

## Chapter 11 Building a Modern Infrastructure System

We will promote the coordinated development of traditional and new infrastructure and build a modern infrastructure system that is complete, efficient, practical, intelligent, environmentally friendly, and safe and reliable.

### Section 1 Accelerating the Development of New Infrastructure

We will conduct planning to develop information-based, integrated, and innovation-oriented infrastructure to support digital transformation, intelligent upgrading, and integrated innovation. We will develop high-speed, ubiquitous, secure, and efficient information infrastructure with universal integration and interconnectivity, integrated terrestrial and space-based facilities, and strong data perception, transmission, storage, and computing capabilities. We will accelerate the scaling up of the 5G network to bring its penetration rate to 56% and upgrade 1000M fiber-optic networks and expand their availability. A forward-thinking approach for building reserves of 6G technologies will be adopted. We will expand the capacity of interconnected nodes of backbone networks, establish more international communication accesses, and make comprehensive efforts to facilitate the commercial deployment of Internet Protocol version 6 (IPv6). We will implement projects to improve basic network infrastructure in small and medium cities in the central and western regions. We will promote the overall development of the Internet of Things (IoT), which will support fixed-

mobile convergence (FMC) and broadband and narrowband convergence. We will accelerate the build-up of a system of national integrated big data centers, strengthen overall management and intelligent scheduling of computing power, build national hub nodes and big data center clusters, and build supercomputing centers boasting exascale and 10-exaflop supercomputers. We will promote the active and prudent development of the Industrial Internet and the Internet of Vehicles (IoV). We will create efficient space infrastructure systems for communication, navigation, and remote sensing with global coverage and build spacecraft launch sites for commercial use. We will speed up efforts to upgrade transportation, energy, utilities, and other types of traditional infrastructure with digital technologies, and develop ubiquitous sensing, terminal networking, and intelligent dispatching systems. In the development of new infrastructure forms, we will give play to the leading role of the market, open up diverse channels for investment, and establish new standards.

## Section 2 Accelerating the Development of a Strong Transportation Network

We will build a modern and comprehensive transportation system by promoting the integrated development of different modes of transport and boosting network effects and operational efficiency. We will improve comprehensive thoroughfares and strengthen the development of key strategic routes out of Xinjiang and into Tibet, in the central and western regions, and along our rivers, coasts, and borders. We will promote the upgrading and expansion of thoroughfares with insufficient capacity in an orderly way and enhance connectivity with neighboring countries. We will develop express transportation networks, basically complete the construction of the high-speed railway network featuring eight vertical and eight

horizontal lines, improve the national network of expressways, and work faster to construct clusters of world-class ports and airports. We will improve mainline networks, accelerate the construction of normal-speed railways and the electrification of rail lines, and achieve an optimal layout of passenger and freight lines. We will connect and upgrade bottleneck sections on ordinary national and provincial highways and expand and upgrade high-grade inland waterways. Steady progress will be made on the construction of regional airports, general-purpose airports, and cargo airports, and general aviation will be developed. We will build more postal facilities and carry out projects to extend the express delivery network to all villages, industries, and the rest of the world. To promote the integration of transport in city clusters and metropolitan areas, we will accelerate the development of intercity and municipal (suburban) rail services, build ring road systems of expressways, and advance the development of urban rail transit in an orderly manner. We will promote transport accessibility and improve the construction of regional rail. Faster progress will be made on the construction of highways along and leading to our borders, rural roads will be built, operated, managed, and maintained to a high standard, and road safety facilities will be upgraded. We will create a tiered, integrated, and comprehensive system of transport hubs and improve the layout of hub stations to make it more concentrated and comprehensive. We will improve collection, distribution, and transportation systems, develop intermodal passenger transport and multimodal freight transportation, and popularize one-stop and one-unit services throughout the transportation process. We will push forward the construction of the China-Europe rail freight assembly center. We will make a strong push to advance the reform of railway enterprises, comprehensively deepen the structural reform of air traffic management, and advance the reform of the road toll and road maintenance systems.

