6	21.2	18.6
Online trading volume of proprietary electronic channels (RMB100 million)	89.1	222.2	186.1
Trading volume of mobile payment (RMB100 million)	1,761	3,294	5,124
Staff per capita learning time in online college (hour)	16.6	27.9	18.4

Public welfare responsibility	2017	2018	2019
Total social donation (RMB10,000)	5,780	13,937	20,548
Number of registered volunteers	44,271	60,458	68,652
Number of person-time of volunteer activities (person-time)	89,920	105,030	121,083

Note 1: "Call drop rate of mobile communication" and "Call completing rate of mobile communication network" are VoLTE data after the full commercial use of VoLTE (4G network-based calls) services in 2019, and are not comparable to the CDMA network data used in previous years.

Note 2: In 2019, the original indicator "4G network outdoor base station" was changed to "4G base station" to supplement the data of this indicator in 2017 and 2018.

Note 3: The statistical approach to the "number of R&D staff" was adjusted in 2019, not comparable with the previous year's data.

Note 4: "Number of customer complaints" and "Customer complaint rate" are based on adjusted statistics of the Ministry of Industry and Information Technology, not comparable with the data of previous years.

Main Honors

Award to	Honor	Award granted by
China Telecommunications Co., Ltd.	Class A Enterprise for 2018 Business Performance, Class A Enterprise for 2016-2018 Tenure Performance Evaluation	SASAC, State Council
	2019 A-Level Organization for Tax Credit	State Taxation Administration
	Rated "Good" in Evaluation on Fixed-Point Poverty Alleviation by Central Units in 2019	The State Council Leading Group Office of Poverty Alleviation and Development (LGOPAD)
	Top 50 Cases of Targeted Poverty Alleviation Programs by Businesses	LGOPAD
	The "Carrier-Level IPv6 Technology Innovation and Ultra-Large-Scale Deployment" project was awarded the "World's Leading Internet Technology Achievement"	The Organizing Committee of the 6th World Internet Conference
China Telecom Co., Ltd.	2019 A-Level Organization for Tax Credit	State Taxation Administration
	Most Honored Company in Asia, Best CEO in Asia, Best CFO in Asia, Best Investor Relations Program in Asia, Best Corporate Governance in Asia, Best ESG SRI Metrics in Asia	Institutional Investor
	The Asset Platinum Corporate Award, Best Investor Relations Team Award, Gold Award for Best Chief Executive Officer, Platinum Awards for Best Initiatives in Social and Environmental Responsibility, and Corporate Governance	The Asset
	The Best of Asia - Icon on Corporate Governance (2007-2019), Best Investor Relations, Best Corporate Communications, Best CFO	Corporate Governance Asia
	China's Best Companies – No. 1, Best Investor Relations – No. 1, Best ESG in China – No. 1	FinanceAsia
	The 9th "The Golden Bauhinia" – Best Public Company Award, Entrepreneur of the Year Award	Takung Wenwei Media Group
China Communications Services Co., Ltd.	The Best of Asia, Best CEO, Best Investor Relations	Corporate Governance Asia
	China's Top 100 Software and IT Enterprises 2019	China Information Technology Industry Federation
	2019 Excellent ICT Enterprises in the "Belt and Road" Program	China Information Technology Industry Federation
BestTone Holding Co., Ltd.	Best VR Applications Award for E-Cloud VR, "Gold Award for VR/AR Innovation" for VR system platform and application software	2019 World Conference on VR Industry

Special Report: All-out Measures to Fight against COVID-19

The outbreak of the COVID-19 pandemic at the beginning of 2020 has dealt a heavy blow to social production and life. In the face of the sudden outbreak, General Secretary Xi Jinping was personally in command and led deployment efforts. The entire China Telecom Group acted swiftly upon the urgent task, resolutely implemented the decisions and arrangements made by the CPC Central Committee, and put people's life and health in the first place. The management of the Group Company strengthened overall guidance and comprehensive deployment to form synergy while operations at all levels earnestly implemented various anti-pandemic measures based on local conditions to facilitate the resumption of work and production and actively perform social responsibilities.

