Sciences of human settlements: Searching for the theory and practice

Wu Liangyong

The author is Professor of Architecture and Urban Studies, Tsinghua University, Beijing, People's Republic of China; member of the Chinese Academy of Sciences; member of the Chinese Academy of Engineering; and Director of both the Institute of Architectural and Urban Studies and the Center for Human Settlements, Tsinghua University. He is also a member and former President of the World Society for Ekistics (WSE). The text that follows is a slightly edited and revised version of a paper presented at the WSE Symposion "Defining Success of the City in the 21st Century," Berlin, 24-28 October, 2001.

The science of human settlements in the world

Since C.A. Doxiadis advanced the theory of Ekistics with the ending of World War II, the theory and practice of the Science of Human Settlements has been developed over the world. The UN Habitat I Conference in Vancouver in 1976, the Rio Conference in 1992, the UN Habitat II Conference in Istanbul in 1996, as well as other worldwide actions up to the UN Special Conference of Istanbul+5 in June 2001, have marked an unceasing progress of research in this field; and the new concepts of Human Settlements, *Habitat*, cities in a Globalizing World, emerging in consequence of the research progress, have become the global guidelines for building a sustainable world. Today the sustainable development of Human Settlements has become a common theme all over the world and thus architecture and urban planning have been ushered into a broad realm of multidisciplinary co-operation for further development.

Taking into consideration all the current changes, we hereby advocate developing the Sciences of Human Settlements in a more comprehensive way. That means establishing communities of science, encouraging collective work and multidisciplinary communication among all the participants, and searching for the theory and approach of the new paradigm.

Recent rural and urban development in China

It is well known that great changes have taken place in China in the past two decades which can be seen not only at any geographical dimension but also in all socio-economic aspects: politics, economy, culture, science and technology. Both economic development and urbanization have stepped into an accelerating phase, leading to a great annual growth of GDP and urban population (figs. 1 and 2). Amidst magnificent achievements, there have emerged some complicated problems. The crux is that the cities and the countryside are developing at such a rapid rate, on such a large scale, with such enor-

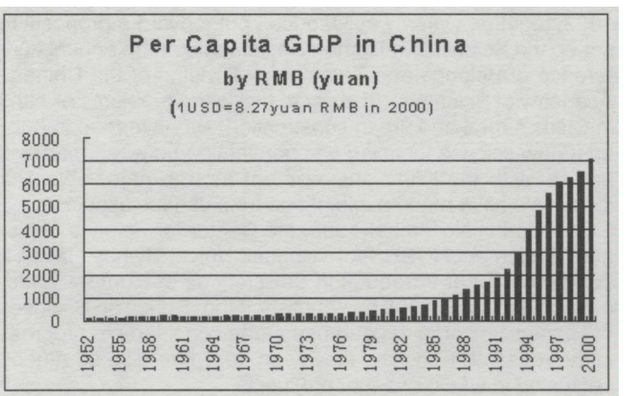

Fig. 1: Per capita GDP in China by RMB (yuan) (US$1.00 = 8.27 yuan RMB in 2000).

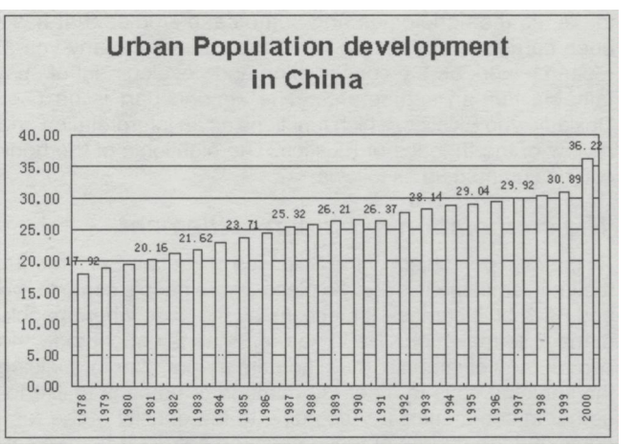

Fig. 2: Urban population development in China.

mous capital, to such a vast extent, that they have surpassed any historical period that the country has ever witnessed before. Building construction has today virtually become a major economic pursuit in China.

