Universe Scientific Publishing

ORIGINAL ARTICLE

Research on the Building Energy Saving Development Planning Workout Pattern

Ling Wang[1*], Wenling Tian[1] and Lingling Fan[2]

[1] School of Civil Engineering, Hebei University of Technology, Handan, Heibei, China

[2] School of Civil Engineering, Shijiazhuang Railway Institute, Shijiazhuang, Hebei, China

ABSTRACT Based on the national situation and combined with status of building energy consumption, building energy saving development planning is the most effective measure to deal with the building energy consumption problem in China. Given the building energy saving development planning problem, proposals are given in terms of the planning patterns, planning flow and the organization, which would be of practical value to the implementation of building efficiency planning in China at current stage.

KEYWORDS

Building energy consumption

Energy saving plan

Planning pattern

1. Introduction

Energy issues is currently the world universal attention problems, the total building energy consumption accounts for about one-third of total energy consumption, the primacy of social energy consumption, building energy efficiency in many countries have been placed in a pivotal position [1] . In recent years, building energy efficiency development plan (hereinafter referred to as the Plan) as the country deal with the increasingly serious energy crisis and developed new plan, has become the basis for building energy efficiency is an important part of building energy management is to achieve a resource-saving and environment-friendly nation-building society, the development of recycling economy, promote the healthy development of urbanization important tool, but ideas and issues facing their programs are new. In this paper, the construction industry from the government to carry out public management perspective, through practice and gradually explore how to build an effective planning model for planning scientific, rational, and standardization to provide theoretical and technical guidance to ensure that China's building energy efficiency achieve milestones [2].

Copyright © 2012 Ling Wang *et al.*

doi: 10.18686/wcj.v1i1.3

Received: January 14, 2012; Accepted: April 20, 2012; Published online: June 26, 2012

This is an open-access article distributed under the terms of the Creative Commons Attribution Unported License (http://creativecommons.org/licenses/by-nc/4.0/), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

*Corresponding author: School of Civil Engineering, Hebei University of Technology, Handan, Heibei, China. E-mail: ling_ww2208@sina.com

2. The concept and status of development of building energy efficiency plan

2.1. The concept of building energy efficiency goals of development planning

EEB development plan is based on the concept of sustainable development, energy saving and emission reduction targets, to nurture and develop building energy efficiency market, a reasonably functioning government action for the protection of urban energy-efficient building construction content and conduct pre-arranged steps and continue process into practice. EEB development planning concern construction demand and consumption situation of energy, starting from the analysis of urban development, building energy consumption growth in the amount of research, coordination of national and local socio-economic development of building energy efficiency requirements; the implementation of national and local energy efficiency policies and norms and other measures; guide the new building energy saving technology, new materials, new system and promote the use of renewable energy sources, to achieve the overall goal of national building energy efficiency [3].

2.2. Status of building energy efficiency development plan

The past 20 years, our government for the construction industry development status and operating conditions of the domestic market economy, promulgated administrative regulations and building energy efficiency standards, local governments began to develop guidelines and procedures to control and guide the building energy consumption, provinces have issued a building energy efficiency development plans, but the development of building energy efficiency in local planning work, important issues remain to

be solved in the presence of the following.

First, the lack of a comprehensive normative building energy development planning model, resulting in local development planning EEB is only a planning department or a business plan, not a comprehensive urban development plan of building energy efficiency, its content is mainly to save energy main index requirements, a "one size fits all" type of energy-saving measures, the macro-control building energy conservation, energy efficiency development plan to make the building cannot fully play its role of direction and guidance.

Second is the lack of building energy efficiency development planning process of unification constraints specified, the lack of effective coordination of government intervention and market mechanism, there is no mechanism for public participation, approval, monitoring and feedback mechanisms are not established planning and the like.

Third, the lack of a sound organizational system, planning of execution is not enough, a direct impact on the planning authority and unity, and ultimately affect the implementation of the program of work.

3. Design planning model

3.1. Design planning mode

Planning model design guidelines: EEB construction in China depends on all stakeholders including the central government and local governments building department, building the energy sector, building energy service companies, building developers and the public, can be summarized as together the three forces of propulsion: the government forces, market forces and social forces. Energy-saving building development planning process, it is necessary to make these three forces can find their focal point, to be able to form the largest force, driven by the ideal plan into reality. Planning model design guidelines: EEB construction in China depends on all stakeholders including the central government and local governments building department, building the energy sector, building energy service companies, building developers and the public, can be summarized as together the three forces of propulsion: the government forces, market forces and social forces. Energy-saving building development planning process, it is necessary to make these three forces can find their focal point, to be able to form the largest force, driven by the ideal plan into reality [4]. Programming mode must focus on building a sound organizational system, management mechanism, public participation mechanisms to ensure the planning of scientific and enforceability.

