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Building Ten Types of New Infrastructure System for a Great Modern Power

Abstract

From the perspective of human historical development process, this study analyzes the connotation evolution and system composition of infrastructure. Measured by the intergenerational leap in infrastructure, this study discusses the connotation and characteristics of new infrastructure in the era of knowledge and intelligent society. From the two dimensions of form and content, the study also puts forward that the new infrastructure system includes technology and digital infrastructure, infrastructure upgrading, infrastructure digitalization, national security, and governance infrastructure in the next 30 years. Based on the eight "economic and social foundation and strategic systems" and two basic systems of "scientific and technological innovation and institutional innovation", this study discusses the composition and structure of ten types of new infrastructure system for a great modern power by 2050. Finally, combined with the current situation, the study puts forward some policy suggestions to promote the construction of new infrastructure system for a great modern power from the three aspects of strategic layout, investment plan, and project reserve.

Keywords

new infrastructure; great modern power; system; structure

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Building Ten Types of New Infrastructure System for a Great Modern Country

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Abstract: From the perspective of the human historical development process, this study analyzes the connotation evolution and system composition of infrastructure. Measured by the intergenerational leap in infrastructure, this study discusses the connotation and characteristics of new infrastructure in the era of knowledge and intelligent society. From the two dimensions of form and content, the study also puts forward that the new infrastructure system includes technology and digital infrastructure, infrastructure upgrading, infrastructure digitalization, national security, and governance infrastructure in the next 30 years. Considering the eight “economic and social foundation and strategic systems” and two basic systems of “scientific and technological innovation and institutional innovation,” this study discusses the composition and structure of ten types of new infrastructure system for a great modern country by 2050. Finally, combined with the current situation, the study puts forward some policy suggestions to promote the construction of new infrastructure system for a great modern country from the three aspects of strategic layout, investment plan, and project reserve. **DOI:** 10.16418/j.issn.1000-3045.20200401003-en

Keywords: new infrastructure; great modern country; system; structure

In order to realize the objective of “six stabilities,” including the stability in employment and domestic investment, and the task of “six securities,” including security in job and basic living needs, the central and local governments have launched a series of major infrastructure investment projects to accelerate the new infrastructure construction while making up for the shortcomings of traditional infrastructure. New infrastructure construction covers digital infrastructure construction, digital transformation of traditional infrastructure, and integrated management based on a digital platform, which can better reflect the features of digital economy and promote the transformation and upgrading of China’s economy^[1]. New infrastructure construction contributes to stabilizing the growth, adjusting the structure, and benefiting the people in the near future, but it should not be generalized. From a long-term perspective, the systematic and qualitative “intergenerational” leap is required to adapt to the general trend and needs of human beings to step into an era of knowledge society^[2].

1 Connotation evolution and system composition of infrastructure

In regard to “infrastructure,” “Infra” is a Latin root meaning “in lower part,” and “Structure” means the “structure.” Therefore, this word can be literally understood as “a system or structure necessary for a country or an organization

to keep operating”^[3]. Both the Grand Canal (constructed in 486 BC) and Dujiang Weir (constructed in 256 BC) in China and Roman aqueducts (constructed in the 6th century BC) have demonstrated the public perception of infrastructure in human society.

1.1 Understanding of infrastructure from the perspective of social cost

Infrastructure and its supporting services are mutually interpreted. Infrastructure in a narrow sense covers the basic industries and public utilities in the aspects of transportation, electricity, communication, water supply and drainage, water conservancy, and pipeline gas, all of which constitute the basic support for the economic and social development, sharing the characteristics of public goods and quasi-public goods. From the perspective of investment, infrastructure belongs to the public overhead capital, which must be constructed prior to private production investment with fast returns. In the case of market failure, the government should make a decision on supply based on the cost-benefit analysis of the whole society, and pay with the revenues such as taxes^[4].

Infrastructure in a broad sense can be understood from the perspective of social cost. In addition to the infrastructure in a narrow sense, namely the public overhead capital, it also covers a wide range of fields such as education, science, culture and health, national defense, and public security; it can provide element support and environmental services for

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direct production activities of the society, thus making private direct production investment more efficient and increasing the revenue from production; since the cost will be shared by the society, it is also known as social indirect capital or public indirect capital, which can improve the competitiveness and profitability of the entire social development and provide indirect economic benefits. Hence, it also shares the characteristics of public goods and quasi-public goods.

