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Review Article

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Study on the Risk Management of Dredging Engineering

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Abstract Dredging project has the characteristics of large investment, long construction period and complicated engineering. It is because of these characteristics that the risk of dredging is high, so it is necessary to carry out the risk management research on the dredging project. In this paper, according to the characteristics of dredging engineering, the risk source of the project is identified and the countermeasures are put forward to provide reference for the risk management of the dredging project.

Keywords Dredging Engineering, Risk Management, Countermeasures

0. Preface

Risk is an events about uncertain future, which is objective exist also can be measured subjectively, but the expected results and actual results are different, the risk may bring loss to stakeholders. Uncertainty is the core of risk. All kinds of risk is hidden in any project. Correct understanding of the project risk, active avoiding and dissolving the project risk is an important condition to the efficient operation of engineering.

The dredging construction project is a kind of water conservancy project, which is a combination of investment behavior and construction behavior. Dredging refers to the use of manpower, hydraulic or mechanical means to broaden and deepen the waters and the excavation of underwater earthwork, modern ports and waterways are generally used large dredger dredging. Dredging stay an important role of the development of the national economy, especially for water transport, water conservancy and flood control, and urban construction [1]. Dredging project has characteristics of large investment, long duration, working conditions change, the complexity of technical processes and so on, that means dredging projects facing higher risk. Therefore, the research of dredging engineering risk is of great significance to the development of economy and has an important effect on the river management.

1. Characteristics of Dredging Engineering

Dredging engineering is a kind of underwater engineering, which belongs to the hidden engineering. Modern dredging engineering is closely linked to shipbuilding, power, machinery, metallurgy, electrical, automation instrumentation, electronics and other industrial level and technology. Many new technologies, such as high-strength wear-resistant materials, information technology, are widely used in dredger construction, making the dredger's technical content is getting higher and higher, its operating performance is more efficient, simple, rapid increase in production efficiency [2]. Dredging works are underwater operations, different from the general construction, has its unique.

1. Have clear construction goals

Dredging projects have a clear goal of construction, as for the construction of dredging project objectives, from the macro point of view of government departments, whether dredging projects is filling landfill, or channel dredging deepened, are to meet the needs of a certain national development , The project to

achieve a certain macroeconomic effects, social effects and environmental effects, from the perspective of the enterprise is more attention to the project's profitability and other micro-goals.

2. Subject to multiple factors

The realization of the goal of the dredging project is limited by many factors. The time constraint means that a project has a reasonable construction time limit. The resource constraint means that the project should complete the construction task under certain conditions of people. Quality constraints refer to the requirements of the project to achieve the expected production capacity, technical level, product grade or engineering use efficiency; space constraints refers to the project in a certain space through scientific and reasonable way to organize the completion.

3. Dredging project is disposable and irreversible

The construction site of the project is fixed, the project can not be moved after the completion of the project, and the design of the unity, the construction of the single. The project is different from the general commodity production and can not be mass produced. Once the project is completed, it is not reversible.

4. Long-term impact

The general period of construction project is longer, the payback period is correspondingly longer, and the service life of the project is long. Therefore, various factors determine the quality of the construction project, and the effect time is long.

2. The source of the dredging project risk

There are many sources of dredging risk, and these sources of risk should be identified in order to take the right approach to avoid the risk. Dredging the risk of the project mainly include the following aspects:

1. Social and political risk.

Such risks include political turmoil triggered by changes in state power, changes in national political, economic, legal, conflicts of different interest groups, social groups, religious factions, influence and involvement of foreign forces. Social and political risk is a strategic level of risk, this risk in the event of a direct impact on the development of corporate strategy to achieve the intention [3]. The development of international market dredging enterprises, the international political, diplomatic, security and other risks of the analysis, forecast, is an extremely important thing.

2. Natural disasters

Due to the characteristics of long duration, the changing working conditions and the complicated technical process, the dredging works are more difficult to control in the process of construction. Therefore, the risk of dredging construction is also high. For example, duringthe dredging construction period, Will increase the amount of sediment and mud silt, if the typhoon struck by the wind affected by the resulting siltation risk will be greatly increased. Nature is full of variables, in the face of nature, mankind is always small. And the impact of natural disasters are generally larger, and some even fatal, catastrophic, resulting in irreparable damage.