Spare no effort to assist the severely affected areas such as Hubei and Wuhan. The Group Company immediately activated the pandemic prevention and control response mechanism and mobilized the whole group's strength to deploy anti-pandemic materials with a focus on assisting emergency support to severely hit areas such as Hubei and Wuhan. The Hubei Branch made every effort to ensure the smooth communication for local government and the health care industry, guarantee the overall stable operation of the province's private medical and health networks and cloud platforms, and secure smooth operation of 12345 and 120 hotlines; it promptly activated 5G communications for Wuhan Huoshenshan and Leishenshan Hospitals, and quickly completed core system deliveries to the two hospitals; promptly enabled network coverage in newly-built hospitals in Huanggang, Xiaogan and other places; successfully fulfilled important guarantee such as the video connection between national leaders and Wuhan hospitals, and remote medical consultations. In addition, the Hubei Branch enhanced its network coverage in a variety of ways to meet the network access needs of the vast majority of local rural students returning home so that class lectures were not suspended; the bandwidth of IPTV, cloud platforms and Internet data centers was expanded in time to provide cloud conference, cloud office, cloud storage of teaching materials and other services to education departments, universities, teachers and students free of charge.

Strengthen employee care and strive to maintain employees' safety and physical health. The Group Company established an employee care team to guide subordinate companies/branches at all levels to strengthen their care for employees. The care for front-line employees for communications support against the pandemic and special care for 11 specific employee groups were launched by the Group Company, together with the supply of anti-pandemic materials at home and abroad in an orderly manner. Subordinate companies/branches at all levels raised funds for support and sympathy through multiple channels for special pandemic care, made active coordination to address the difficulties of employees in their lives, and set up mental health hotlines to help employees ease their psychological anxiety.

Give full play to the advantages of cloud-network integration, promote a number of comprehensive ICT services, and help the society fight the pandemic and resume work and production. Combining the needs for pandemic prevention and control and demands for new ICT services, China Telecom organized and provided ICT applications and services including e Cloud, cloud conference, cloud live streaming, cloud class, Cloud Dam, E-surfing Push-to-Talk, E-surfing Housekeeping, E-surfing Speaker, E-surfing Pandemic Info and remote medical consultation system, and promoted 5G+VR, 5G+thermal imaging to check body temperature/smart disinfection vehicles and other 5G-based ICT applications to help pandemic prevention and control, assist enterprises to resume work in a safe and orderly manner, and serve the society and people's livelihood. A number of ICT applications such as China Telecom's Pandemic Info and remote consultation system had played a significant role in helping combat the pandemic, and have been well received by the society. The 5G "supervisor on the cloud" has also received extensive recognition.

Work hard to do a good job in customer service. More than 20 service measures including zero deactivation, SMS for public good, rapid activation of important guarantee and caller tags have been launched in a timely manner. Service management had been strengthened and the online service capabilities in electronic channels improved. Work-from-home seats were adopted in the 10000 customer hotline center and the resumption of work and production in physical service halls were steadily facilitated while ensuring area-specific pandemic prevention and control levels to ensure uninterrupted service and guaranteed customer experience. Network information security was strengthened to protect users' personal information.

Acknowledge outstanding figures and sacrifices made in anti-pandemic efforts. During the fight against the pandemic, over 8,600 grassroots CPC organizations and more than 57,000 CPC members fought on the front line. A large number of executives and employees made due contributions to ensuring stable operation of the national economy, social stability, and pandemic prevention and control, producing outstanding teams featuring the courage to overcome difficulties, innovation and dedication, as well as excellent individual models brave to take responsibility against challenges and make sacrifice. The Group Company commended 24 teams including the Wuhan Branch, and 34 individuals including Shi Sanping, all with remarkable performance in pandemic prevention and control.

The global COVID-19 pandemic is still spreading. China Telecom will conscientiously implement the requirements of the CPC Central Committee and the State Council, coordinate anti-pandemic efforts at home and abroad, and resolutely guard against "imported infections and domestic resurgence"; coordinate the work in normalized pandemic prevention and control with economic and social development to do its best to complete the pre-set goals and tasks for the whole year.

Outlook

In 2020, China Telecom will carry out the following tasks in fulfilling its social responsibilities:

Promote responsibility management: resolutely implement a series of decisions and deployments made by the CPC Central Committee to combat the COVID-19 pandemic and promote socio-economic development, put people's life and health first, earnestly fulfill the responsibilities of central SOEs, coordinate efforts in pandemic prevention and control, production and operation, as well as reform and development, solidly promote high-quality development, and make due contributions to the decisive victory of poverty alleviation and the comprehensive building of a moderately prosperous society.

