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Research on the technological innovation strategy and policies of china's new urbanization

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ABSTRACT

Urbanization in China has reached a very important period. This needs the full support of technological innovation. On the basis of review the technological innovation of the process of urbanization in the history, and the contribution to the development of China's urbanization, the paper presents several major issues facing China's new urbanization. It presents the main topics, ideas and main tasks of technological innovation supporting for the new urbanization, and gives some policy recommendations from the aspects of strategic planning, technical system construction, demonstration pilot project, demand side policies, local and grass-roots work, and talent cultivation.

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KEYWORDS

Technological innovation;
New urbanization;
Economic transition;
Policy recommendation.

INTRODUCTION

New urbanization is a significant strategy proposed in the 18th National Congress of the CPC facing the future economic and social development. Science and technology innovation (STI) is the strategic support to improve social productive forces and overall national strength. Recently, various levels of government are stepping up to arrange and promote measures for the construction of new urbanization. But for how to play the role of STI in new urbanization is lack of systematic planning. Under new circumstances, it is highly relevant to further clarify the rules STI in promoting the development of urbanization, identify the science and technology (S&T) needs of urbanization and strategic path relying on STI to promote new urbanization, and steadily

push forward the development of new urbanization.

RULE OF STI PROMOTING THE DEVELOPMENT OF URBANIZATION

From the history and the experience of developed countries, STI has a great impetus to the process of urbanization. New urbanization is a new strategy based on the history of practical experience of urbanization, combining the rules and features around the world that relies on STI to promote the development of urbanization. It provides reference for China to promote urbanization through STI.

S&T progress is the basis of urbanization and industrialization, sti accelerates the process of urbanization

There is necessary link among urbanization, industrialization and STI. S&T progress is the basis for industrialization and urbanization, and the decisive force to promote urbanization is S&T revolution caused by STI. From a historical point of view, every major S&T revolution has greatly promoted the process of urbanization. Before the 1800's industrial revolution, the share of world's urban population to total population was just 3%, with the vast majority of people living in rural areas engaged in agricultural labor. Three revolutions, taking the invention of the steam engine, wide application of electricity and the research and development of micro-electronics and computer technology as the symbol, gave birth to the modern industry, and promoted the development of the town, created a knowledge-based economy and modern services industry. The scale of cities and towns rapidly expands, with the rapid growth of population, in which nurtures the growth of modern civilization. Currently, over 50% of the world population lives in cities and towns, 70% of GDP and 85% added value of the tertiary industry are from cities and towns, more than 90% of colleges and universities and research efforts are also concentrated in towns. Along with the launch and deepening of new industrial revolution based on STI, it will drive the profound, rich and asymmetric changes in national urban development patterns^[3].

Urbanization development has different stages. With the upgrade of urbanization development, sti plays an increasingly important role.

Urbanization is both an important symbol of the development of industrial civilization, but also a critical manifestation of S&T progress. STI continues to solve in-depth problems in urbanization, leading the future development of cities and towns. Urbanization shows different development phases, from gathering materials in the early stage to the accumulation of factors of production, and to integrating innovative elements and the network, from production-oriented city, to consumption-oriented city, and to the eco-city. With cities and towns further developing to the low-carbon and eco-sustainable type, as well as multi-level open to the urban system, urbanization asks more demands to STI in the industrial development, urban infrastructure, natural resources, ecological environment, public services, liv-

able urban governance and planning etc. STI plays an increasingly important role. Relying on STI to solve deep-seated problems in urban development facing energy resources, ecological environment, population and health, public safety etc, urbanization improves the level of city management, provides a livable and happy town life. STI has become the leading force in economic and social development. Cities and towns is acting as an important carrier of economic and social development, as well as the main gathering place of innovative elements. STI plays a more prominent role in the development of urbanization, and it will lead the future development.

The promotion of STI on urbanization is a process of interaction between government and market, we must give full play the leading role of the government in the process of urbanization.