3.1.1. To plan scientific, can be implemented as the goal of the organization system

EEB development planning organization system, is the sum of the settings from the central government to local government agencies and their planning and management departments at all levels of institutional competence to define. Although the government is currently building committees at all levels are generally set up construction of the specialized agencies. However, the quality and quantity of the system at all levels within the organization structure, far cannot cope with the arduous task of planning in the economic globalization process. System within the Ministry of Construction, should further clarify the authority and responsibilities of different grade level planning organization, the relationship between the organization and the same level of planning their responsibilities and obligations, planning and management institutions and planning agencies and other relevant organizations. Ministry of Construction outside the system should further establish a rational, authority clearly defined, efficient collaboration of spatial planning organization system. Preparation of building energy-saving plan, should the rational allocation of the overall urban planning, energy development planning, housing development planning, urban renewal planning, urban ecology layout planning, environmental planning, spatial planning functions and powers, the eventual establishment of a unified spatial planning and management organization regular meetings with departmental co-lateral system combines organizational system.

3.1.2. Government intervention and market mechanisms for the management mechanism combining features

Market mechanisms to promote energy efficiency, create the conditions for sustainable development of building energy efficiency. However, in the process of free and open economy, the market cannot make everyone equal opportunity to enjoy the power and the development of substances than are more interested in the implementation of the blueprint, requires the ability to realize the economic value of energy-efficient buildings, there is an urgent need for government intervention in a modest in order to control the market power failure. Government intervention refers to the government to use economic and legal means and necessary administrative means to regulate market supply and demand, create a favorable economic and social environment, and create favorable conditions for the market to run well. In other words, the government in building energy efficiency in developing interventions to regulate economic activities, through the development of building energy conservation technical specifications and corresponding laws and regulations, to carry out energy-saving building label certification work to develop strong operational policies, including mandatory and incentive to provide information services and other measures to promote the development of energy efficiency in buildings, in order to achieve efficient allocation of resources. Market mechanism and government intervention is indispensable to the development of China's construction industry in two ways. Moderate emphasis on government intervention with the market mechanism, through appropriate and effective government intervention into the normal market mechanism and orderly track, so that China's construction industry on the path of sustainable development, which is both neces-

sary and feasible. Japanese government under the unified market economy timely and appropriate planning intervention, "the overall market economy + regulator + social justice" planning mode under the German social market economy, as well as Hungary, Sweden, Denmark, the Netherlands and other countries plan and market integration The plan provides us with a useful reference experience.

3.1.3. Public participation in planning and political participation as a means to push the lead force

EEB public participation in development planning refers to EEB stakeholders through a certain way or procedures, the use of various forms of exchange of information for the content of planning, to express their views, decision-making, implementation, monitoring and evaluation process or behavior. Planning is a product of the past, mostly made directly involved in politics, and rarely considers the public participation process, planning reflects only the government intention. It is true that the need for government intervention in the market mechanisms, but planning as one of the functions of government, not direct operation, but plays coordination, arbitration and validation of the role. Also, the Government is not omniscient, its decision is made by the people, because of various reasons, and there will be government failure. Steiner believes that a plan's success depends largely on the number of affected people to participate in its decision-making process [5]. So must pay attention to the relevant interest groups involved in planning, focusing on the power mode of action planning various decisions in the planning process, the importance of the decision-making process of planning by introducing public participation mechanisms in the planning process, as far as possible to meet specific regional planning energy efficiency in buildings The value orientation. Further diversity main building, the need to reflect future values of the main building diverse and subjective determination by way of public participation. External features architecture also determines the necessary coordination by way of public participation of stakeholders. This not only allows different interest groups to enjoy equality of opportunity and voice in the development of policy, planning and management process. It also can form a good oversight mechanism, so that government decision-making more open, transparent and democratic.

