

The Formation Mechanism of Emergency Logistics Standard System

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Abstract—Emergency logistics standard system is a typical post-standardization system, with the coordination, forward-looking, public welfare, industry and other notable features. From the perspective of mechanism, we can see that the formation of the standard system of emergency logistics is affected by the integration of emergency logistics standard projects, the forward-looking guidance of emergency logistics technology system, the promotion of emergency logistics public welfare undertakings, and the innovation-driven response of emergency logistics service industries. To speed up the formation of a standard system for emergency logistics, we should scientifically grasp the formation mechanism and give full play to the guiding and guiding role of the theory. We should make plans and improve the technical organization in a forward-looking manner to make overall plans to promote the system and steadily push forward the standardization of emergency logistics.

Keywords—emergency logistics, standard system, formation mechanism

I. INTRODUCTION

Since the concept of emergency logistics was put forward by the experts and scholars of the armed forces in 2003, China has made great strides in theoretical research and practical exploration of emergency logistics and has played an irreplaceable role in the previous emergency response [1]. In particular, Hubei logistics and distribution emergency support mobilization center, Jiangsu credit Emergency Logistics Rescue and Protection Mobilization Center, Xi'an grain emergency logistics base, Military and civilian integration of emergency delivery security base, Gansu military and civilian integration emergency logistics base, Three Gorges Emergency Logistics Center, Xiushan County "China Emergency Logistics Practice Base" in Chongqing Logistics Park, Shandong Province Emergency Logistics Alliance and a number of emergency logistics service support entities have been built and gradually play a role [2~9]. It should be said that in recent years, Emergency logistics construction has continued to accelerate in accordance with the "government-led, market-oriented" dual-wheel drive ideas and achieved remarkable results.

However, in practice, the standardization of emergency logistics is relatively low, the standard is missing, and the relevant standards are not unified. To a large extent, the effectiveness of emergency logistics support has been severely restricted. As early as October 2008, some experts pointed out

Fund Project: National Key Research Project "Research on Emergency Logistics Standard System" (2016YFC0803202)

at the International Conference on International Logistics and Transportation in China that "there are still many problems in the current emergency logistics and even the emergency response mechanism. For example, the flow of emergency logistics is confused, the logistics information technology and standards are lacked and "the logistics standards of aircraft, automobiles and railways are not unified", "The construction of the emergency logistics system is crucial for the normal development of rescue operations after disasters occurred and the related works like improving the standards is urgent" [10]. To this end, *the Medium and Long-Term Plan for the Development of Logistics (2014-2020)* clarifies the "Logistics Standardization Project" and requires focusing on promoting logistics technology, information, services, and emergency, etc. logistics standards revision process [11]. National Standardization Management Committee, National Development and Reform Commission and other departments jointly issued the notice on printing and issuance *the middle and long-term development plan for logistics standardization (2015)*, the emergency logistics Standards included in the standard system revision key areas [12]. In particular, the General Office of the State Council announced the "*Thirteenth Five-year Plan*" for the National Emergency Response System Construction and clearly stated that it is necessary to "speed up the formation of a standard system for emergency logistics and gradually achieve emergency logistics standardization, modular and efficient." [13]

The formation mechanism of emergency logistics standard system is a regular understanding of the generation, development, maturity of emergency logistics standard system. It is an important realistic issue in the methodology of emergency logistics standard system research. Deeply studying the forming mechanism of emergency logistics standard system is of great theoretical and practical significance for constructing scientific standard system of emergency logistics, probing deeply into the theory of emergency logistics standardization and cultivating new forms of emergency logistics service.

II. THE LITERATURE REVIEW

As early as the late 1950s in our country, the issue of establishing a standard system has been put forward. In the mid-1970s, China formulated the first standard system table; in 1984 most of the industries have prepared a standard system table. China has also promulgated *standard system table compilation principles and requirements* (GB/T 13016-2009),

Enterprise Standard System Table Compilation Guide (GB/T 13017-2008), *service industry standard system compilation guide* (GB/T 30226-2013), and other national standards, from different angles regulate the construction of the standard system of the relevant principles, methods and requirements. *Standard System Theory and Practice* published in 2010 systematically introduces the history, status and theory of the standard system, explains the technical clauses in GB/T 13016-2009 and GB/T 13017-2008, and introduces the standardization Laws and regulations, basic standards and basic principles, discussed the typical cases of industry and enterprise standard system practice [14].