1.2 Understanding of the infrastructure system from the perspective of development connotation

With the gradual deepening of people's understanding of social development, the connotation of infrastructure has also been enriched [5]. In 1965, the economist Hansen [6] initially proposed that the infrastructure included social infrastructure and economic infrastructure. Social infrastructure refers to indirect investment in people's livelihood, such as health and education investment. Economic infrastructure refers to the indirect investment supporting economic production and general economic activities, mainly including public utilities, public works, and transportation [7]. Later on, the infrastructure system is further expanded to cover the infrastructure supporting life and protecting the environment [8] as well as that in the fields of humanities, innovation, and system.

The world is composed of matter, energy, and information. Energy is the driving force of matter and information flow, and information is the signal for the human to understand and regulate the matter and energy flow. By virtue of the smooth flow of matter, energy, and information (M-E-I) and institutional guarantee, human society can survive and develop. Infrastructure is a network of software and hardware facilities that ensures smooth, safe, and efficient M-E-I flow at a specific stage of the human society, thus providing persistent public service support for economic, social, and environmental development. Infrastructure is both the achievement of past development and a precondition for future development. In the information society, technology and informatization are the main driving forces for economic, social, and environmental development. More precisely, the technology and information products and services drive the sustainable development of the economy, society, and environment. The

infrastructure system has been further expanded to include technology and informatization infrastructure, economic, social, and environmental infrastructure, as well as national security and governance infrastructure (Figure 1).

2 Connotation and characteristics of new infrastructure

"New infrastructure" is originated from "traditional infrastructure," and "new development" is based on "traditional development." The understanding of the "intergenerational leap" of the infrastructure depends on the corresponding development concept and time scale. From the perspective of long-term social development, development and new development, as well as the development and infrastructure, are deeply integrated and dynamically evolved. Some infrastructural facilities are taken as social shared costs at an early stage, which then become the basic industries due to the introduction of a large amount of private production investment and are included in the scope of economic and social development. As for innovation-driven development, the deep integration between new infrastructure and traditional infrastructure will provide basic support for driving "all-round innovation" and "comprehensive development."

2.1 Connotation of new infrastructure

New infrastructure is a network of software and hardware facilities with the characteristics of systematic and qualitative "intergenerational leap" for ensuring a smoother, safer, and more efficient M-E-I flow in human society in the future, thereby providing persistent public service supports for "new development." In the future society, the research and development, production, circulation, distribution, consumption, and disposal activities, as well as the supply, flow, and combination of such elements as land, labor, knowledge, technology, talent, capital, information, and management, will be reflected in the networking, digitalization, and intellectualization of M-E-I. Therefore, support from the new and old infrastructure systems is required.

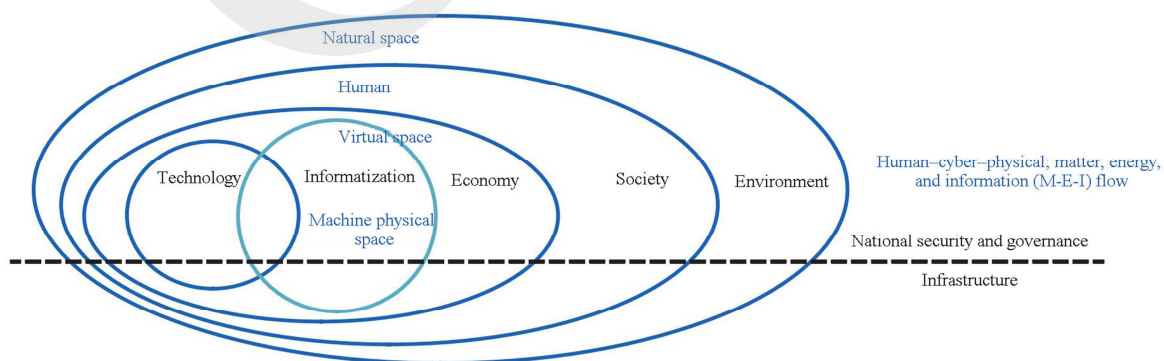


Figure 1 Gradual expansion of the infrastructure system with the enrichment of development connotation

Japan once put forward the construction of “Super Smart Society 5.0,” namely a new social form following the hunting society, farming society, industrial society, and information society^[9]. Different social forms and development stages may correspond to the infrastructure of different “intergenerations,” which are mainly reflected by differences in generation, transmission, combination mode, and efficiency of M-E-I. At present, human society is moving towards an intelligent society. Driven by the human-cyber-physical intelligence technology, machines will be gradually elevated as partners instead of tools; and the digitization, networking, and intellectualization of M-E-I will allow the interaction, digital twinning, and virtual-real fusion of human society with virtual space, natural space, and machine physical space, thus forming a new human-centered social form under human-cyber-physical integration^[10].