Develop ICT services: actively develop the "new infrastructure" and accelerate the establishment of new information network infrastructure such as 5G, Internet of Things, and data centers. Make efforts to allow 5G networks to serve more users with good experience. Promote cloud-network integration, build integrated cloud-network infrastructure with corresponding products and operation systems. Speed up network construction and universal service in remote and poor villages. Optimize 4G network coverage, consolidate and improve the quality of fiber-optic broadband networks, and actively deploy gigabit networks based on user needs to further reduce tariffs. Continue to build a large-capacity broadband satellite network to actively meet customer demands for satellite communications. Promote technological innovation and independent R&D of key, core technologies. Strengthen network information security, improve emergency communication support capabilities, and ensure secure and smooth networks. Improve smart service capabilities at higher customer service levels.

Boost economic transformation and upgrading: actively expand cooperation with diversified verticals and promote "new consumption" with "new infrastructure". Give full play to China Telecom's advantages in 5G, cloud-network integration, network security and reliability to make in-depth exploration of the application of the new generation of ICTs to empower digital government, smart cities, industrial Internet, education, medical care and others fields, facilitate the transformation and upgrading of traditional industries through integrated intelligent information services, improve people's livelihoods, facilitate the integrated development of various industries, promote green development, and promote the high-quality development of a moderately prosperous society.

Join hands to promote civilization development: make every effort to promote poverty alleviation, ensure that areas for targeted poverty alleviation and counterpart assistance will achieve set targets as scheduled, and actively help localities meet poverty alleviation goals. Protect the rights and interests of users in accordance with the law so that users can consume with confidence. Protect the legitimate rights and interests of employees, promote the development of talent teams, innovate approaches to talent selection, cultivation, use, and incentive mechanisms, give full play to the role of various talents, and promote the spirit of model workers and craftsmen. Effectively safeguard the life and physical health of employees, do a good job in pandemic prevention and control in accordance with the specific requirements of localities, and continue to strengthen safe and civilized production management. Promote energy conservation and emission reduction, and strive to achieve further reduction in energy consumption per unit of information flow. Support the development of social undertakings such as science, education, culture and health. Actively participate in the Belt and Road programs, actively fulfill social responsibilities overseas, and help relevant countries (regions) in their socio-economic development.

Rating Report

Rating Report of China Telecom CSR Report 2019

Commissioned by China Telecom, experts were selected by Chinese Expert Committee on CSR Report Rating to form a rating team and give a rating to China Telecom CSR Report 2019 (hereafter referred to as "the Report").

I. Basis of Rating

Guidelines for Preparation of CSR Reports in China (CASS-CSR 4.0) of Chinese Academy of Social Sciences and Rating Standard of CSR Reports in China (2020) of Chinese Expert Committee on CSR Report Rating.

II. Process of Rating

1. The rating team reviewed the CSR Report Process Information Confirmation Letter and related evidentiary materials submitted by the Report preparation team;

2. The rating team evaluated the compilation process and contents of the Report, and drafted a rating report;

3. The vice chairman of Chinese Expert Committee on CSR Report Rating and leader and expert of the rating team reviewed and signed the rating report.

III. Conclusion of Rating

Procedural Performance (★★★★★))

The Group's Corporate Strategy Department has set up a report preparation team, and the Chairman and the President of the Company were responsible for controlling the overall direction and key nodes, as well as the final review of the report; the Company positioned the report as an important tool to improve CSR transparency, promote CSR management, enhance communication with stakeholders, and spread the image of the Company as a responsible enterprise with clearly defined value proposition; it identified substantive issues according to relevant national macro policies, industry benchmarking analysis, company's major issues, stakeholder surveys, etc.; it drove the subordinate companies – China Telecom Corporation Limited and China Communications Services Corporation Limited - to publish their CSR reports and strengthen the management of social responsibilities vertically; the Department planned to release the Report on the official website and present it in electronic and printed versions in both English and Chinese as well as other forms such as a brief version, having outstanding procedural performance.