Objectively speaking, China's emergency logistics standardization just started, on the emergency logistics standard system, especially emergency logistics standard system formation mechanism of the research results is rare. Only a few literatures studied the status quo of the research and development of relevant standards of emergency logistics at home and abroad, analyzed the demand for the construction of emergency logistics standard system, put forward the guiding ideology, basic principles and basic framework of emergency logistics standard system, proposed the specific measures to promote the construction of emergency logistics standard system [15]. Even as standard project that constituting the emergency logistics standard system, has just two national standards of *Enterprise Emergency Logistics Capability Assessment Standard* (GB/T 30674-2014), and *Emergency Material Delivery Packaging* (GB/T 30676-2014) and Labeling Promulgated at present [16].

The research achievements of the standard system construction in other industries have an important reference for the research on the forming mechanism of the emergency logistics standard system. For example, to the Global Energy Internet (GEI) standard system, preliminary achievements have been made in the research on construction methodology, and the working ideas for establishing GEI standard system in the existing technical fields and professional directions have been put forward [17]. To the transportation environmental protection and energy conservation standard system, the system framework has been determined the ideas and structure levels [18]. To the multimodal transport standard system, the principle of frame construction has been studied, and a framework consisting of transport equipment, station facilities and equipment, operation service, information and statistical evaluation modules has been constructed [19]. To the standard system of energy conservation, according to the goal of "building an energy-saving standard system with advanced indicators and in line with national conditions", energy-saving standards have been classified the process of energy conservation, and seven common basic objectives, design, construction, operation, evaluation and optimization are established Standard sub-system constitutes a framework [20].

In short, at present, China's research on emergency logistics standardization should just say that it has just started, and major issues such as the establishment of emergency logistics standard system are urgent to deepen the study. Therefore, we should make full reference to the theory and practice of building reference systems in other industries, systematically analyze the characteristics of emergency

logistics standard system, discuss the mechanism of emergency logistics standard system in depth, and lay a solid foundation of methodology for the research of emergency logistics standard system.

III. THE CHARACTERISTICS OF EMERGENCY LOGISTICS STANDARDS SYSTEM

Theoretically, emergency logistics standard system is part of the post-standardization system. Namely, the emergency logistics related industries may have carried out standardization in their fields respectively, forming a standard system to some extent, which has been widely used in every aspect of economy and society. These standard systems which have already existed in their fields are difficult to change due to emergency logistics standard system. The construction of emergency logistics standard system will inevitably be based on this, and the property, namely, post-standardization, will contribute to some unique characteristics.

A. Coordination

Coordination refers that the degree to which the internal components of emergency logistics standard system are interrelated with the relevant standard system and the external regulation and policy environment.

First, there is the coordination between emergency logistics standard projects. The standard project in emergency logistics standard system is a unified solution given from a standardization point of view, which has different meanings to the standard project with characteristics of "one project one discussion". The standard project of emergency logistics should be integrated in both general guidelines and specific indicators, and the technical level should be relatively close either from elements like human resources, material equipment, facilities, equipment, information resources, or from macro strategy, medium management, micro operation, or from links in the production chain such as raising procurement, warehousing, packaging, sorting, loading, unloading and moving, traffic in transit, distribution as well as information control, or from fields like protective equipment, life salvage, life support, rescue vehicle, temporary accommodation, pollution clearance, power fuel, engineering equipment, tools, lighting equipment, communication facilities, transportation, and engineering materials.

Second, there is the coordination between emergency logistics standard system and some related industries. Compared to other related industry standard systems, emergency logistics standard system, though time is short, the related indicators should not oppose to each other but shall be consistent.

Last, there is the coordination between emergency logistics standard system and the external regulatory policy environment. The emergency logistics standard system, which is in the comprehensive function of the external regulation and policy environment, must comply with and reflect the spirit of relevant regulations and policies, and implement the system design of the regulations. Of course, the regulations, policies and the standard systems in other fields should be mature, normative and scientific. If some certain clauses are not

reasonable, the emergency logistics standard system should not be coordinated with them.