3.2. Framework for building energy efficiency development planning model

Multi-stage planning model design should be planned (Preparation – planning process – planning and implementation) starting to solve a problem only highlights of each stage, and the harmonization of the relationship between each stage, by the "rough" to "fine" to achieve coordination at all levels of optimization. Planning must pay attention to government intervention and market mechanisms combine to achieve the government's development plan for the EEB macro-control targets, and play to the basic role of the market mechanism optimal allocation of resources; emphasis on planning various decisive force in the planning process mode of action, stressing organic coordination with public participation in political participation, through

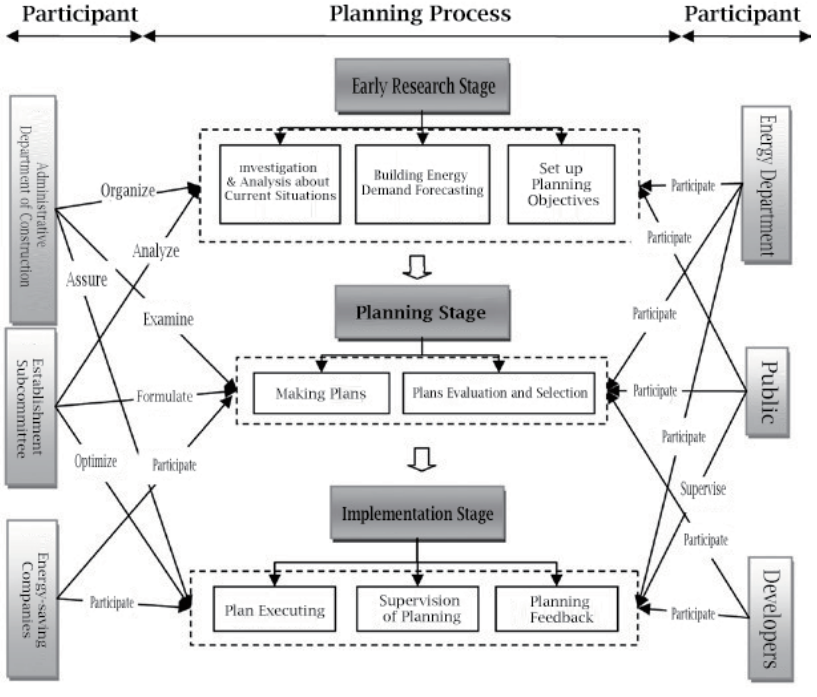

Figure 1. Planning mode frames.

the introduction of various implementation mechanisms in the planning process, as much as possible in line with the value orientation planning a specific area of building energy efficiency development.

Therefore, local conditions to grasp the social development stage EEB proposed planning model framework shown in Figure 1, the planning process of the model is "preliminary studies - Planning and implementation - planning to develop" all stages of the cycle, organizational systems are all participating members in the planning duties. Government and local construction authorities as the leader, the main work can be summarized as "Pre- guidance, process supervision, post assessments. Planning Group as compilers planning work, the main work can be summarized as investigation and analysis, comprehensive coordination, planning; other auxiliary units mainly provides data support for planning.

4. Planning processes and organizational system

Building development planning process and the planning result of energy-saving practices are unknown, from planning and design to implementation faces many uncertainties. To address the scientific planning, foresight and preparation process can be implemented targeted include: the preliminary study stage, planning stages of development, planning and implementation phase of three phases.

4.1. The preliminary study stage

Preliminary research stage work is through the urban status quo and development trend, the basic situation of the status quo, construction technology and application of energy-saving building energy consumption survey, analysis of urban building energy characteristics and ways to assess the development of its existing building energy efficiency, urban EEB develop practical goal.

(1) The early research stage. The first step: Status Survey and Analysis of urban architecture, In order to ensure the scientific planning and implementation of targeted investigation of various factors on the development of urban architecture; the second step: building energy demand forecast, in order to maintain. We are planning Prospective and accuracy as the goal, analyze the relationship between building energy consumption and environmental impact; The third step: the establishment of planning objectives, based on building Investigation and analysis, set realistic urban building energy-saving targets.

(2) The implementation of the body of the preliminary study stage. The form and content of the survey-construction supervisor. Composed of sector-led planning team Planning Team using statistical theory, identify indicators building energy consumption survey, design and survey forms and organization of the investigation; Investigation of energy consumption indicators - building the energy sector, the public; Building energy demand forecast-Planning Group; Set planning goals - planning team, building the energy sector, the public.

"Establishment of planning objectives" is a specialized democratization of the policy process, must pay attention to the combination of public participation and political participation, brainstorming rely on local expertise and respect for public opinion. Resident representatives were playing the role of different social sectors, such as politicians, government officials, scientific experts, entrepreneurs and social workers, urban construction problems in the development of energy-saving solutions are proposed, summarize and bring together all the members of the proposed feasibility program, finalized a report containing a series of objectives, analysis of priority measures and the preferred action programs.