| <b>Box 5<br/>Transportation Projects</b>                |  |
|---|--|
| 01 Key strategic routes                                 | <ul style="list-style-type: none"> <li>▪ Build the Chengdu-Lhasa Railway from Ya'an to Linzhi and other railways including Yining-Aksu, Jiuquan-Ejina, and Ruoqiang-Luobupo;</li> <li>▪ Push ahead the preliminary construction of the Shigatse-Gyirong and Hotan-Shigatse lines;</li> <li>▪ Complete China National Highway 219 and China National Highway 331 along our borders;</li> <li>▪ Upgrade and renovate China National Highway 318 from Chengdu to Lhasa.</li> </ul>  |
| 02 High-speed rails                                     | <ul style="list-style-type: none"> <li>▪ Build a Yangtze River line from Chengdu (Chongqing) to Shanghai, a coastal line from Shanghai to Hepu, via Ningbo, an auxiliary line of the Beijing-Shanghai high-speed railway from Tianjin to Xinyi, and other lines including Beijing-Xiong'an New Area-Shangqiu, Xi'an-Chongqing, Changsha-Ganzhou, and Baotou-Yinchuan.</li> </ul>   |
| 03 Normal-speed rails                                   | <ul style="list-style-type: none"> <li>▪ Establish the new western land-sea corridor from Huangtong to Baise, the Second Guizhou-Guangxi line running parallel to the original one, and Ruijin-Meizhou, Zhongwei-Pingliang-Qingyang, and Liuzhou-Guangzhou lines;</li> <li>▪ Develop railways such as Yuxi-Mohan and Dali-Ruilu to enhance connectivity between neighboring cities;</li> <li>▪ Enhance the container shipping capacity of the railways;</li> <li>▪ Expand the transportation corridors and ports of entry for the China-Europe Railway Express;</li> <li>▪ Build exclusive lines for large industrial and mining enterprises, logistic parks, and key ports;</li> <li>▪ Realize full rail access for key ports in the main channels of the Yangtze River.</li> </ul> |
| 04 Rail transit in city clusters and metropolitan areas | <ul style="list-style-type: none"> <li>▪ Open another 3,000 kilometers of intercity and municipal (suburban) rail to traffic;</li> <li>▪ Basically complete the construction of rail transit networks in the Beijing-Tianjin-Hebei region, the Yangtze River Delta, and the Guangdong-Hong Kong-Macao Greater Bay Area;</li> <li>▪ Open 3,000 kilometers of new urban rail transit lines to traffic.</li> </ul>  |
| 05 Expressways  | <ul style="list-style-type: none"> <li>▪ Increase capacity around congested sections of the main lines of national expressways including Beijing-Shanghai, Beijing-Hong Kong-Macao, Changchun-Shenzhen, Shanghai-Kunming, and Lianyungang-Khorgas;</li> <li>▪ Speed up the construction of parallel highways and connecting roads to the main lines of national expressways;</li> <li>▪ Press ahead with construction of expressways in the Xiong'an New Area such as Beijing-Xiong'an;</li> <li>▪ Plan the layout and construction of electric vehicle battery charging and swapping facilities;</li> <li>▪ Complete 25,000 kilometers of newly-built and upgraded expressways.</li> </ul>  |

*continued*

| <b>Box 5<br/>Transportation Projects</b>               |  |
|--|--|
| <b>06 Harbor and shipping facilities</b>               | <ul style="list-style-type: none"> <li>▪ Construct clusters of world-class ports in the Beijing-Tianjin-Hebei region, the Yangtze River Delta, and the Guangdong-Hong Kong-Macao Greater Bay Area;</li> <li>▪ Build container terminals in the northern part of Xiaoyangshan of the Yangshan Port Area, in Section C of the Beijiang Port Area of Tianjin Port, and in the eastern port area of the Yantian Port in Shenzhen as well as the fifth phase of a container terminal in the Nansha Port Area of the Guangzhou Port;</li> <li>▪ Increase the capacity of coal transportation in the Caofeidian Port;</li> <li>▪ Advance the construction of a combined river-ocean shipping service center in Zhoushan, an international gateway port in the Beibu Gulf, and a hub port in the Yangpu Economic Development Zone;</li> <li>▪ Conduct further preliminary feasibility studies on the new channel of the Three Gorges water transport;</li> <li>▪ Study canal projects to connect different river systems including the Ping-Lu Canal.</li> </ul> |
| <b>07 Modern airports</b>                              | <ul style="list-style-type: none"> <li>▪ Construct clusters of world-class airports in the Beijing-Tianjin-Hebei region, the Yangtze River Delta, the Guangdong-Hong Kong-Macao Greater Bay Area, and the Chengdu-Chongqing region;</li> <li>▪ Implement projects to renovate and expand international hub airports in Guangzhou, Shenzhen, Kunming, Xi'an, Chongqing, Urumqi, Harbin and other cities and regional hub airports in Hangzhou, Hefei, Jinan, Changsha, Nanning and other cities;</li> <li>▪ Construct new airports in Xiamen, Dalian, and Sanya;</li> <li>▪ Complete the construction of a dedicated cargo airport in Ezhou;</li> <li>▪ Construct regional airports in Shuozhou, Jiaxing, Ruijin, Alaer, and northern Guizhou;</li> <li>▪ Build at least 30 new civil airports.</li> </ul>  |
| <b>08 Integrated transportation and logistics hubs</b> | <ul style="list-style-type: none"> <li>▪ Promote the integrated and intelligent development of existing passenger transportation hubs;</li> <li>▪ Encourage the integration of railway stations and cities;</li> <li>▪ Implement projects for airport-rail transit connectivity;</li> <li>▪ Advance the construction of around 120 national logistics hubs;</li> <li>▪ Accelerate the building of international postal centers.</li> </ul>   |

