Indicators of Social Impact Assessment for BOT/PPP Projects☆

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***ABSTRACT*:** Build-Operate-Transfer (BOT) and Public-Private-Partnerships (PPP) are of help in improving infrastructure efficiency and solving government financial deficiency problem, and therefore have attracted great attention. During the last two decades, BOT/PPP is becoming one of the most prevailing ways for infrastructure development in China to meet the needs of China's economic growth. When evaluating BOT/PPP projects, much emphasis is usually placed on the economic and financial aspects. However, BOT/PPP also imposes significant social, active and passive, impact. It is therefore important to evaluate also the social impact of BOT/PPP projects. This article proposes an index system of social impact assessment for BOT/PPP projects, in which 20 indicators are proposed including common indicators and those addressing the characteristics of BOT/PPP projects. The development of the index system has taken into account three aspects: the characteristic of BOT/PPP projects, the specific situation of China and social impact assessment for projects.

KEYWORDS: Build-Operate-Transfer (BOT) / Public-Private-Partnership (PPP), Social Impact Assessment (SIA), Indicators

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1. INTRODUCTION

1.1 Background

The Build-Operate-Transfer (BOT) and Public-Private Partnership (PPP), modes of project finance, are that a government grants concession right to a private company to obtain the quicken construction and efficient management of infrastructure. Since naissance of this arrangement, it has attracted great attention from government, which has been brought into China since 1980s. When evaluating BOT/PPP projects, much emphasis is usually placed on the economic and financial aspects. However, BOT/PPP projects also impose significant social impacts, which have not been paid attention to, for example:

- Solving the government's financial deficiency problem in infrastructure investment: the government can then devote more budgets to meeting citizen's basic needs, e.g. developing science, education, healthy and conquer poverty.
- Promoting investment in infrastructure: Compared with other investment vehicles, BOT/PPP can encourage investment of all sorts of capital, foreign of private, in infrastructure development. This is especially significant for China, which has great needs for infrastructure to support the rapid development of economy and society.
- Enhancing efficiency of investment and management and operation of project life cycle: Compared with government invested projects, the BOT/PPP arrangements which bring in foreign and private expertise has advantages of achieving higher

quality, shorter duration and less cost of projects..

There is no agreeable definition on Social Impact Assessment. Interorganizitional Committee on Guidelines and Principles for Social Impact Assessment of America defines it as “By social impact assessment we mean assessing the consequences to human populations of any public or private action-that alter the ways in which people live, work ,play, relate to one another, organize to meet theirs needs ,and generally cope as members of society”. Rauno Sairinen and Satu Kumpulainen give a definition that it is done in advance during the planning phase in order to offer better knowledge base for the decision-making processes.

But in China research on SI is in the beginning, it is not common to assess social impacts of a project, including BOT/PPP project. As the above sections stated, it is therefore very important to assess the social impact of BOT/PPP projects.

1.2 Objectives of this research

The objective of this article is to develop an index system of social impact assessment for BOT/PPP projects involving common project indicators and those addressing the characteristics of BOT/PPP projects.

The article first gives principals for selection of social impact indicators, then develops a matrix for selection and gives descriptions of social impact indicators in detail. Social impact assessors can select proper indicators from 4 indicators at level Ⅰand 20 indicators at level Ⅱfor assessing a specific project

2. METHODOLOGY

The methodology developed for this study includes (1) a comprehensive literature review to identify an initial list of unique or critical social impact indicators associated with common projects including BOT/PPP projects, the detailed lists of indicators can be founded in the undergraduate dissertation of the first author; (2) unstructured interviews and discussions to filter the indicators identified in (1); (3) case study to provide additional insight concerning social impact assessment and the characteristic of BOT/PPP projects.