The traditional process of urbanization is a natural gathering process of the population and other economic factors, with STI playing a slow role in the process. While accompanied by the development of modern urbanization, science and technology is promoting urbanization from instrumental support in a traditional, single way to the full range and diversified way. The integration of technology and social systems brings about the development of large socio-technical system. Government plays an important role in planning and guiding in this development process. The urbanization process in different countries has shown that urbanization is a complex and integrated process. Government should be given full play the guiding role in terms of urban planning, construction and management. According to a World Bank report in 2006, in future, nearly 94% of the increased global urban population will occur in developing countries, and this trend will reshape the face of the world. One of the key points is that an inner-grown wealth-increasing cycle mechanism centered by towns will be shaped under the joint action between government and market. The focus should be put on S&T investment and the cultivation of innovative ability of enterprises on the premise of ensuring normal economic growth and employment level. The post-advantage countries should be particularly taken as the major driving force of the transformation of national development model.

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CURRENT FACT ON STI SUPPORTING URBANIZATION IN CHINA

Since reform and opening up, China's urbanization level has been significantly improved. The urban population has increased from 172 million in 1978 to nearly 700 million by the end of 2011, with the urbanization rate rose from 17.92% in 1978 to 51.27% in 2011, an annual increase of 1 percentage points. It is expected to reach around 60% by 2020. If China can become a highly urbanized and modernized country in the middle of this century, its economic strength, science and technology and cultural influence will change the pattern of the world politics and economy greatly^[6].

In 2011, the urbanization rate surpassed 50% for the first time, meaning that China's urbanization development has entered a new stage shifting from quantity to quality (Figure 1). China's national conditions and the goal of socialist modernization determined that we must take an urbanization path with our own characteristics. STI is serving as the core of national development strategies and the key to improve the comprehensive national strength. We should rely on science and technology to speed up urbanization development in a healthy, rapid and harmonious way.

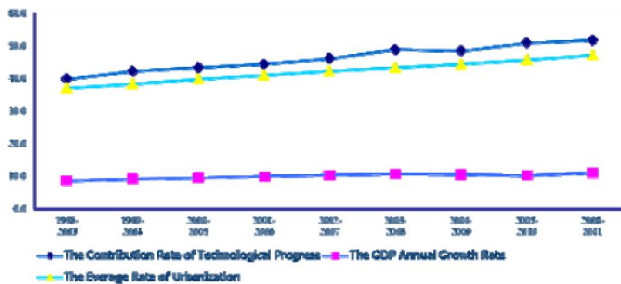


Figure 1 : 1998-2011 China's Contribution rate of technological Progress, The GDP annual growth rate with Teh average rate of urbanization.

S&T work has achieved remarkable progress relying on science and technology to speed up urbanization development in a healthy, rapid and harmonious way.

First, the "urbanization and urban development" is enlisted as the key areas of S&T development. The S&T work about the development of urbanization has made a large number of innovation achievements. As for the S&T needs in the process of urbanization, the major task is focusing on dynamic monitoring of urban and regional

planning, improving urban functions and saving space, green energy and green building, the quality of the living environment of urban ecology, information platform of urbanization. The government organizes technical research to obtain a large number of innovations. Second, accelerating the transformation and industrialization of S&T achievements has played an important role in the upgrade of industries and economic restructuring, so as to promote the improvement of China's industrialization and accelerate the urbanization progress. Leading and supporting the development of modern agriculture, promoting sustained and stable development of agriculture and promoting the coordinated development of urban and rural area. Third, "innovation poles" of urbanization is formed relying on high-tech zones, so as to develop technology industry working system with Chinese characteristics and industrial technology innovation environment in line with rules of market economy. It gathers resources for innovation in the process of urbanization, and plays a leading and guiding role. Fourth, S&T development to solve issues of people's livelihood in the area of population and health, resources and environment, disaster prevention and mitigation, public safety and other areas, has played a decisive role in improving the quality of urban development and urban modernization. Fifth, a number of innovations demonstration projects are implemented in the pilot cities and towns such as new energy vehicles (thousand vehicles in ten cities), solar photovoltaic (Golden Sun project), semiconductor lighting (ten thousand lights in ten city), the next generation information network (3TNet). They accelerate the transformation and applications of S&T achievements, and play an important supporting role in developing cities in a healthy and rapid way. Meanwhile, a large number of high-tech products are widely used, greatly increasing the content of technology and knowledge in society, breeding and spreading the new urban civilization, and innovation civilization, and is radically changing the face of cities and towns.