## Section 3 Building a Modern Energy System

To advance China's energy revolution, we will build a modern energy system that is clean, low-carbon, safe, and efficient and enhance our energy

security and supply capabilities. Promoting both centralized and distributed generation, we will move faster to develop non-fossil energy, significantly increase the scale of wind and photovoltaic power, and accelerate the development of distributed energy sources in the central and eastern regions. We will take ordered steps to develop offshore wind energy, speed up the construction of hydropower bases in the southwestern regions, develop coastal nuclear power in a safe and careful manner, and build a batch of clean energy bases that enable integrated energy generation. The share of non-fossil energy in China's total energy mix will increase to about 20%. We will promote the concentration of coal production in regions with rich mineral resources, ensure the appropriate scale and pace in the development of coal-based power generation, and push ahead with the replacement of coal with electricity. We will take well-ordered measures to remove restrictions on market access for oil and gas exploration and development, and accelerate the utilization of deepwater, deep-seated, and unconventional oil and gas resources to increase output and reserves. Geothermal energy will be developed and used in line with local conditions, and the utilization rate for ultra-high voltage transmission routes will be increased. We will transform traditional power infrastructure with smart technology, accelerate the development of smart microgrids, and ensure that power systems achieve better complementarity and become smarter and more adaptive with enhanced coordination between sources, grids, loads, and storage. We will enhance our capacity for clean energy absorption and storage, improve our ability to transmit electricity to remote areas, increase the flexibility of coal-based power generation, and speed up the development of pumped-storage hydroelectric plants and the scaling-up of new energy storage technologies. We will improve trans-regional transmission routes and collection, distribution, and transportation systems for coal, work faster to build trunk lines for natural gas, and boost oil and gas connectivity.

| <b>Box 6</b><br><b>Modern Energy System Development Projects</b> |  |
|--|--|
| 01 Large clean energy bases                                      | <ul style="list-style-type: none"> <li>▪ Build a hydropower base in the lower reaches of the Yarlung Zangbo River;</li> <li>▪ Construct clean energy bases in the upper and lower reaches of the Jinsha River, the river basins of the Yalong River, the upper reaches and Jiziwan of the Yellow River, the Hexi Corridor, Xinjiang, northern Hebei, and Songliao, and offshore wind energy bases in Guangdong, Fujian, Zhejiang, Jiangsu, Shandong and other places.</li> </ul>   |
| 02 Coastal nuclear power   | <ul style="list-style-type: none"> <li>▪ Complete <i>Hualong-1</i>, <i>Guohe-1</i>, and high temperature gas-cooled reactor demonstration projects and actively and systematically promote the construction of third-generation coastal nuclear power;</li> <li>▪ Carry out demonstrations of advanced reactors including small modular reactors, 0.6 gigawatts commercial high temperature gas-cooled reactors, and the marine mobile nuclear power platform;</li> <li>▪ Build low- and intermediate-level radioactive waste disposal sites and spent fuel reprocessing plants;</li> <li>▪ Develop demonstration projects for comprehensive utilization of nuclear energy in Haiyang, Shandong and other places;</li> <li>▪ Increase installed nuclear power capacity to 70 gigawatts.</li> </ul> |
| 03 Power transmission routes                                     | <ul style="list-style-type: none"> <li>▪ Build ultra-high voltage transmission routes from Baihetan to the eastern regions and from the upper reaches of the Jinsha River;</li> <li>▪ Implement the project for promoting power network interconnectivity between Fujian and Guangdong and the Sichuan-Chongqing ultra-high voltage transmission project;</li> <li>▪ Conduct feasibility studies of ultra-high voltage transmission routes from Longdong to Shandong and from Hami to Chongqing.</li> </ul>  |
| 04 Power systems   | <ul style="list-style-type: none"> <li>▪ Build pumped-storage hydroelectric plants in Tongcheng, Pan'an, Tai'an (phase II), Hunyuan, Zhuanghe, Anhua, Guiyang, and Nanning;</li> <li>▪ Implement energy storage demonstration projects of electrochemistry, compressed air, flywheel, etc.;</li> <li>▪ Carry out research on the large energy storage project of the Yellow River cascade hydropower plant.</li> </ul>   |
| 05 Oil and gas storage and transportation capacity               | <ul style="list-style-type: none"> <li>▪ Build new oil and gas pipelines including the domestic section of the China-Russia east-route natural gas pipeline and the second Sichuan-East natural gas pipeline;</li> <li>▪ Implement the major petroleum reserves projects;</li> <li>▪ Speed up the development of underground gas storages including the Wen-23 underground gas storage in the Zhongyuan oilfield and the Liaohe underground gas storages.</li> </ul>   |