3. Financial risk

Financial risks include fluctuations in foreign exchange rates, interest rate risk, liquidity risk, corporate asset-liability ratio, and financial reporting risk. Special attention is required to include the following:

(1) Risk of debt service. Due to the dredging construction enterprises are technology-intensive enterprises, in the dredging equipment, equipment, renovation and operation and maintenance (especially foreign advanced technology and equipment) generally occupy a relatively large amount of funds, so if enterprise have too many liabilities and poor cash management, may lead to business can not repay the debt, it will have the risk of debt service.

(2) Risk of income change.This risk comes mainly from the uncertainty of the use of funds, this uncertainty will be through the debt of the financial leverage to produce amplification effect.

(3) Risk of capital recovery.Mainly refers to the collection of accounts receivable in time and the amount of uncertainty caused by the risk. First, the uncertainty of time, manifested as arrears of project accounts. Second, the uncertainty of amount, the performance of accounts receivable can not be fully recovered, the formation of bad debts.

(4) Other economic factors related to the project construction (prices, taxes, wages, inflation, exchange rate and even charges, etc.), and brings risk to the construction of the project.

4. Technical risk

Dredging technology develop to today,More and more advanced dredging methods and construction techniques are used in dredging projects; in the case of self-propelled rafting dredgers, the current ship is larger, the transport distance is longer, the speed is faster, and the navigable waters are more wide [4]. But because some of the enterprises to grasp the introduction of technology and not enough to spend a lot of foreign exchange purchase of equipment can not play its due role, resulting in equipment idle and waste, so that the applicability of new technology, advanced, feasibility and reliability greatly reduced , This risk arises from the technology itself, and thus is a technical risk. Which may include losses including R & D costs, technology transfer, and conversion. Can effectively use the technology is the best, not the more advanced technology the better.

5. Construction contract legal risk.

Dredging enterprise construction must be carried out in accordance with the contract signed, therefore, the contract text of the audit and the implementation of the terms of the contract itself has a very large number of risk factors. The audit of the contract relates to all aspects of the project, from the engineering standards, acceptance criteria, project quality control to the contract side of the credit and financial status of the understanding of the payment of the contract, as well as the project during the implementation of the construction environment changes, raw material market prices Of the volatility and so on, are subject to the scope of the contract risk considerations; any part of the omissions and hidden dangers are back to the dredging enterprises have serious consequences.

6. Operational risk

This is mainly refers to the dredging of internal management and its various departments in the communication, organization, coordination of the problems arising from the construction project risk.

7. Environmental risk

The risk is mainly due to the characteristics of the dredging project itself. It mainly includes:

(1) Bottom sand suspension. Dredging is taking advantage of mechanical equipment to transfer the water under the mud, which inevitably have a negative impact on the local environment; due to the role of machinery in the water will stir the bottom of the sediment, the local water quality to produce a large number of suspended solids may release toxic substances and remain in the water, potentially dangerous to the local aquatic life. And the estuary area by the wave and the river double role, more likely to cause the re-transmission of toxic substances.

(2) Dredging spoil. Dredging is born with a large number of dredging spoil, if placed on land, it will cause a large area of land waste, and dried dredged spoils in the fine particles will move with the wind, resulting in air pollution; If it is left in the water, it will cause the increase of sediment concentration in the local waters of the shredding area, and may cause the sedimentation problem of other estuaries under the action of coastal sediment transport.

3. Response measures to dredging project risk

Dredging project risk response measures is to avoid the risk or reduce the probability of risk occurrence. Common dredging project risk response measures are risk transfer method, risk avoidance method, risk retention method, risk control method and risk utilization method [5]. Due to the complexity of the dredging project itself, a variety of coping strategies are usually used in practical engineering applications. In other words, in risk management, an engineering project may use multiple coping strategies at the same time. The same risk problems may arise in different projects and may require different coping strategies.