New urbanization needs to change the direction towards "innovation-driven" development, which is the core of "S&T innovation". S&T work has a long way to go.

The urbanization includes the population urbanization, industrial structure urbanization, rural residents life style urbanization, landscape urbanization and the over-

all quality of the population urbanization^[5]. Over the past 30 years, the rapid development of China's urbanization mainly comes from cheap land, labor, and other "factor-driven" and "investment-driven" policies^[2]. To explore a new urbanization development path needs to take innovation as the driving force to integrate the application of modern S&T innovation achievements, and meanwhile in line with the actual development of urban and rural areas. New urbanization will provide continuous driving force to the transformation of China's economic and social development, and STI plays a crucial role in the development process of new urbanization. "Innovation-driven" new urbanization is to develop from expansion focusing on quantity to intensive development focusing on quality. Its core is the "S&T innovation." In a new historical period, S&T work needs to stand in a new height, making a greater contribution around the new urbanization.

New urbanization puts forward higher requirements to S&T work, which has bright prospects through STI supporting and guiding the development of new urbanization.

At present, China is in a period of rapid progress of urbanization. From 2001 to 2011, China's urbanization rate increased from 37.66% to 51.27%, with an average annual increase of 1.24 percent, higher than the average annual increase of 0.86 percentage points from 1978-2000, far higher than that of 0.28 percentage points before the reform and opening up. And the healthy development of future urbanization cannot be realized without effective support and guidance by science and technology work, which is promising in future. A group of S&T issues need making major breakthroughs based on original level, such as how to use the strategic thinking of green and sustainable development to examine urbanization process in terms of living environment, urban settlements, circulating water system, energy conservation, metropolitan transport, rational use of land, disaster prevention and mitigation, and the new town planning system, etc. Also, S&T progress can promote industrial restructuring and meanwhile create a large number of effective jobs and so on. It mainly includes the following aspects:

First, promote industrial restructuring and upgrading and coordinated development of industrialization,

urbanization and modernization of agriculture. Make full advantage of the intensification of knowledge, intelligence and talent, increase the support of modern logistics, e-commerce, digital content, information services, and cultural and creative industry, accelerate the development of modern service industry, and promote industrial technology upgrading and structural adjustment in cities and towns, realize the industry supply that pays equal attention to quantity, quality, structure and effectiveness, develop new village adapt to urbanization and industrialization, finally realize the harmonious development of urbanization.

Second, strengthen the scientific planning of urban development and dynamic monitoring. Improve the comprehensive management of cities and towns through rapid development of urban information technology and network construction. Establish and improve the network system based on sensing network and intelligent technology, improve ability in terms of disaster prevention and mitigation and emergency response capabilities, so as to achieve the sustainable development of urbanization.

Third, vigorously promote the development of ecological civilization, and strive to build livable cities and towns. Enhance the research and application of energy conversion efficiency, energy-saving and new materials, waste recycling and other energy conservation technology, and improve energy efficiency of resource application. Vigorously develop ecological and environmental protection technology to enhance the ability for ecological environment monitoring, protection, repair and respond to climate change. Actively develop a circular economy, develop low-carbon technologies, and establish an industrial system and consumption patterns featured by low carbon emissions, and strive to build a resource-saving and environment-friendly society, to develop intelligent transportation technology, implement science and technology projects regarding food safety, the National health technology projects, so as to achieve people-oriented, harmonious development of the new urbanization.

S&T work should be encouraged to move forward in the development of "four modernizations", by a good grasp of strategic positioning, and forming a set of strategic guidance systems, and mechanism

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and models supporting new urbanization.