In the transition from a planned economy to a market economy, China has found her way in accordance with the specific conditions of the country: the socialist market economy which overemphasizes neither the plan nor the market at the expense of the other. It means that general plans are still necessary, perhaps even more necessary than before, in the course of this rapid growth. To ensure the sustained development of China in the future, we should carry out holistic research, search for the general strategies and lay out common guidelines. In terms of urbanization, we should in particular study integrated rural and urban development from the regional viewpoints in the hope that the cities and the countryside will advance side by side and the various regional cultures will co-exist.

Theorized progress at the Center for Science of Human Settlements of Tsinghua University

Aware of the seriousness of the issues and conscious of the adoption of a scientific approach, I have devoted myself to search for the theory of Science of Human Settlements in China in the past decades with a series of academic publications including *A General Theory of Architecture* in 1989. In 1993, together with my colleagues I put forward a proposal to set up the Sciences of Human Settlements at the annual conference of Science and Technology Division of the Chinese Academy of Sciences. In order to tackle the problems existing in China's rural and urban construction, we have tried to build up a new science focusing on coordination between man and nature, with the living environment as the major object of study. We have made explorations from various aspects.

Founded in November 1995, the Center for Science of Human Settlements (CSHS) of Tsinghua University has offered a course on "Brief Introduction to Sciences of Human Settlements," and since 1998 has published the "Series on Sciences of Human Settlements" and has made considerable progress in the research field. The steady process has marked a good beginning in a field of bright prospects.

Recently, I published a book entitled *Introduction to Sciences of Human Settlements*, which mainly explores the relationship between humans and environments, also with a view of the way out for human settlements in China. The book is divided into two parts. The first part introduces the origins of the Science of Human Settlements, its constitutions, its basic ideas, its methodologies and some case studies that have been carried out by the CSHS in the course of many years' research work on the conservation and development of sustainable human settlements. The second part is on C.A. Doxiadis and Ekistics, which functions as an interpretation and review of the theories of Ekistics. The highlights of the book can be summed up as follows.

The connotation of human settlement

As the research object of the Sciences of Human Settlements, a human settlement is firstly a place where people come to live and have built homes. It functions as the base where people manage to make their life in nature. Man is undoubtedly the core of the settlements, thus the primary purpose for building the settlements is to meet the demand of humans to live together in communities. According to the density of the residents and the degree of their impact on nature, a human settlement can be divided into two parts in terms of physical space: the ecological environment and the manmade environment. During the long history of the evolution of human settlements, the harmonization of Man with Nature has always been the ideal of mankind, though the specific building actions differed greatly from each other under the influences of natural and social factors.

In detail, the human settlement is composed of five systems: Nature, Man, Society, Habitation and Network, among which the first two systems are most essential while the last two systems are also indispensable in terms of the construction of physical environment. The relationship between the human settlement and its five systems is like that between the whole and the parts. Therefore the achievement of a better human settlement does not lie in the perfection of its systems in part, but in the integration of them; and a better human settlement should be not only an ecological environment but also a humanistic one which can meet the demands of mankind as both biological and social individuals.

As a complex system, the human settlement involves all kinds of settlements on the earth, from a room, a village to a town, a city, even to the whole world. According to their scale, they can be categorized into five levels: the global, region, city, community and shell. This categorization is very helpful in clarifying some basic concepts in the research of the Sciences of Human Settlements and in setting up acceptable standards for research at different levels.

The main purpose in promoting the Sciences of Human Settlements in China today is to try to adapt the large-scale constructions to the current circumstances. It suggests that research works should be carried out not only in the academic field to find out the law of the development but also in the practical field to guide the construction of human settlements that takes place every day and everywhere. As stated above, a better human settlement, composed of five systems, should be such an integrity of all its parts that the demands of different aspects would be well satisfied: ecology, economy, science-technology, society, culture-art, etc. From that point of view and with regard to the specific case of China, five principles are proposed herewith as the guidelines for the construction of human settlements in China: respect for nature by awakening the ecological awareness of the public and tackling environmental issues; the sound circle between the construction of human settlements and economic development; the prosperity of society promoted by the progress of science and technology; the concerns for the interests of people in terms of individuals as well as of society as a whole; and the integration of the pursuit of science and the creation of art (fig. 3).

The framework of the Sciences of Human Settlements

Taking living environments as a research object, by the Sciences of Human Settlements, dealing in a comprehensive way with all the problems occurring during the development of human settlements, we indicate not a mono-discipline but a multi-disciplinary one which involves the sciences of nature, technology, humanities and so on. It implies that, with the common goal to build an ideal human environment for human beings, all the disciplines concerned with the construction and development of human settlements are regrouped in one framework, centering the trinity of architecture, landscape architecture and urban planning that work as the leading disciplines.