The core of new infrastructure in the intelligent society lies in the strategic, network-based technology and digital infrastructure of a new generation (Figure 2): ① “Matter flow” is characterized by “human-natural materials-artificial materials,” including a network of public service facilities that ensures human activities such as research and development, production, circulation, distribution, consumption, and disposal; it can obtain power from “energy flow” and information from “information flow”; ② “Energy flow” is characterized by “exploitation-conversion-utilization,” including a network of public service facilities that ensures human exploitation, development, conversion, utilization, storage, and transmission of energy; it can obtain energy substances, intelligence, and machine from “matter flow” and information from “information flow”; ③ “Information flow” is characterized by “cloud-net-sea,” including a network of public service facilities that ensures human exploitation,

collection, storage, processing, and application of data and information; it can obtain data, intelligence, machine and energy from “matter flow” and “energy flow” to control the development and operation of “matter flow” and “energy flow.”

2.2 Characteristics of new infrastructure

The formation mechanism of new infrastructure determines its new characteristics. ① Driven by new elements. Different from the limited supply capacity of traditional elements, the supply capacity of new production elements such as knowledge, technology, information, and data has the characteristics of sharing, accumulation, multiplication, which implies higher requirements of “interconnectivity, open sharing, and security assurance” for infrastructure. ② Driven by the new combination of elements and digital empowerment. Similar to the law that the value of the network is proportional to the square of the number of users (Metcalf’s law), the innovation opportunities of knowledge production in a country are directly proportional to the degree of knowledge accumulation and communication. In the industrial age, the centralized combination of elements is prevailing, featured by other-organization and monopolistic competition; the infrastructure is mainly provided by the government. However, in the knowledge age, the distributed combination of elements becomes common, mainly characterized by self-organization and creative competition; leading companies and institutions are infrastructure providers. For example, the internet and cloud computing have the characteristics of scattering and decentralization. ③ Driven by original innovation “from 0 to 1.” The competition for the source and commanding height of technological innovation among major countries is getting more and more intense.