(3) Contents of preliminary study. Investigation and analysis of urban architecture-tune check on the completion of the planning cycle EEB, national policy guidance; the city before, the scale of urban development and socio-economic conditions; resources urban power grids, gas and heat networks and network status; available within the area of renewable energy resources available, including: solar, wind, geothermal and biomass energy; the basic situation of existing buildings, including the existing building size, structure and energy consumption; building energy conservation demonstration projects to promote energy-saving technologies and circumstances.

Building energy demand forecast-combining content analysis of urban building energy consumption survey the situation, with performance characteristics and ways to assess their existing development model for building energy demand forecasting; to establish planning objectives-including the regional macro-savings targets; each Class of building energy efficiency targets; types of building energy efficiency targets; major energy-consuming equipment, energy efficiency indicators, the city development plan will focus on building energy saving energy saving target to develop.

(4) Analysis of previous studies. Statistical theory, system dynamics, and The rapid development of remote sensing and GIS technology as the representative of modern planning techniques will help solve three major problems facing the EEB development planning [6]: First, the beginning of planning to collect information and data on a variety of planning, coordinating and analysis, using geographical information (GIS) technology to build building energy database model and statistical analysis model, achieved in GI S platform building energy consumption data entry, statistical analysis, updated; the second is the planning process based on the analysis of the planning scheme prediction, comparison, primarily the relationship and dynamic simulation from a quantitative point of view SimCity building energy consumption and environmental impact of each element, through the regulation of core parameters, comparative analysis of urban building energy consumption under different scenarios of development momentum; Third planning and implementation process, real-time monitoring and dynamic management, dynamic

management system is an important technical support program implementation, with strong flexibility and applicability, able to establish a plan, improve and implement play a significant role.

4.2. Planning stages of development

After the completion of the planning goal setting plan to develop, plan is to eliminate the gap between the current situations to the goal of a series of countermeasures taken, is the relationship between the elements constituting the EEB specific process.

4.2.1. Planning principles developed

Planning for both the development of building energy efficiency

Existing Situation issue, measures to solve, but also for the goal of building energy efficiency development plan, find ways to reach the target, but also consider limiting building energy efficiency development of the external environmental conditions, including the natural environment, social and economic environment. Planning for the existing problems requires a scientific, objective-oriented planning requirements planning has advanced, consider limiting factor requires planning to have operability. For the planning process, requires a clear dominant force in this process, through the study of the various stages of content, features, logical relationship between each other, the relationship between the three forces of planning to build a scientific and rational planning of content.

4.2.2. Planning program

Develop programs

Elaboration of new buildings Energy saving, energy saving of existing buildings, renewable energy applications in buildings, heating system and large public building energy efficiency in different stages of development planning. Each required a specific plan lists the program objectives, program details, implementation methods, timetables and expected results of five elements.

Program evaluation and selection

Combined with the task entrusted by the government, comparative analysis of different scenarios planning, target planning, implementation, benefits, role, impact and social identity objective analysis system, optimize and determine the plan.

4.2.3. Plan developed and implemented the main stage

Develop programs*:* Developed over due Planning Cheng will involve the interests of all aspects of the construction industry, need each other to achieve the balance the interests of the game process, so the work is primarily the planning stage led the development team plan, participating departments include: building the energy sector, building energy efficiency companies, construction developers and the public to plan discussion, revision, and tissue breakdown discuss and participate in the development of the next phase of detailed planning schemes.

Program evaluation and selection: Construction authorities should seek the views of the public on the basis of experts to conduct feasibility studies evaluate the plan.

4.3. Planning and implementation phase

Transition from planning to implementation is critical, because the face is planning future development and a wide selection of uncertainty, resulting in the implementation process will also appear many uncertainties, it is necessary to establish a monitoring and feedback mechanisms solve new problems arising from time to develop and gradually emerging. Planning and implementation, program monitoring and feedback are three main steps to planning the implementation phase.

4.3.1. Planning and implementation of the subject

Planning and implementation

Building departments, Building energy companies, construction energy companies, building developers and other departments to effectively implement planning;

Planning supervision

Building departments, public oversight simultaneously, ensuring coherence government and local building department to support efforts;

Feedback and correction plan

Planning team, building energy companies, construction energy companies, building developers, public.

4.3.2. Planning and implementation of the safeguard mechanism

Planning monitoring mechanism

Through monitoring, evaluate the overall program planning process in the implementation process through feedback to continuously improve and perfect, ensuring quality and intended target of specific action programs.