Substantive Performance (★★★★★)

The Report systematically discloses key topics in the telecom industry in detail, such as ensuring communications quality, innovation in products and services, dealing with customer complaints, protecting customer information, creating a healthy Internet environment, safeguarding emergency communications, closing the digital gap, co-construction and sharing of base stations, development and application of environmental protection technologies and managing electromagnetic radiation, having outstanding substantive performance.

Completeness (★★★★)

The Report systematically discloses 78.87% of the key indicators of the telecom industry from such aspects as "Empower A Moderately Prosperous Society", "Boost Economic Transformation and Upgrading Toward A Moderately Prosperous Society" and "Synergy to Promote Civilization Development in A Moderately Prosperous Society", and is leading in completeness.

Balance (★★★★☆)

The Report discloses negative data and information including work-related injury and death, call drop rate of mobile communications, customer complaint rate, casualty rate in 1,000 employees when at work, packet loss on ChinaNet backbone, number of major safety incidents and above with an outstanding balance performance.

Comparability (★★★★★)

The Report reveals comparable data about 70 indicators in three consecutive years, including success ratio of fixed telephony, number of new patent licensing, labor productivity of employees, value-maintained and value-added rate of state-owned assets (%), funding for care and total social donation. At the same time, horizontal comparison is made in terms of the rank of the 141st in Fortune 500 and the rank of the 2nd among central SOEs in overseas publicity. In conclusion, it is excellent in comparability.

Readability (★★★★★)

Themed with "Empower A Moderately Prosperous Society", the Report demonstrates the Company's responsibility fulfilling philosophies, practices and achievements regarding critical topics from three aspects – ICT service, economic transformation and upgrading, civilization development and advancement, and elaborates the Company's thorough understanding of CSR fulfillment; the cover design creativity and chapter spreads outline virtual scenes with cartoon animations and integrate the main business elements of the Company, which not only highlights the industry characteristics of the Company, but also enhances the uniqueness of the Report; the "Tips" column interprets industry terminology and enhances the readability of the Report, achieving excellent readability performance.

Originality (★★★★)

The Report sets a responsibility topic "Empower a Moderately Prosperous Society with Commercial 5G Use" and a special report on "Fighting against COVID-19", focusing on effective actions by the Company to support the building of a moderately prosperous society in all respects and help the prevention and control of the pandemic while demonstrating the responsibility of a central SOE; the feedbacks from stakeholders testify the effectiveness of CSR performance and enhance the credibility of the Report, suggesting excellent originality.

Overall Rating (★★★★★)

As evaluated by the rating team, the 2019 China Telecom CSR Report is rated five-star as an outstanding CSR report.

China Telecom CSR Report won five-star rating for the 9th year in a row

IV. Suggestions for Improvement

1. Increase disclosures of core industrial indicators to improve the completeness of the report.

2. Increase disclosures of insufficiencies in CSR performance to improve the balance of the report.

Vice Chairman of Chinese Expert Committee on CSR Report Rating

Leader of Rating Team

Expert of Rating Team

Process Evaluator Ren Jiaojiao

Issuing date: August 21, 2020

Scan here to check corporate rating

Reader Feedback Form

Dear Readers:

Thank you for taking time to read China Telecom CSR Report 2019.

If you have any advice or suggestions on this report or on China Telecom's CSR performance, you are welcome to fill in the following form and send it to us by post, fax or email. For contact information, please refer to the Report Specification on the first page.

Thank you very much for your attention and support to China Telecom!

Corporate Strategy Department, China Telecom

June 2020

1. Do you think this report can inform you of China Telecom's performance in social responsibilities?

A. Excellent B. Good C. Not bad D. Bad E. Not informed

2. How do you evaluate China Telecom's actions in empowering a moderately prosperous society?

A. Excellent B. Good C. Not bad D. Bad E. Very bad

3. How do you evaluate China Telecom's achievements in fulfilling social responsibilities in 2019?

A. Excellent B. Good C. Not bad D. Bad E. Very bad

4. In your opinion, which areas should China Telecom improve in this report? (Multiple Choices)

A. Framework and logic B. Substance and integrity C. Language expression D. Report design E. Others _____

5. Please leave your other advice or suggestions:

Please let us know more about you if convenient:

Name: Contact:

Occupation: Employer:

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