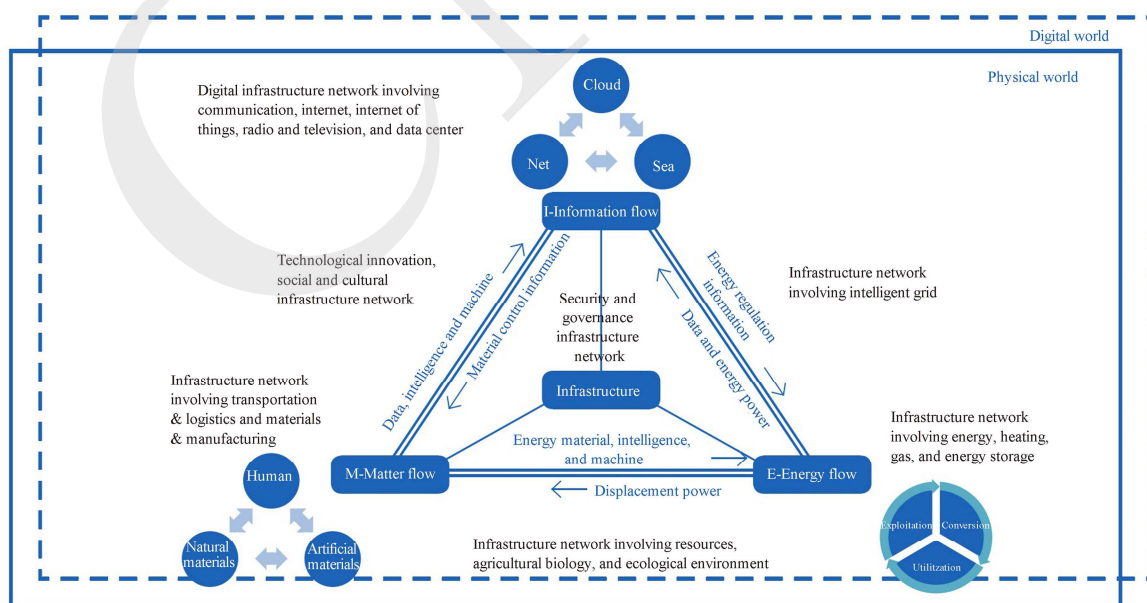


Figure 2 Conceptual model of infrastructure for social development (from the M-E-I perspective)

Only the countries that first discover the laws of basic science and develop and apply original leading technologies can form leading and driving strategic products and strategic industries^[11]. ④ Driven by new demand for economic social development. In a knowledge economy and intelligent society, the new infrastructure should be innovative, systemic, foundational, public, leading, balanced, safe, intelligent, ecological, and sustainable, so as to provide green, intelligent, inclusive, innovative, comprehensive, and safe public services for social development. ⑤ Driven by institutional reform. In order to extensively gather high-quality and sustainable new elements, and guarantee balanced development and inclusive supply of regional, national and cross-border infrastructure, we should improve the standardization, digitalization, and intelligent governance capacity of infrastructure system construction and application.

3 New infrastructure types and system framework

Without the supporting object, it is unable to understand the new infrastructure and its system compositions. New infrastructure construction means not only to make up for the shortcomings of traditional infrastructure construction and resolve the pressing issues in current development but also to lay a solid foundation for the future long-term development of a nation by paying attention to the strategic emerging industries and cultivating new industries and economic growth points. Therefore, only when the new infrastructure construction reflects the state will with a top-level design enhanced and overall planning guaranteed, will it keep ahead in the new round of technological revolution and industrial transformation and occupy a dominant position in the future economic competition and even the competition of comprehensive national strength^[12].

3.1 New infrastructure types

In terms of form and content, “new” in new infrastructure construction of a great modern country is mainly embodied in the following four types: “new wine in a new bottle,” “old wine in a new bottle,” “new wine in an old bottle” and “new system”^[13]. “New” in a narrow sense refers only to “new wine in a new bottle,” namely the digital technological innovation and intelligent digital infrastructure as well as infrastructure involving modern energy, advanced materials, and intelligent green manufacturing, such as the 5G, big data center, artificial intelligence (AI), industrial internet, charging piles for new energy vehicles, light source, and square kilometer array (SKA) radio telescope. “New” in a broad sense explained by the other three types: “Old wine in a new bottle” refers to the digitalization of infrastructure, such as intelligent logistics, intelligent transportation, intelligent ports, intelligent medical care, and intelligent agriculture; “new

wine in an old bottle” refers to the upgrading of infrastructure with the characteristics of systemic and qualitative “inter-generational” leap, such as the upgrading and expansion of aerospace and maritime facilities, extra-high voltage (UHV), intercity high-speed railway and intercity rail transit; “new system” refers to national security and governance infrastructure, such as security and governance standard, system, and other software and hardware facilities.

3.2 System framework of new infrastructure in a great modern country

The series report “Technological Revolution and China’s Future-Innovation 2050” described the prospect of modernization and technological development roadmap towards 2050 in China under the background of a new round of technological revolution and industrial transformation characterized by green, intelligence, and sustainability. In addition, the report also put forward the overall concept of the “eight economic and social foundations and strategic systems supported by technological innovation,” and described the construction characteristics and objectives of the eight major systems^[14]. They, serving as the basis of economic social development in the future, and another two basic systems supporting technological innovation and institutional innovation together constitute the ten types of new infrastructure^[15] (Fig. 3).

4 Ten types of new infrastructure for a great modern country

For new infrastructure construction in a great modern country, the current traditional kinetic energy and new kinetic energy in the future should be activated and stimulated to promote high-quality economic and social development and digital transformation; besides, it is also necessary to lay a solid foundation for longer-term M-E-I digitization and production, connection, dissemination and application of digital knowledge.

4.1 “Digital technological innovation and intelligent digital infrastructure” are the core contents of infrastructure in a great modern country

The report delivered at the 19th National Congress of the Communist Party of China put forward a strategic goal of building China into a great digital country and also a great country in science and technology. The digital economy, marked by the industrial application of next-generation information technology, should be supported by complete strategic, network-based technology and digital infrastructure.