B. Industry

Industry refer that the emergency logistics standard system is applicable to specific industry field-emergency logistics, which should fully reflect the characteristics of the emergency logistics industry. From the perspective of industry belonging, emergency logistics is a special field of modern logistics industry. Generally speaking, modern logistics system is the basis of emergency logistics, providing the basic guarantee of resources and power for emergency logistics service guarantee. As a new generation of modern logistics, emergency logistics is a branch that provides material support to cope with crisis issues [21]. Emergency logistics is also an organic part of the emergency industry, laying a solid material foundation for emergency management. During the 12th five-year plan period, the national and regional emergency logistics construction projects have been identified as one of the key tasks to strengthen the construction of emergency management capacity [22]. *The general office of the state council of the People's Republic of China: on speeding up the development of the emergency industry* also puts emergency logistics into the category of emergency services as the key direction for the development of the emergency industry. Therefore, emergency logistics standard system is a part to national standard system, and is a part to both modern logistics standard system and emergency industry standard system, defining standardization in the field of a particular industry. The emergency logistics standard system is similar to modern logistics standard system and emergency industry standard system, and there is difference. The similarities is that emergency logistics standard system is subordinate to modern logistics standard system, but it has a cross relation to the emergency industry standard system. The difference is that the emergency logistics standard system should fully reflect the properties of emergency, service and public interest of emergency logistics, and reflect the specific characteristics of the emergency logistics industry.

C. Perceptiveness

Perceptiveness' refers that the emergency logistics standard system should be fully embody dynamic openness and rolling development, playing a leading role in technical system, service mode, system and mechanism in innovation and development of emergency logistics. In generally, the standard system should attain a rolling development and achieve a dynamic update to adapt to the continuous development of economy and society. However, the construction of emergency logistics system in China is still in the planning infancy from an objective perspective. Compared to some other mature and systematic industries, it has a favorable opportunity to be built with forward-looking design and systemic planning. As a result, the formation of the emergency logistics standard system can effectively grasp the rare advantage of backwardness, striving to strengthen the theoretical research and practical exploration and focusing on the current reality demand, with a view to the future long-term development, system planning, scientific design and to building forward-looking, reasonable structure of emergency logistics standard system. In particular, we should have a scientific prediction and accurate grasp of the direction of key

technology of emergency logistics, and effectively avoid standard projects' influence on technology innovation and restriction, covering relevant levels, elements, links, and fields of emergency logistics. We should not only ensure the complete emergency logistics standard system framework and bring the leading emergency logistics technologies, auxiliary technologies and existing service patterns into the standard system, but also lay a foundation for subsequent service mode innovation by forward-looking design, reserving sufficient space for development of emergency logistics pilot technology.

D. The public welfare

Public welfare means that the standard system of emergency logistics should not only improve operational efficiency from a market perspective, but also regulate the development of the industry from the perspective of public welfare undertakings and restrict emergency logistics support activities and related elements through mandatory standards. In general, the standard is based on the market. The standard is to "get the best order and get the best benefit" [23]. However, emergency logistics mainly serves public emergencies, making the basic properties of emergency logistics standard system, compared with the standard system with standardized market as the main function, a great degree of shift has taken place, showing more government departments Active involvement and strong leadership. In particular, the emergency logistics industry can also be applied to the socialization of logistical support for the armed forces in accordance with the requirements of "peacetime service, emergency in an urgent need and fighting in wartime" to provide supplies to the armed forces. It can also be put into wartime after the mobilization and in accordance with the military requires the implementation of material support security tasks. From this perspective, the formation of the standard system for emergency logistics should focus on the characteristics of the public welfare service support operations, with mandatory standards as the main, supplemented by the recommended standards. In the full implementation of the mandatory standards of the conditions are not mature enough, you can take a phased, step-by-step strategy to organize the implementation, that is, in the early stages of regulating the development of the industry, industry standards can be the main research and development of emergency logistics standard system to be emergency Logistics theory and practice of exploration and standard projects mature, and then rose to national standards, a comprehensive and systematic regulation of emergency logistics industry.

IV. THE EMERGENCY LOGISTICS STANDARD SYSTEM FORMATION MECHANISM ANALYSIS

The research and analysis of the forming mechanism of emergency logistics standard system is an important part of deepening the understanding of emergency logistics standard system from the perspective of methodology and has important theoretical and practical significance for scientifically establishing emergency logistics standard system. The formation of the emergency logistics standard system, contains the elements, elements and between elements and the external environment of mutual connection and interaction. Objectively

speaking, the emergency logistics standards system is in the process of being formed, both standard projects have been formulated and published, there are also being studied in the formulation of standard projects, more of the future plan to study the development of standard projects, and Also need to give full consideration to the convergence of the standard system in other industries related to it [23].

A. Based on system theory emergency logistics standard project aggregation and integration

System is composed of interconnected, interactive elements of a certain structure and function of the organic whole. Research shows that Germany, the United States, Britain and other countries in the national standard system research and practice also attaches great importance to the use of systems theory [24]. The emergency logistics standard system covers all levels, elements, links and specialties of emergency logistics. It is a complex system composed of several standard projects which are linked to each other and work. The effective functioning of the emergency logistics standard system needs to fully grasp the characteristics of its integrity, relevance, functionality, environmental adaptability, dynamisms and orderliness, and make it operate orderly through a complete set of elements and reasonable structure, effectively regulate and constrain the construction, development and operation and management of emergency logistics.