The report of 18th National Congress of CPC proposes that: information technology and industrialization should make in-depth integration, industrialization and urbanization should be interacted, urbanization and agricultural modernization should be coordinated, industrialization, information technology, urbanization, and agricultural modernization should be promoted in parallel. Urbanization is a profound change involving ideological change, allocation and integration of resources, optimization of productivity layout, large-scale population transfers, interest adjustments, transformation of management system, etc. The complexity and the extensiveness of the issues involved require a comprehensive work that must be solved through systematic measures. S&T work needs to plan ahead, in which a good grasp of strategic positioning is needed, and give full play the role of supporting and guiding, in order to form a set of strategic guiding system.

It should be noted that China's effort on STI to support the development of urbanization is not enough. S&T element in urbanization is few, and there are many institutional barriers, such as a lack of coordination between departments, lack of planning the role of STI in urbanization; standard construction lagging behind, inadequate compulsory norms, the channel for S&T not smoothly functioning; science and technology industrialization demonstration projects inadequately promoted, and so on. In future work, it needs to improve and overcome barriers, and thus actively and steadily pushing forward China's new urbanization. In addition, from a historical perspective, urbanization has no universal model, and China's urbanization also has its own distinctive features. Different actions needs taking according to different local conditions. A variety of paths should be promoted for urbanization. It is a realistic choice based on China's national conditions. S&T work needs to explore long-term mechanism and typical patterns in different paths to support new urbanization.

GUIDING THOUGHTS FOR STI TO SUPPORT AND GUIDE NEW URBANIZATION

At present, China's urbanization has reached a very important period of transitional stage. "Innovation-driven"

is a new development strategy different from the traditional urbanization featured by "factor-driven" and "investment-driven". New urbanization should change path-dependence, to achieve expansion development focusing on quantity to intensive development focusing on quality, and to implement the urbanization development model driving by innovation. China's urbanization should be coordinately promoted through development ideas, patterns, portfolio of functions, industrial appearance, integration methods of factors, management models, historical and cultural protection methods of innovative cities^[1], in order to further expand the STI space in new urbanization process.

First, innovation-driven development of urbanization is a systematic work, and its implementation is to give full play the leading and supporting role of science and technology. It guides the orderly flow and reasonable configuration of socio-economic factors through multidisciplinary and multi-sectoral public policies.

Second, innovation-driven development of urbanization is a dynamic work. Its implementation process is featured with time and space. In different periods of time and different spatial scales, the priorities are significantly different. One of the keys is to form a long-term mechanism that gives play the role of supporting in S&T work.

Third, innovation-driven development of urbanization is an exploratory work. It needs to analyze urban and rural differences and regional disparities. Appropriate policy should provide guidance according to local conditions^[4]. The tasks and priorities of new urbanization in different geographical scope is different. Work priorities will change and transfer according to the change of different areas and different period of time. We need to always pay attention to analyze characteristics of S&T work at different stages, in order to make timely adjustment of at different times and different levels.

POLICY RECOMMENDATIONS TO FURTHER GIVE PLAY THE ROLE OF STI IN SUPPORTING AND GUIDING URBANIZATION

At the strategic planning level, strengthen strategic research and planning guidance of S&T to sup-

port new urbanization.

First, sort out the structure of resource. Find out the basis for existing S&T work and structures of resources around the new urbanization as soon as possible, combing related supportive work to strengthen the integration of relevant S&T achievements and resources. Be aware of what's what properly. On the other hand, strengthen coordination, and build up a leading group as well as liaison officers of various departments, in order to establish a work organization system supporting new urbanization, coordinate the S&T work in developing new urbanization.

Second, plan ahead. At the strategic level, a forward-looking plan should be taken into consideration, so as to formulate strategic planning of urbanization supported by STI. The overall layout of economic, political, social, cultural and ecological development, as well as the "four modernizations" require a good grasp of a series of strategic positioning, which focuses on transforming traditional urbanization through STI, supporting the harmonious development of new urbanization, leading the sustainable development of new urbanization, and exploring long-lasting mechanisms and typical patterns of urbanization through STI. Meanwhile, it is suggested that the development of urbanization through STI should be listed in the next long-term planning for S&T development and issue relevant guidance.