① Digital technology innovation infrastructure is the underlying support for new infrastructure construction, including major technological infrastructure, science and education infrastructure, and integrated innovation infrastructure. It also supports the construction of a scientific and

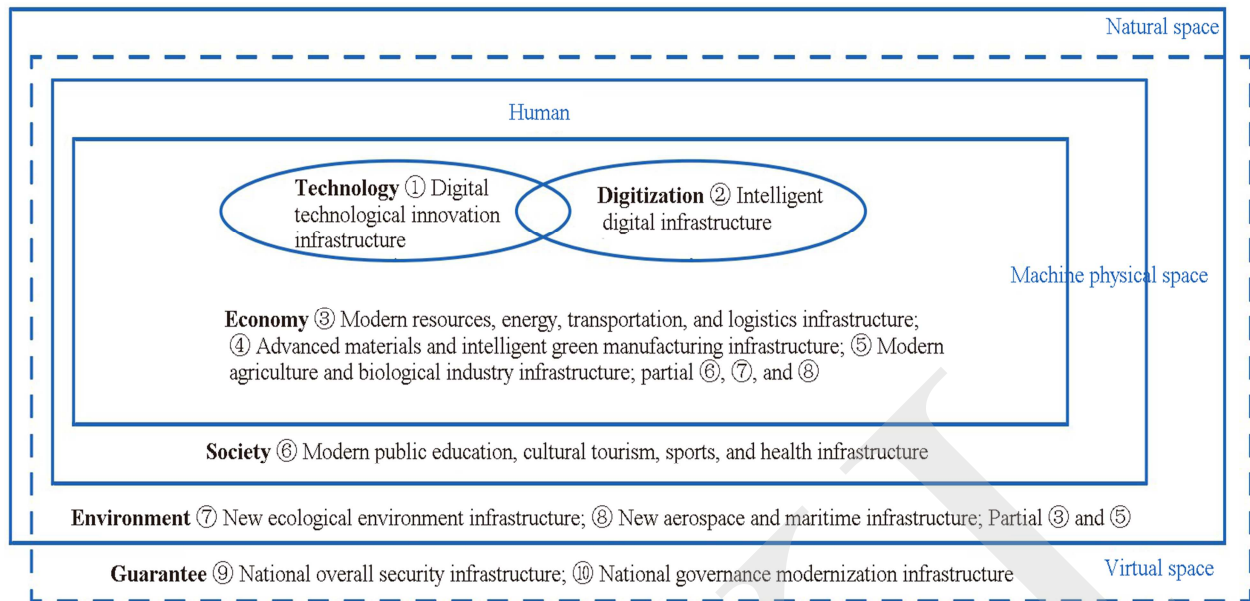


Fig. 3 Framework of new infrastructure system in a great modern country

technological innovation system in the digital age and the chiasitopic fusion of innovation systems in the fields of science, technology, engineering, industry, and society, and promotes the resolution of basic and key bottleneck problems of many disciplines^[10]. Upgrading and constructing a batch of major technological infrastructure and digital technological innovation infrastructure are required for strengthening the support for fundamental research, application research, data-intensive science, and innovation, entrepreneurship and creation activities, and promoting innovative development in various fields and regions.

② Intelligent digital infrastructure occupies a predominant position in new infrastructure construction, involving the infrastructure of communication network, new technique, storage and computational power evolved based on the next-generation information technology. It supports the construction of an information network system (“internet of beings”) and strategic computing platform and helps to build China’s strength in cyberspace and to build a digital China and a smart society. Remodeling the development pattern of digital industrialization and industrial digitalization can bring a series of economic and strategic benefits. The networking, digitization, and intelligence of the facilities such as perception, transmission, data centers, and application platforms should be enhanced to ensure that new infrastructure, data, and network systems conform to the security standards. It supports technological innovations in intelligent broadband wireless networks, supercomputing networks, quantum computing, edge computing, advanced sensing and display, advanced reliable basic and application software, and can eliminate the digital divide^[2], so as to better follow a safe, green and inclusive digital path.