## Section 4

### Strengthening the Development of Water Conservancy Infrastructure

Focusing on river basins as a whole and the balanced distribution of water resources, we will strengthen management, protection, and key project construction for river systems that span multiple administrative divisions and strengthen coordination and support between micro, small, medium, and large water conservancy facilities, so that we are better able to allocate water resources and manage floods and droughts. With water conservation as our top priority, we will improve the water resource allocation system through the construction of key projects and stronger development of key water sources and emergency and backup water sources for cities. We will implement projects to strengthen flood control, shore up weak links, and move ahead with key flood control initiatives. We will harness small and medium rivers, reinforce dilapidated reservoirs, and make comprehensive efforts to promote the construction of levees and flood detention basins. Efforts will be made to protect and restore water source conservation areas and to safeguard key rivers and lakes by putting them under comprehensive management, so that we can see that our water ecosystems fully recover and are endowed with clear waters and flourishing banks.

**Box 7**  
**Key National Water Network Projects**

**01 Major water diversion projects**

- Carry out the follow-up projects for the eastern and central routes of the South-to-North Water Diversion Project and conduct feasibility studies for the western routes of the South-to-North Water Diversion Project;
- Implement water resource allocation projects in the Pearl River Delta, western Chongqing, and northwestern Hainan, the Yangtze River to Lake Chao and the Huai River diversion project, the Jinsha River to central Yunnan diversion project, the Han River to the Wei River diversion project, the Kuytun River diversion project, and the water supply project for the main canal of Xiong'an New Area;
- Accelerate the preliminary feasibility studies for the Yellow River to Xining diversion project, the connectivity project for the Heilong, Wusuli, and Songhua rivers, and the water resource allocation project in the Beibu Gulf Rim.

**02 Water supply and irrigation**

- Advance the construction of large reservoirs including the Korgan Reservoir in Xinjiang, the Guanmenzuizi Reservoir in Heilongjiang, the Guanyin Reservoir in Guizhou, the Quanmutang Reservoir in Hunan, the Kaihua Reservoir in Zhejiang, and the Changtang Reservoir in Guangxi;
- Build support facilities and carry out upgrades for large-scale irrigation zones including the great bend of the Yellow River irrigation area, the Dujiangyan irrigation system in Sichuan, and the Pishihang irrigation area in Anhui;
- Implement large irrigation projects including the Xiangjiaba Dam project in Sichuan, the Gengma irrigation project in Yunnan, the Huaihongxin River irrigation project in Anhui, the Niululing irrigation project in Hainan, and the Dao irrigation project in Jiangxi.

**03 Flood control and disaster mitigation**

- Develop the flood control project in Xiong'an New Area, the projects for bank collapse management and major flood detention basins in the middle and lower reaches of the Yangtze River, the comprehensive management of primary waterways and floodplains along the Yellow River, the phase-II project for the waterway from the Huai River to the Yellow Sea, the Hai River waterway management project, the levee construction project for the primary channels of the Xijiang River, the Wusong River water conservancy project on Taihu Lake, and the Maiwan water conservancy project in Hainan;
- Improve preliminary feasibility studies for the Guxian water conservancy project on the Yellow River and the Shangbaishi reservoir project in Fujian.

Figure 1. Large Clean Energy Bases (CEBs) in the 14th Five-Year Plan