(1) Risk avoidance

Taking the risk avoidance measures is after risk assessment, as for the construction activities which have large risk, and the project department can not bear the risk of operation, the project department shall immediately stop work to give up or change the operation mode, to avoid the risk.There are two main ways to avoid risk: to abandon the implementation of a job activity; to change the nature of an activity.If there is

significant risk factors, they should immediately stop working, timely report to the superior department, and organize relevant experts to conduct feasibility studies, to see if we can make new plans later to continue the implementation of this operation, if feasible, we must develop a corrective plan, pending completion of the rectification, after the acceptance, and safety if the risk assessment, evaluation results that the risk within an acceptable range, in order to return to work; if not can reduce the risk in the affordable range of feasible solution, then giving up the activities.

(2) Loss control

Loss control is the most active, reasonable and effective management technology in safety risk management. The goal of loss control is to minimize the probability of risk accidents and reduce the degree of loss. The cause of the accident that the accident is due to the occurrence of an undesirable contact between people and things. This kind of contact occurs because of the insecure state of the existence and the unsafe behavior of the person, and the insecure state of the person and the unsafe behavior of the person are caused by the defect of the safety management. Therefore, the loss control of the dredging project should be carried out from three aspects: the unsafe behavior of the person, the insecure state of the thing, the defects in management and supervision. The control of the object mainly through the engineering and technical means to eliminate the insecure state of the object; the control of the people is mainly through education to achieve, can take the interpretation, comfort, infection, persuasion, rewards and punishments and other forms, from the security knowledge, Attitude management, the control of management defects is mainly through the institutionalized procedures to control the way, such as the strict implementation of the laws and regulations, rules and regulations, regular security checks, strict rewards and punishments, of course, have to And constantly improve the management capacity and quality, improve the management level, improve management methods.

(3) Risk transfer

The method of risk transfer is mainly aimed at the major risk and medium risk in the risk assessment of dredging project. The security risk of the dredging project in the process of existence is absolute, restricted by the actual technology, manpower, management and other factors, could not completely eliminate or control the security risk, so in the process of project implementation, by taking measures of risk transfer, the security risks they face to transfer to other units bear, in order to reduce the security risks they face, is a very effective measures in safety risk management. Therefore, the following measures should be taken to carry out the safety risk transfer in the actual construction process of dredging projects:

1）Using contract to transfer security risks.

During dredge construction process, often involving situation to outsource or subcontract , with the outsourcing or subcontracting unit signed subcontract, should be signed separately safety production special contract or in the subcontract to set separate terms, clear their respective responsibilities and obligations , And set the corresponding exemption clause.

2）Using engineering insurance to transfer security risks.

Taking advantage of engineering insurance to transfer risk is in fact through the insurance company this third party to transfer the risk. Engineering insurance refers to the owner or contractor to the specialized insurance institutions (insurance companies) to pay a certain premium, the insurance companyestablish the insurance fund to compensate the loss of property or personal injury in the event of the insured risk.It is essentially a risk transfer, that is, by the owner or contractor insured, the original risk should be transferred to the insurance company to bear. Dredging works in the construction process, although the use of loss control, risk avoidance and other methods, but due to various factors, the risk of forecasting, evaluation is a certain error, while the construction process there are a lot of accidental factors, Force majeure, even if an experienced contractor can not anticipate the situation and other events, so the risk of the accident occurred is inevitable. By insuring an insurance company, the contractor may be compensated for losses in the event of a safety risk incident. At present in the dredging process construction, the port safety supervision department will generally require the construction unit before the construction, must be involved in all project participants to buy accident insurance, which is to consider the risk transfer of a better measure.

4. Conclusion

In the dredging process construction, the risk is ubiquitous. Project risk refers to all the set of uncertainties that affect the achievement of the project objectives [6]. The emergence and interaction of these uncertainties affect the degree of achievement of the project objectives and the deviation from the actual results of the project and the expected objectives. In order to achieve the development of dredging project, it is necessary to strengthen the awareness of risk prevention, improve the risk management organization, establish the risk management information system, strengthen the risk management work, so as to effectively identify and assess the risk, and risk occurs, Promptly respond, take active and effective measures to prevent and avoid risks, to ensure the smooth development of the project and the completion of the project objectives.

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