As the integrity of different disciplines, by the Sciences of Human Settlements we mean an adaptive open system which changes unceasingly. The number of the disciplines concerned in the framework may increase or decrease while their importance may also vary from time to time. All the disciplines

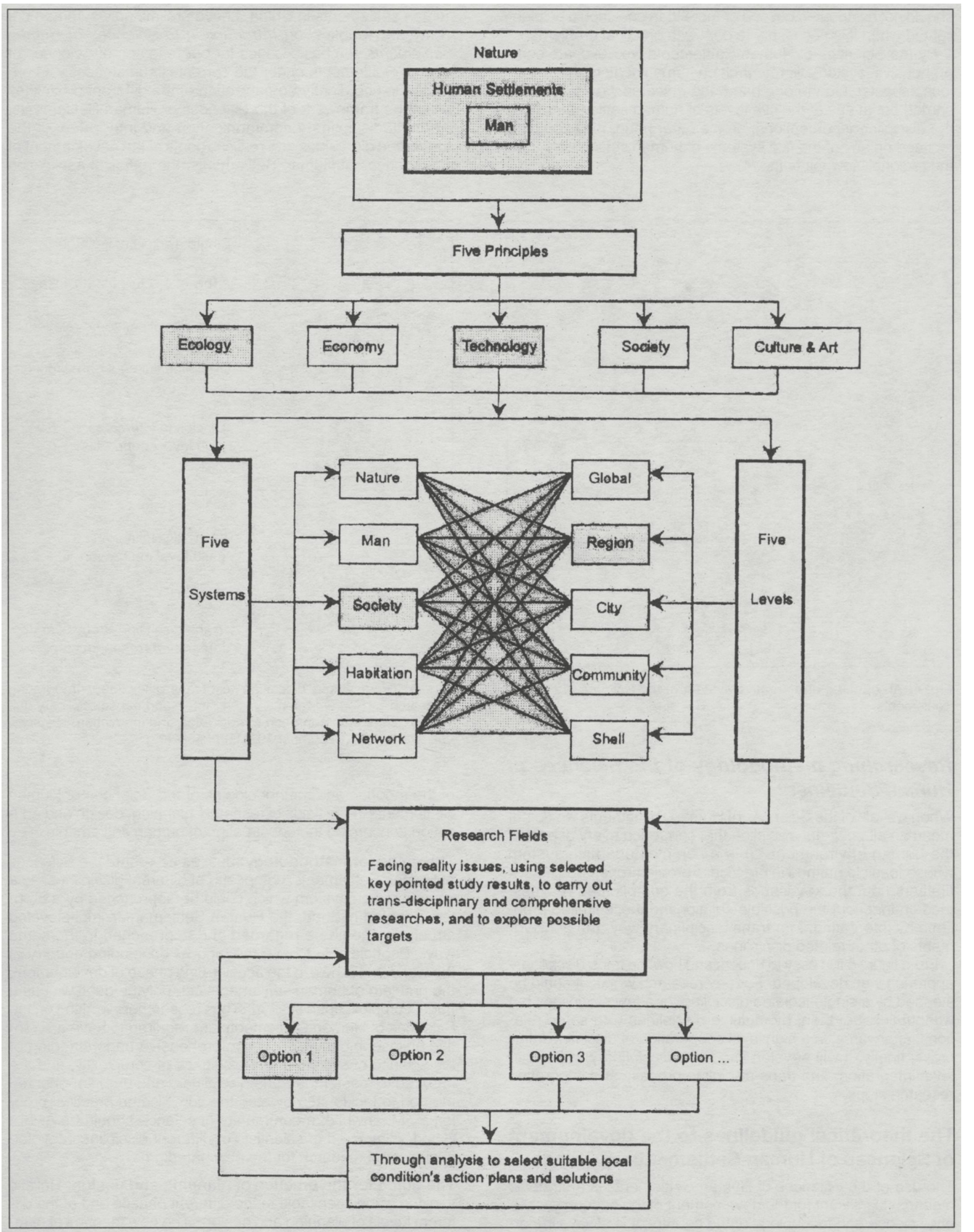

Fig. 3: Framework of the Science of Human Settlements Studies.

should not be equated but one or more than one should be highlighted when it is necessary to deal with practical problems.