4.2 “Infrastructure in the fields of modern resources, energy, transportation and logistics, advanced materials and intelligent green manufacturing, modern agriculture, and bio-industry” is the main body of economic infrastructure in a great modern country

AI will be the representative technology in a new round of industrial revolution. The representative infrastructure includes digital technological innovation infrastructure and intelligent digital infrastructure, which serve as the core supports for the digital economy, with the core elements being data, information, knowledge, technology, and management. Economic infrastructure mainly involves the facilities in the fields of modern resources, energy, transportation and logistics, advanced materials and intelligent green manufacturing, modern agriculture, and bio-industry. Besides, some modern public education, cultural tourism, sports and health facilities, and partial new ecological environment, aerospace and marine facilities are also included.

③ Modern resources, energy, transportation, and logistic infrastructure is the main artery of the national economy, which supports to construct China’s sustainable energy and resource system and conduct energy revolution and resource revolution. The development of UHV, intelligent grid, microgrid, distributed energy utilization, new energy storage, hydrogen energy, and nuclear energy infrastructure can significantly improve the energy and resource utilization efficiency. Resource science has been developing to realize the efficient development and comprehensive utilization of mineral resources, water resources, and biological resources, thus ensuring a continuous, stable, and safe supply^[10]. Establishing a comprehensive, intelligent, green, and safe transportation system, constructing a modern comprehensive

transportation network, perfecting the “channel + hub + network” infrastructure system involving post, warehousing, and logistics, and expanding digital and intelligent transportation and logistics infrastructure are conducive to building China into a great country in transportation and logistics.

④ Advanced materials and intelligent green manufacturing infrastructure serve as the foundation for building China into a manufacturer of quality. It supports the construction of China’s advanced materials and intelligent green manufacturing system, as well as its construction into a manufacturing country. Accelerating the intelligent, green, and renewable process of materials and manufacturing technology and promoting the structure upgrading and strategic adjustment of the materials and manufacturing industries will effectively guarantee the supply of advanced materials and intelligent green equipment and their efficient, clean, and renewable recycling. Intelligent equipment and factories based on the cyber-physical system will induce the transformation of manufacturing methods^[10]. Personalized, informationized, digitized, intelligent, and green manufacturing is essential to optimize the supply chain of materials, equipment, products, and services. A manufacturing country is a country strong on quality, which should be supported by a modern standard system and infrastructure for inspection and testing.

⑤ Modern agriculture and bio-industry infrastructure, as the basis of biological economy, supports the construction of high-yield, high-quality, high-efficiency, and green modern agriculture and a safe, high-value, high-efficiency, and high-quality bio-economy system in China; it also supports agricultural modernization and guarantees food and agricultural product safety and biosecurity. It can promote the transformation into large-scale agriculture based on digitization and the application of intelligent agricultural machineries, the high-throughput, intelligent, and precise integration system of planting and breeding, as well as sensors, automated robots, and micro-irrigation facilities in agricultural production, thereby supporting the development of intelligent agriculture and bio-industry, the prevention and mitigation of agricultural disasters, as well as the prevention and control of major epidemics.

4.3 “Modern public education, cultural tourism, sports, and health infrastructure” is the main body of social infrastructure in a great modern country

In order to make steady progress in “ensuring people’s access to childcare, education, employment, medical services, elderly care, housing, and social assistance,” we should promote the digital transformation of social infrastructure and strengthen the construction of inclusive and general programs for people’s livelihood, thus enabling all our people to share in more fruits of development in a more equitable way.

⑥ Modern public education, cultural tourism, sports, and

health infrastructure supports the construction of an inclusive education, cultural tourism, sports, and health guarantee system meeting the needs of over a billion people in China, as well as its construction into a great country in education, culture, tourism, sports, and health. It can enhance the integrity, accessibility, and reserve of the social infrastructure system, strengthen the scientific and technological support for public health, and promote the quantitative, precise, visualized, and cross-convergent development of life science^[10], thus allowing the medical model to transform from disease treatment to disease prevention, prediction, and early intervention. It is also necessary to give full play to the advantages of traditional medicine and enable it to take the lead among modern medicine, health science, public health crisis response, and medicine & engineering intersection; accelerating the construction of infrastructure for the old and strengthening the transformation of social infrastructure in response to the needs of the old are required; promoting the integration of philosophy, social science, humanity and art, economics, psychology, and culture with science and technology, strengthening cross-disciplinary integration in dealing with major social challenges, and enhancing the construction of digital science popularization facilities such as creative spaces, science parks, popular science venues, and museums are also indispensable to provide public communication space for cross-disciplinary, cross-field, and cross-institution innovation, entrepreneurship, and creation.