Planning a feedback mechanism

Throughout the whole planning process, it plays an important role in planning the monitoring and evaluation of the implementation process. By identifying key indicators to monitor data and gather information summarizes feedback received, adjusting assumptions and updating the initial target, the impact from an earlier stage of the program began a series of steps.

4.3.3. Content planning and implementation stages

Planning and implementation

The members of the party according to the plan Case objectives and requirements, content and priorities through the implementation of the audit of the special planning. At the same time, issues change and implementation process combined with external situations encountered, under the

guidance of the government and local construction authorities, based on GI S technology planning and management and decision-making system, combined with on the basis of the relevant spatial database construction investigation of early stage and statistical analysis, etc., to achieve information for planning and implementation of the decision-making management of the whole process, and timely to carry out the revision of the plan rolling amended to ensure the correctness of planning and enforceability.

Planning supervision

To key program objectives for the indicators to measure the effectiveness of implementation of the program; the extent of the situation and the extent of deviation from the success rate and programs for each particular level of overall advancement of the implementation plan as an index, check the value of the feedback milestones reached. Emphasis on public participation in planning and monitoring mechanisms, government and building departments take the initiative, take full advantage of the results of the performance of the various means of extensive publicity means, smooth channels of public oversight, strengthening each level of public participation in planning and implementation. Each step of program implementation should reflect the communication and careful planning arrangements with each program participant.

Planning Feedback

Because the planning process is full of uncertainty, to monitor data and information obtained feedback summary, the need for continuous follow-up phase to the contents back to the front of the stage, by adjusting the assumptions and the initial target of update methods, adjust the position of each stage of awareness of the problem, consider the content may have previously ignored, questioned the initial evaluation, the impact of the start of the study from the pre-programmed series of steps to reposition the action plan, so that planning has become a dynamic, continuously the process of Eco-cities are to become a reality, education is a prerequisite. (1) For urban policy makers, managers, technical personnel and other missionary planning and training, capacity building of these people; (2) Through various means and channels, to the masses of low-carbon, ecological aspects of publicity and education, in particular to strengthen basic education advocacy; (3) Guide public behavior follows the "5R principle", the initiative to change from the traditional model to the high-carbon low-carbon eco mode. Strongly encourage people to consciously choose green consumption, promote public to develop green consumption habits, clothing, food, housing, transportation, reduce unnecessary waste with various aspects, to develop health, science, green, ecology, low-carbon lifestyles and lifestyle; (4) Establish reward system, reward the behavior and practices of green, punish anti-ecological, environmental destruction, in the whole society to protect the ecological glorious, good atmosphere shameful anti-ecological concept of honor and distinct ecological city.

5. Epilogue

Humans have been in pursuit of the ideal of urban development patterns. Some historical conditions at the time the advanced concepts (such as Garden City, linear city, Broad acre City, bright city, etc.) he took to develop to become a reality, but they enriched the theory of modern urban planning, urban development for future generations provided reference.

Ideological Origins of Modern Ecological City in Garden City Theory, "eco-city" and "garden city" has some similarities, but there are also very different. The current ecological city construction has its unique background, which is a hundred years ago the British cannot match. Eco-city construction in China is entirely possible breakthrough concept, the success of the practice. Current Situation and Problems of Chinese eco-city construction learn English Garden City movement of the experiences and lessons that we should start from theory, techniques, practices, institutional and educational five-pronged approach to comprehensively promote the eco-city development in China, as early as possible to achieve good ecological city ideal.

We should also recognize that: eco-city is not an ultimate goal, it is a process to realize their own ideals of humanity, it is a way and means to the pursuit of sustainable human development. As British scholar Martin Jacques said: "the 19th century, the Church of England in the world how to produce; the 20th century, the United States taught the world how to consume; if China is to lead the 21st century, it must teach the world how to achieve sustainable development." Let us work together to meet the eco-city China's development of a better tomorrow.

Acknowledgments

The Secretary-General thanked the Chinese city of science will give Lee inquiry guidance and help.

Conflicts of interest

These authors have no conflicts of interest to declare.

Authors' contributions

These authors contributed equally to this work.

References

1. Chou, B. X. (2010). City to make life better. *Urban Studies, 2*, 1–15.
2. Xie, P. F. (2009). London Metro Planning Construction (1898—1978), London Metro building experiences, lessons and enlightenment to Beijing. *Peking University doctoral thesis*.
3. Li, X., Cao, G. Z., Xu, W. Z., & Yang, C. Z. (2010). China and other low-carbon eco-city development strategies. *Urban Studies, 1*, 32–45.