First, we should integrate the system of emergency logistics standard projects. For the existing emergency logistics standard projects, we should integrate the system of emergency logistics standard as an integral part. At present, two national standards of *Enterprise Emergency Logistics Capability Evaluation Standard* (GB/T 30674-2014) and *Emergency Material Delivery Packaging and Labeling* (GB/T 30676-2014) have been promulgated in December 2014, and came into effect in July 2015 [25]. *Emergency logistics warehousing facilities and equipment, emergency logistics service cost accounting and emergency logistics service standards* and other industry standards and local standards, research work has been completed or being completed [26]. These standard projects need to be integrated into the emergency logistics standard system and set appropriate modules to match the overall performance according to their specific functions.

Second, we should overall plan emergency logistics standard system. The formation of the standard system for emergency logistics, focusing on overall planning and scientific design, to avoid structural imbalance, broken links system dysfunction, insufficiency and other issues so that it fully regulate the constraints, leading the development of emergency logistics industry. We should give consideration to the needs of economic construction and national defense construction, take full account of the differences in regional development and the framework of the scientific design standard system, and make overall plans for the research and formulation of standard projects. Determine the level of emergency logistics standards and priorities of the project. And we should roll out the plan, co-ordinate emergency logistics standard project revision, in order to ensure the

continual and healthy development of emergency logistics industry.

Third, we should organic convergence related industry standard system. For the relevant industry standard system, then focus on docking fusion. Relevant industry standard system has a considerable basis for the development and a certain degree of maturity, in a sense, the main reference and an important foundation for emergency logistics standard system. Emergency logistics standard system performance of the external functions should be related to the industry standard system of organic convergence, seamless convergence, integration. For some more complex conditions do not have the situation, predictable set aside the perfect interface. It should be pointed out that, in addition to the truly unique emergency logistics standard projects, many standard projects can use the standard projects in related industries.

B. Based on technological innovation emergency logistics technology system lead the way

In general, technological innovation is the application of innovative knowledge and new technologies, new processes, adoption of new modes of production and operation and management, improvement of product quality, development and production of new products, provision of new services, market occupation and realization of market value. The formation of the standard system of emergency logistics should fully consider the factors of technological innovation and look ahead to the design of the system structure so as to effectively lead the innovation and development of the key technologies of emergency logistics, especially the leading technology, and effectively promote the coordinated development of the leading technology and assistive technology.

First, we should lead the innovation and development of emergency logistics technology. The key technologies are the technologies that play a decisive role in enhancing the core competitiveness of the industry, improving or extending the industrial chain, and nurturing emerging industries. The fundamental purpose of the emergency logistics standard system is to improve the level of emergency response materials and service quality, if not timely introduction of advanced technology, will inevitably meet the needs of the situation and tasks. Therefore, with the continuous emergence and rapid progress of advanced technologies such as artificial intelligence, big data and unmanned systems, the key technologies of emergency logistics, especially the leading technologies, will also continue to evolve. The standard system of emergency logistics must adapt to this trend, Promote the application of reserved space for the pilot technology innovation and development to provide forward-looking lead. For example, the use of artificial intelligence technology planning emergency materials distribution path, the use of big data technology to determine the pre-storage of emergency supplies of species structure and distribution, the use of unmanned systems to deliver emergency supplies, these issues are necessary to be included in the system support, reasonable structure Emergency logistics standard system, through the systematic means to lead and regulate.

Second, we should promote the coordinated development of leading technology and supporting technology. The emergency logistics standard system regulates the whole system and the whole process of emergency logistics construction, development, operation and management, promotes the scientific of emergency logistics and enhances cost efficiency. For example, the emergency logistics adopts such means of transportation as road, a rail and air transport as well as the technical means of equipment, management and handling of loading and unloading, warehousing, storage and other functions, and can widely share the application in different industries or different regions, having a general promotion of economic and social development. Through the standardization of the emergency logistics standard system, the coordinated development of the leading technology and assistive technology of emergency logistics should be promoted in an all-round way.

C. Based on Public Goods Emergency Logistics Public Welfare Promotion

Public goods refer to those products that are both non-competitive and non-exclusive in consumption. As emergency logistics has greater risk and basically does not have clear market competition attributes, it mainly serves the public interests of national security, social development, improvement of people's life quality and environmental improvement. Relying solely on the market may be due to the profit-seeking of enterprises Harmful and invalid. Therefore, it is necessary for the government to scientifically standardize the industries with strong public interest such as emergency logistics to provide the public with reliable public goods through government intervention.