By the Sciences of Human Settlements we advocate comprehensive, systematic research on human settlements in various aspects. On the one hand, the research works could be carried out at any of the five levels of human settlements from the disciplinary perceptions; on the other hand, they could be focused on any of the five systems of human settlements from the regional viewpoints (fig. 4).

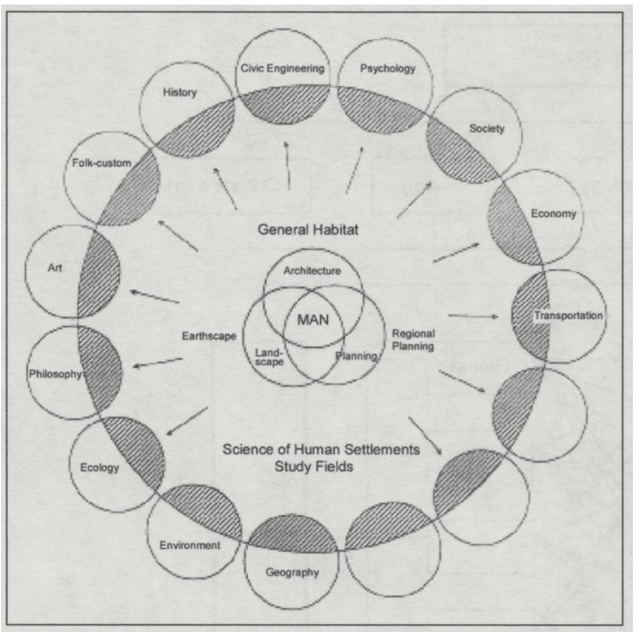

Fig. 4: An opening and creative system of the Science of Human Settlements.

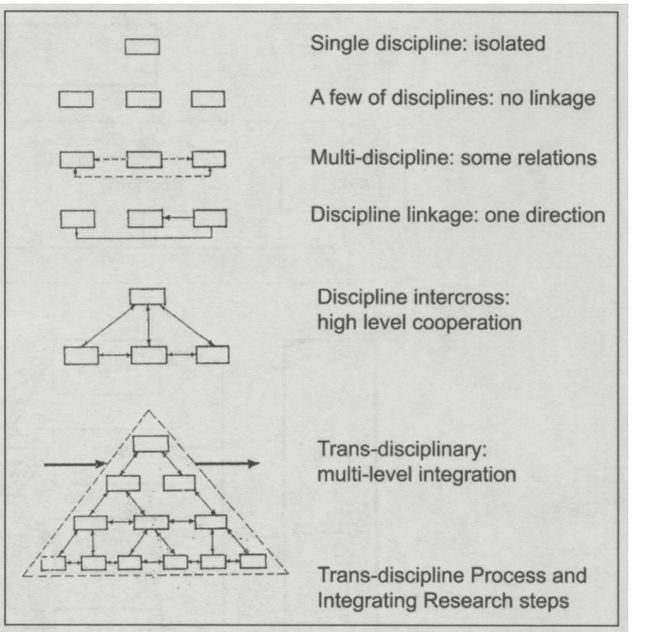

Fig. 5: From single discipline to "Trans-disciplinary Integrating Research." (*Source:* Erich Jantsch, "Inter- and transdisciplinary university: a systems approach to education and innovation," *Ekistics,* vol. 32, no. 193 (December 1971), pp. 430-437).

Researching methodology of the Sciences of Human Settlements

When we talk of the Sciences of Human Settlements we do not mean an all-powerful discipline that can reach every aspect of the human environment. It is a complex adaptive system whose feasible method in practice is problem-oriented. It says firstly dig out the key issues from the complicated realities, then channel out the possible solutions to these limited problems by integrating, in a trans-disciplinary way, the achievements of other related disciplines.

From figure 5 it is easy to understand how the trans-disciplinary approach was developed. For any research works, it could be stepped by a single-isolated discipline, or a few disciplines but without linkage; then, by multiple disciplines with some relations; afterwards, in a high level cooperation of discipline intercross; finally, it will develop into trans-disciplinary with multi-level integration, and trans-discipline process and integrating research steps.