4.4 “New ecological environment, aerospace and marine infrastructure” is the main body of environmental infrastructure in a great modern country

A good ecological environment is the fairest and most inclusive public product, so we must “embark on a road of civilized development with developed production, affluent life, and sound ecological environment”^[16]. Only when the ecological infrastructure supporting ecological civilization and beautiful China is well constructed, will the supply of high-quality and reliable green public products and public services to all citizens be guaranteed.

⑦ New ecological environment infrastructure construction means to construct a natural reserve system centered on national parks, an ecological environment monitoring network for biodiversity, atmosphere, water, soil, and radiation, and the recycling and processing facilities for sewage, garbage, and solid wastes. It supports the construction of an ecological environment conservation and development system that maintains the harmony between humans and nature, a green, low-carbon, circular economy society, and an environment-friendly and beautiful China. Building a large-scale ecosystem observation and research network contributes to improving China’s capacity to monitor, protect, and restore the ecological environment and tackle climate changes, strengthening the prediction and forecast of natural disasters,

pollution, and ecological safety risks, and improving disaster prevention and mitigation. The continuous development of the technologies, methods, and means related to green innovation and green development will provide systematic solutions to energy, food, and water resources. The construction of green, low-carbon, and recycling infrastructure for green production promotes the greenization of the infrastructure.

⑧ New aerospace and marine infrastructure is the guarantee for expanding future development space, which supports the construction of aerospace, ocean, polar region and deep underground expansion capability and system in China, as well as its construction into a great country in aerospace and marine, thereby safeguarding the national air and space, ocean, polar and deep underground interests and homeland security. It can improve China's capacity of space exploration, earth observation, polar monitoring, deep-sea exploration, space situational awareness, and comprehensive monitoring, and early warning, thus moving towards the deeper and more distant universe, ocean, polar region, and deep underground, and supporting the marketization and commercialization of the blue economy and space technology. The ground facilities and control systems, polar research stations, submarine space stations, launch systems, satellites, and spacecraft systems, and space stations based on the integration of heaven and earth are conducive to peaceful development and utilization of outer space, ocean space, polar space and deep underground space^[15].

4.5 “Modern infrastructure for general national security and national governance” is the infrastructure guarantee of a great modern country

The infrastructure system of a great modern country is a complex giant system, whose resilience and safety must be ensured^[15]. In the knowledge and intelligent society, knowledge and technology have penetrated into all aspects of society, and it has been harder to distinguish the boundary between natural risks and technological risks^[2]. Therefore, it is of great importance to ensure the security of the infrastructure system. The increased uncertainty and risks of innovation and application of emerging technologies and excessive or insufficient supervision will go against innovation and development. Moreover, technological dependence has been deepened during technological advancement, so higher requirements have been put forward for the modernization of the government's governance capability. Since the digital government plays a decisive role in scientific decision-making, economic operation, market supervision, social governance, scientific and technological innovation, infrastructure and public services, and national security, the government's capacity of developing, accumulating, utilizing, and managing massive data must be improved, and the infrastructure and institutional guarantee for national security and governance must be strengthened.

⑨ Overall national security infrastructure is the cornerstone of security of a great modern country, which supports

the implementation of the strategy of military-civilian integration and the construction of a national security system that integrates political security, homeland security, military security, economic security, cultural security, social security, scientific and technological security, information security, ecological security, resource security, nuclear security, and biological security^[17]. Ensuring the material system security, technology security and data network security of national critical infrastructure such as national industrial control system, financial infrastructure, major technological infrastructure, major economic, social and environmental infrastructure, developing and perfecting traditional and non-traditional security precautionary technologies, standards and engineering and improving the capacities of major risk monitoring, early warning, prevention, and emergency response are required to safeguard overall national security and public safety^[15].