Third, strengthen the coordination of planning. Strengthen the linkage and coordination among macro-management departments, enhance and give full play the role of science and technology planning in the future of urban development. Establish consultation mechanism among different departments to make overall planning and arrangements of new urbanization. Clarify requirements of S&T development planning in urban development, so that S&T becomes an integral part in the decision-making process of urbanization.

Develop technology system in line with new urbanization

First, based on the existing R & D deployment and accumulated results, make layout of new urbanization, strengthen guiding force of market, and promote the application of advanced technologies. Effectively solve the new emerging difficulties and problems in the process of urbanization, summarize according to the

need of local conditions, so as to from long-term mechanism and typical patterns of new urbanization supported by STI.

Second, support major and key technologies in new urbanization in the form of project, to carry out technical research for breakthroughs, and compile technology roadmaps. Select a number of industries with good market prospects, low resource consumption, lead efficient, lots of employment opportunities, and good comprehensive output. Accelerate R&D and application of the core technologies and products, focus on the development in the field of electric cars, clean and renewable energy, triple networking, semiconductor lighting, smart grid, biological medicine, new materials and high-end manufacturing etc.

Third, guide the development and application of STI through standards and other policies. In the process of urbanization, STI's channel is not smoothly functioning. One of the important reasons is the standard lagging behind, lack of interoperability, and lack of incentive policies. The promotion of the application of new technologies, green products, green buildings, and new energy lacks subsidies and credit incentive measures. Therefore, it is necessary to strengthen the construction standards in cities, such as standards on energy efficiency of buildings, standard setting of the promotion of new technologies. Different goals should be established at stages, and their implementation should be strengthened. Increase subsidies of application of new technologies, and strengthen mandatory measures. Spread green and mandatory standards to improve energy efficiency in small towns and rural areas.

Further promote the pilot demonstration and guidance of demand-side policies in urbanization development supported by S&T

In recent years, The cities and towns have carried out a number of science and technology industrialization demonstration projects, such as the "one thousand electric vehicles in ten cities", "ten thousand semi-conducting enlightening in ten cities", "Golden Sun", etc. they have played an effective role in promoting the application of science and technology products, but the scale and radiation is still limited. It is recommended that pilot and special actions should be taken in this regard. First, conduct pilot demonstration with differ-

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ent themes, started from innovation-oriented city (district), Sustainable Development Experimental Zone, Hi-tech Zone, agricultural science and technology park including the demonstration of modern agricultural system, new energy demonstration, application of information network demonstration, demonstration of new intelligent transportation systems, livable technology demonstrations, environmental protection and resource comprehensive utilization. Second, by focusing on programs and projects such as the "Green Olympics", "low-carbon Expo", better promote energy conservation, control environmental pollution and enhance green technology development and demonstration. Comprehensively improve the quality of residents and cultivate S&T ideas and innovation culture.

Motivate the activity and creation of local especially grass-root departments, focus on new urbanization and other modernizations

China's new urbanization also takes the mission to make breakthrough in urban-rural split and coordinate urban and rural development. Local and grass-root sectors will have more opportunities through the leading concepts and ideas of new urbanization supported by STI, so as to promote the development of rural areas. For example: focus on the new demands and new trends of the regional rural urbanization, effectively link with external innovation resources such as with industrial chain, technology chain, capital chain and market chain; promote the development of rural science and technology pilot projects; promote the optimal allocation of production factors and integration of ecological factors, and promote the industrial structure adjustment between urban and rural areas.

Pay attention to and strengthen the talent cultivation

In order to accelerate the support of STI to lead new urbanization science and technology talent is the key elements. It is necessary to be guided by "National Long- and Medium-term Development Plan for Science and Technology Talent", cultivate various scientific and technological personnel in the process of urbanization, increase the professionals support of S&T projects, emphasizing on training skills-based practice personnel, and strive to build high-quality personnel to

develop and manage urban planning and infrastructure construction.

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