The theoretical guidelines to the development of Sciences of Human Settlements in China

The use of the Sciences of Human Settlements is a strategic research significant for the development of the economy, society, science and technology of the country; it is always important to put forward a research schedule appropriate to the realistic occasion. Using as a basis the sustained studies of human settlements in China, I have preliminarily summed up, in my new publication *Introduction to Sciences of Human Settlements*, the basic issues for our research of Sciences of Human Settlements under the current circumstances. It concerns the coordinative organization of the different disciplines within the framework of the Sciences of Human Settlements, the multi-disciplinary communication and integration of the concerned disciplines, the realistic goals of the development of the Sciences of Human Settlements, the practical application of the theories and methodologies of the Sciences of Human Settlements in the fields of research, planning, design and education concerning the construction of human settlements.

The guide for methodology: Just as we regard the Sciences of Human Settlements, composed of different disciplines, as a complex open system which could be approached by a problem-oriented method, the Human Settlement, a multi-leveled structure, should be regarded and approached in the same way. Especially in China, the biggest developing country of the world that is now in the accelerating phase of development, the problem of human settlements can only be dealt with as a huge, complex, open system. Thus researchers working on the Sciences of Human Settlements are required to have a scientific philosophic thinking, a comprehensive understanding of the science of system and the science of complexity, and are required to master the trans-disciplinary and problem-oriented method to tackle step by step the complicated practical problems. Meanwhile, a community of science should be established, composed of scientists of different disciplines devoted to sustained research for the new paradigms.

The guide for the practice of planning and design: Holistic thinking is indispensable in the different phases and at the different levels of planning and design. The new theories of planning and design can only be worked out by integrating the various existing ones. Exactly speaking, at the level of architec-

tural design, the theory of General Architecture should be encouraged to return architectural creations to the basics. At the level of urban design, the new concept of human settlements would lead to the harmony of the physical spaces by respecting the perceptions of region, city, community and building. At the level of general planning and design of human settlements, a new dynamic notion of time and space should be set up to reach the harmonization of time, space and human beings.

The guide for professional education: Architectural, landscape and planning education should be reformed and adapted to the new context to provide society with the new type of qualified personnel who are capable of carrying out trans-disciplinary research works and integrating science, humanity and art. In this view, the training of "professional leadership" and the popularization of the Sciences of Human Settlements would be the key points in future education.

The practices at the Center for Science of Human Settlements of Tsinghua University

Concerning the advocacy of the Sciences of Human Settlements in China, a considerable number of research works have been done by Tsinghua University in the past half century, especially in the past 20 years after the economic and political reforms of China. The problem-oriented analysis, the historical and regional study and the multi-disciplinary reference have served as the main methods for the CSHS.

Holistic thinking is the philosophy of the CSHS's planning and design practices. It means that when dealing with a specific project, we always approach it as a part in the whole, as a period in the time sequence and as an element in the spatial system, and the solution is the result of the integration of the past and the future, the element and the entity, the personality and the harmony.

In accordance with our experiences in the research of Sciences of Human Settlements, the following factors are indispensable for success:

- The establishment of innovative and industrious academic groups;
- The spirit of cooperation and practical and realistic attitude of the participants;
- The advance of common academic guidelines, academic theories, developmental stratagems and working methods;
- The organization of research groups, directed by high-level academic leaders, which are made up of a combination of the old, the middle-aged and the young;
- The promotion of practical problems which it is urgent to tackle.

Regional studies

• *Sustainable Development of Human Settlements in the Northwest Area of Yunnan Province.* This is a collaborative research between the provincial government of Yunnan and Tsinghua University, which involved the School of Architecture of Tsinghua University and several local institutes of Yunnan Province. The Northwest Area of Yunnan is distinguished by its richness of ecological and cultural diversities, while suffering from the fragility of environment and the backwardness of economic development. Aiming at improving the living environment of the local people, we searched for the potentiality to accelerate the pace of local economic development yet to better preserve the regional feature of ecological and cultural diversities. Some constructive propositions were made:

- to coordinate ecological preservation with socio-economic development by setting up a regional network of preservation of ecological diversity;
- to encourage the development of tourism and related service industries as the key to promoting the local economy;
- to consciously conserve the diversity of regional cultures under the pressure of economic growth;
- to ameliorate the planning, construction and governance of the living environment.

Finished in 1999, the research achieved such success that all the proposals were accepted by the local government and some of them were even applied.