⑩ National governance modernization infrastructure is the basic guarantee for achieving good governance, which supports the construction of a modern governance system integrating three governance mechanisms of efficient market, pragmatic government, and orderly society, thereby guaranteeing the high-quality system supply, advanced management, and good public services. The management science in the era of knowledge economy should fully reflect such new characteristics as the popularization of innovation participants, the opening of innovation organizations, the transboundary integration of innovation industries, the platformization of innovative linking mechanism, and the diversification of source of innovation funds. We should pay more attention to the reproducible, shareable, and value-added characteristics of knowledge resources, the people-oriented principle, the self-organization of innovation subjects, the interconnection and collaboration of innovation platforms, and the construction of an open innovation ecosystem^[18]. The construction of a modern infrastructure system with compatible standards and collaborative integration by means of “improving the old by the new” and coordinating the development of traditional and new infrastructure is a new requirement for the construction, application, and management of national governance modernization infrastructure. Therefore, it is necessary to further promote the infrastructure construction for an intelligent city and urban brain, and vigorously promote the construction of rural governance information and service platforms, thus constructing scientific decision-making and intelligent management governance system and facility network characterized by open sharing, real-time linkage, urban and rural coordination, and global collaboration. Deepening the “one network, one door, one-time” reform of government affairs services and supporting the construction of digital government and the intelligentization of government and social governance are also necessary to improve the informatization and modernization levels of national governance^[15].

5 Conclusions and suggestions

Infrastructure and social development go hand in hand. Infrastructure and its service objects are mutually interpreted and develop in a coordinated way. The new infrastructure system of a great modern country towards 2050 takes “digital technological innovation and intelligent digital infrastructure” as the core, “modern resources, energy, transportation and logistics, advanced materials and intelligent green manufacturing, modern agriculture and bio-industry facilities” as the main body of the economic infrastructure, “modern public education, cultural tourism, sports, and health facilities” as the main body of the social infrastructure, “new ecological environment and aerospace and marine facilities” as the main body of the environmental infrastructure, and “overall national security and national governance modernization infrastructure” as the guarantee^[13, 15]. The new infrastructure system and traditional infrastructure system can jointly form an intensive and efficient, economical and applicable, intelligent and green, safe, and reliable modern infrastructure system.

Since new infrastructure construction is related to the overall development and long-term interests of a country, strategic planning must be completed to deal with the relationships between stability and progress, establishment and destruction, near and far, soft and hard, demand and supply, as well as China and foreign countries. The cost-benefit analysis for the whole society and the construction space layout and scheduling should be performed. In 2018, the contribution rate of gross capital formation to China's GDP growth reached 32.4%^[19], while that in 2019 was only 31.2%^[20], indicating that the direct driving effect of investment on economic growth was weakened. In order to implement the decisions of the central government, all relevant authorities and local governments have launched a new round of investment plans for infrastructure construction. According to incomplete statistics, the amount of investment plans announced by various provinces, autonomous regions, and municipalities directly under the central government has exceeded 40 trillion yuan. Some experts believed that they were actually multi-year investment plans, most of which were for the old infrastructure construction, and new infrastructure construction might account for 10% at the most^[21]. Although new infrastructure construction accounts for a low proportion at present, there is a high growth, permeability, and driving capacity. From the perspective of the structure of issued special bonds, the proportion of new infrastructure projects concerning electronic information internet big data, new materials, new energy, biomedicine, and cold-chain logistics has significantly increased from 0.6% in 2019 to 14.8% in February 2020^[22].

A moderately well-off society will be built in an all-round way in 2020. Therefore, we should adhere to the concept of “a game of chess across the country” at the key point of

formulating a new round of mid- and long-term planning, to plan the strategic layout of new infrastructure construction before 2050 and focus on the deployment of mid- and long-term plan for new infrastructure construction from 2021 to 2035 as well as the “14th Five-Year Plan.” We should adhere to the principles of public-private cooperation, multi-party financing, and diversified investment, so as to steadily promote the new infrastructure investment plan. Under the premise of guaranteeing employment, stabilizing agriculture, and ensuring people's basic livelihood, we should appropriately expand the scale of investment in new infrastructure construction, give full play to the role of counter-cyclical regulation, and avoid debt risks due to rapid expansion. Accelerating the advancement of new infrastructure project reserves oriented by overall optimization and collaborative integration, coordinating the existing and incremental infrastructure projects, and promoting traditional infrastructure with new infrastructure to jointly support the simultaneous development of new industrialization, informatization, new urbanization, and agricultural modernization contribute to facilitating China to realize five modernizations at a higher starting point, a higher level, and a higher goal.

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