First, we should regulate emergency logistics resources. Emergency logistics standard system needs to focus on emergency logistics service support facilities, machinery and equipment, materials and other resources for scientific norms, unified specifications, performance parameters, interface protocols, so that they can be butt fusion with each other to form an organic whole, efficient and orderly put it into emergency logistics service support activities.

Second, we should establish efficient response, the use of processes. Only a standardized command and dispatch process can achieve efficient response and rapid mobilization. Emergency logistics standard system as a whole, overall planning and management of emergency logistics operations management processes, early warning response, mobilization and use, command and control, information flow and other aspects of smooth and efficient to ensure that the overall function is greater than the sum of the various local functions.

Third, we should regulate volunteer training. Volunteers are important forces in emergency logistics services. However, volunteers play a rather unsatisfactory role in the practice of emergency logistics services in recent years. The fundamental reason is that volunteers lack basic knowledge about emergency logistics operations and management. Through the human resources module of emergency logistic standard system, a systematic volunteer training system can be established to ensure that contingent logistics can maintain strong human resources support in emergency situations.

D. Innovation driven by emergency logistics service industry based on industrial development

Emergency industry refers to a collection of activities formed to provide products and services for the prevention and handling of emergencies. In recent years, many emergencies in our country are prone to occur, frequent and emergency industries have entered a period of rapid development, and new forms of emergency logistics services have also emerged rapidly. *Opinions of the General Office of the State Council on Accelerating the Development of Emergency Industries* explicitly requested, "Focusing on Improving the Level of Social Services for Emergency Treatment and Handling and Innovating the Status of Emergency Services" and Developing Emergency Services such as Emergency Logistics. It will also help local economic and social development effectively. To this end, we should establish a standard system of emergency logistics with complete elements and reasonable structure according to the idea of "industrialization development, systematic construction and intensive management", effectively regulate the emergency logistics industry and strive to foster a new format of emergency logistics services.

First, we should regulate the development of emergency logistics service industry. At present, China's emergency logistics industry generally faces many outstanding problems, such as less professional power, scattered business teams, weak key technologies and lack of standard specifications. In particular, the relatively centralized and unified service platform has not yet been established, and the advantageous production capacity has not yet been brought into full play. Need to be further standardized. The formation of emergency logistics standard system undoubtedly adapted to this urgent need.

Second, we should improve the quality and efficiency of emergency logistics services. Emergency logistics standard system's fundamental mission is to improve quality and efficiency, enhance efficiency and save costs. Only through scientific front-end design, standardizing early-warning response of emergency logistics, mobilization and use, command and dispatch, information flow and methods can we effectively eliminate institutional obstacles and create a contingent of civil and military emergency logistics enterprises and build an open and shared civil and military emergency logistics system, realize emergency logistics construction and development and operation management process-oriented and standardization.

V. CONCLUSIONS AND SUGGESTIONS

The research on the forming mechanism of emergency logistics standard system lays the foundation of methodology for constructing emergency logistics standard system. Based on systematic theory, we should pool and integrate the standard projects of emergency logistics; based on basic innovation, forward-looking to lead the emergency logistics technology system; based on public products, promote the cause of emergency logistics public welfare; based on industrial development, innovation-driven emergency logistics services industry.

To this end, we should implement the innovation-driven development strategy and implement the important idea of "promoting innovation and standard development that standards lead the progress of the times" in the letter of Chairman Xi's congratulation to the 39th International Organization for Standardization (ISO) Conference. Based on the principle of *Building a national standardization system Development Plan and Standardization of Long-term Logistics Development Plan (2015-2020)* and other relevant policy documents, firmly grasp the historical opportunities at all levels of government attention emergency logistics, standing in the national emergency logistics macro strategic global forward planning emergency logistics standard system. Efforts should be made to develop and strengthen the standardization of emergency logistics research strength, promote the National Logistics Standardization Technical Committee relying on the relevant institutions of higher learning and academic groups set up "emergency logistics sub-technical committee" or "emergency logistics standardization working group", apply research results, strengthen organizational coordination and accelerate the construction of China's emergency logistics standard system. It should absorb the mature factors of the relevant standard system in other industry fields, in response to the characteristics and rules of emergency logistics, considering the long-term development of emergency logistics industry, driven by key technological innovation in emergency logistics, scientific research to develop emergency logistics standard system, scroll to set new standards or revise original standard system and standard items.

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