• *Spatial Development of the Region of Greater Beijing.* As one of the most important regional studies in China, this research work was done in the past two years, involving more than ten research institutes of different cities and hundreds of specialists of different disciplines. It is a successful experiment of the Sciences of Human Settlements in the practical field with the application of the problem-oriented method, the trans-disciplinary communication, the collective work of Community of Science, the holistic thinking, the Science of Complexity, etc. The research object concerns the territory of the Municipalities of Beijing and Tianjin and the northern part of Hebei Province. With reference to the experiences of other countries, we approached the region from the global point of view in the following aspects: strategic role, regional function, spatial layout and mechanism of coordination and cooperation. Based on the deep-going analysis of the current situation of the region, the spatial development of Greater Beijing was restructured, aiming at the emergence of a prosperous world city.

- Combination of organic disposal and rational regroupment in a regional dimension. It means gradually relocating certain urban functions of the core-cities like Beijing and Tianjin to other cities and greatly encouraging the growth of middle-sized cities to transform Greater Beijing from a mono-centered region to a multi-centered city-region.
- Macro-control over the actions of land use from the regional level. Forests, agricultural lands and ecological areas are defined as preservation areas or non-development areas while the comprehensive remanagement of the valleys is considered an important step to ameliorate the regional environment.
- Regional cooperation in terms of the construction of multi-level and multi-functional transportation network. The radial-concentrated pattern should be transformed to a densified network centering two cores with Tianjin being treated as another hub of regional, national and international communication besides Beijing.
- Prototype of Transportation Corridor + Urban Cluster + Ecological Network. It is suggested that the new urban growth should be reorganized in urban clusters of reasonable size, interrupted by ecological green lands, along several transportation corridors.
- Enhancement of regional governance and establishment of cooperative and coordinative mechanism. Regional organizations composed of the concerned departments of the central and local governments should be set up to implement permanent control over regional growth, while special committees should be set up to deal with the key issues in the construction of human settlements, such as the regional network of transportation, the preservation of water resources, the amelioration of the regional environment, the restructuring of the regional economy, and so on.

Projects of urban planning and design

• As case studies in the research of *Sustainable Development of Human Settlements in the Northwest Area of Yunnan Prov-*

ince, several practical projects were done in Zhongdian County, including the Master Plan of Zhongdian County, the Urban Design of the Town Center of Zhongdian and the Preservation Plan of Jiantang Town in Zhongdian. The former has already been approved by the provincial government and was implemented at the end of 2000.

- Evaluation of the Master Plan of the New Area of Suzhou and Detailed Plan for Recent Actions, a project commissioned by the local government, which has been approved by the professional committee of experts.

Projects of architectural design

- Central Academy of Fine Arts. The project concerned the planning of the campus and the architectural design of 95,000 sq.m. Named as one of the Ten Best Projects of Planning and Design of Beijing in 1996, this project was finished in autumn 2001 and has already been put to use.
- Beijing Diaoyutai State Guesthouse. This site planning and design project was approved by the state government in 2000. Based on the project, a building number 19 architectural design scheme of 16,000 sq.m has been completed.
- Institute of Confucius. Commissioned by the city government and Committee of Preservation of Cultural Relics of Qufu, this project deals with the conception of an architectural complex of 12,000 sq.m. As one of the key projects in Shandong Province, the first phase of construction was finished and the building was put to use in 1999.
- Ecological Village in the city of Zhangjiagang. This is an international collaborative project with the Building and Social Housing Foundation of the UK and the local government of Zhangjiagang. Two houses were constructed in 2000 and the environmental evaluation was done in 2001.
- Beijing Housing 2000. This international collaborative project with our Korean colleagues is associated with the research of *Spatial Development of the Region of Greater Beijing*. Exemplary designs have been done in terms of housing rehabilitation and new housing prototype and the results were exhibited in Beijing in March 2001.

Conclusion

In 1993, based on the development situation, we screwed up our courage to set up the concept of the Science of Human Settlements. Seven years later, this concept has been widely accepted in China and also in the world.

Just at the moment that we are starting the WSE 2001 Annual Meeting in Berlin, another conference on Chinese Human Settlements Development is opening in Beijing. This means that the Science of Human Settlements is the focus of attention in the world now and has reached the academic front line with unlimited prospects for the future.

Today, the great rural-urban development sees unprecedented progress in China and its scale and extent stands first in the world. The achievements lead us to think and research the Science of Human Settlements even self-consciously. We should maintain the progress continuously and guide development on the proper route, and search for a new paradigm of tomorrow.