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# The application of nested-game theory in the public participation mechanism in the decision-making of large engineering projects

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**Abstract:**

It is the nested-game theory that provides a new angle for the study on public participation mechanism in the decision-making of large public engineering projects. The public participation is not isolated, but nested in other games. This paper tries to analyze the main bodies' behavior on decision-making during the public participation from the main body of the game and utility，etc. Then it discusses about the effective approach of constructing multi-interests balanced mechanism under the new nested relationship of decision-making on large public engineering projects.

*Key words:* nested-game, large public engineering projects, public participation, decision-making.

Game theory is to study the decision-making when decision-making main bodies' behavior have direct influence on each other, and also to study the balance of decision-making , which are all based on rational assumptions. In many games, the participants seem to act irrationally, but if treating the game as a part of a larger game you can see their behaviors are rational. Such games are nested in a larger game. In this case, the optimal reaction of the big game might not be the best response to a small independent game, that is to say the small game may be used as a sub-game nested in the sequential game.

## THE CURRENT SITUATION OF GOVERNMENT UNI-INTEREST MECHANISM IN THE DECISION-MAKING ON LARGE PUBLIC ENGINEERING PROJECTS

Major public construction project generally refers to the office buildings, tourism, construction, science, education building, communications, construction and transportation construction whose construction area is of 20000 ㎡ or larger than it. The so-called "government monad domination decision-making mechanism " refers to following the model that contains decision-making, planning, preparation, management and implementation of major public construction project under the government's overall lead and control. The government and the public showing asymmetric, non-equilibrium state, the government's absolute strength makes the public's participation too weak. Under the influence of the long-planned economic system, China's major public engineering projects decision-making mechanism divides the work from top to bottom hierarchically and clearly. It has gradually formed the city planning construction administration system from nation to provinces, autonomous regions, municipalities and counties. This paper simplifies the participants of major public engineering projects decision-making game to the central government, the local government and the public.

As the maker of game rules, the central government had a significant impact on game balance. Since it is a familiar system in major public engineering projects, Unitarianism differs from the market economy in both the supply and production relationship: On the supply, consumers are not a few independent individuals or collective, but may be all over a city, region or even the whole nation; on the production, it depends on specialized production institutions of internal organizations, such

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as various large economic and technological state-owned construction enterprises. In addition, the large-scale public engineering projects are usually heavily invested with a long construction period, and the central government allocates special funds for project construction which will greatly boost the local economy and employment rate. Therefore, there's no doubt that local governments are greatly attracted who consider GDP as an important achievement indicator. Since the power and resource allocation between all levels of governments are top-down constrained, the career prospects of local officials have to rely on the central government, and the central government's recognition is the only path to their job promotion. Unitarianism's incentives are accompanied with complex negative effects, which will influence the decision-making of major public engineering projects.

As the game participants in the decision-making game of major public engineering projects, the utility function of the central government, local governments and the public are not only directly bound by the of the game itself, but also by the temptation of grade power and the constraint of pressure. Therefore, they have opportunities for rent-seeking tendencies. Namely, to central and local governments, major public engineering projects in decision-making game are nested in the power system game. The role of central and local governments in major public engineering projects' decision-making are politically affected rather than economically.

At the same time, because the public in major public engineering projects' decision-making system belongs to a vulnerable group, they couldn't have any substantial impact on the results. This is mainly based on the following reasons: Firstly,

because of the contradictory nature of participant's motivation, , though the citizens, as one of the members of the public, concern about their own interests, they may willing to enjoy the public engineering projects' benefits rather than bear the costs of various decision-making. And the second factor is the loose nature of participating organizations. The public participation is individual, spontaneous, casual, loose and so on, which lacks the effective safeguard from some organizations and systems, and does not have the ability to bargain with the government. The passive nature of participation manner is the third factor. In the absence of adequate internal motivation and planning information, the public and the government are not interactively interrelated. The public have often been misled due to the limitations of themselves and their education levels, as well as the information asymmetry. So in most cases the public are just "inquirers" or "decorators" whose opinions have no restraining force. And the fourth factor is the intermittent nature of participation process. The public's participation is lagged behind which means that they express their views possibility only in "how" rather than "what". There is no opportunity for them to participate in public engineering projects' whole decision-making process. And the fifth is the low level of participation. Most of the public still stay at the initial stage of announcements and investigation through the process of major public engineering projects' decision-making.

## THE ANALYSIS ON NESTED-GAME MODEL OF DECISION-MAKING ON LARGE PUBLIC ENGINEERING PROJECTS

The major public engineering projects' decision-making are reflected the pattern of government monoad domination because the superincumbent constraints relationship of each game main body. Fig. 1 uses nested-game model to explain the process.