Literatures used in the paper are Guidelines for Social Assessment of Development Project; Methods for Social Assessment of Development Project; Index System of Social Impact Assessment for Hydraulic project (NDRC, 1997); literatures of Wang on BOT/PPP (Wang et al, 1999, 2000, 2003); Guidelines and Principles for Social Impact Assessment (ICGPSIA, 1995); assessing social impacts in urban waterfront regeneration (Rauno Sairinen, Satu Kumpulainen,2001); conceptualizing social impacts (Frank Vanclay, 2002).

The interviews and discussions focused on social impact assessment and the characteristics of BOT/PPP projects and relationships between two fields above. Because BOT/PPP projects in China are not common, and smaller in quantity of social impact specialists on BOT/PPP, while their opinions and suggestions are valuable. These specialists include professors, government agent, professions on the BOT/PPP and finance and sociology and humanics.

The cases referred in the article are focused on social impacts assessment of projects, whose feasibility study report gives many conceptions.

3. SELECTION OF SOCIAL IMAPCT INDEX

3.1 Principal for selection of indicators

There are three principals for selection of indicators, which are described in the following.

The first is to reveal the characteristics of BOT/PPP projects specially. Based on the secondary author’s former research on risks of BOT/PPP projects, the article gives the classification of these risks, and relate them with social impact indicators

respectively, then develop a matrix for selection of social impact assessment indicators.

The second is to reveal the social impact of project objectively and comprehension, active and passive. Only by this it is helpful for government to make decision and also helpful to negotiate between the government and the private sector.

The third is the integration between qualitative and quantitative indicators. Some important qualitative indicators are introduced helping assess social impacts of BOT/PPP project.

3.2 The Matrix for Selection of Indicators

The matrix for selection of indicators is based on the social impact theory and the characteristics of BOT/PPP project.

Wang (2000) classifies characteristic of BOT/PPP into five aspects in accordance to the participants of BOT/PPP projects. In convenience, the five aspects are replaced by A, B, C, D, and E respectively. The indicators of social impact can be described by four aspects: social effect, adaptability between projects and social, equality indicators, government performance.

Table2 Matrix for selection of social impact index of BOT/PPP project

BOT / SIA	A	B	C	D	E	F	Sum
	1	1	1	1	1	5	
Indicator 1	√						1
Indicator 2		√		√			2
Indicator……			√				1
Indicator N					√	√	6

In this table, A-E are the characteristic of BOT/PPP project, A standing for large investment and long duration, B standing for high tariff for using and lager quantities of stakeholders, C for solving government budget deficiency problem and encouraging foreign and private investment, D for promoting economy development and improving infrastructure, E for complicated cooperation and high risks. Indicators 1-N is social impact indicators for use. The metric is used to guide the selection of social impact indicators.

When using the matrix, you should analyze the relationships between each indicator and the characteristic of BOT/PPP project. As to a certain indicator, if it has close relationship with the characteristic, you should mark a "√" in the table, and so do other indicators. Every "√" stands for one point, and if the characteristic of F is filled with "√", it stands for 5 point, which is a social impact indicator for all projects. After the procedure, you should calculate each indicator one by one, and the sum is the relative impact of each indicator. If the mark is over 5 points, is can be selected to go into the next selection procedure. By doing so one level by one, you can obtain the final indicators used for assessing social impact of BOT/PPP project.

4 DESCRIPTIONS OF THE INDICATORS

Indicators in Table3 are the selected social impact index for BOT/PPP projects. Then the next step is to describe each indicator and explain the mechanism which affects BOT/PPP projects.

Table3 Indicators for assessing social impact of BOT/PPP projects

social effect indicators	environment quality index
	utilizing effect of nature resources
	social impact of time-saving
	promoting National economy
	employment effect analysis
	revenue allocation
	land occupied per unit investment
Adaptability between projects and social	sustainability of projects effect
	people& leader's attitude to projects
	democratization of decision-making
	index of compensation to losses
	the change of finance institution
	change in community infrastructure
equality	distribution of power and authority

	compare of average income
	index of anti-poverty
	vulnerability of underrepresented
Government performance	legislation on BOT/PPP
	cooperation between governments
	performance of concession

- *Environment quality index*

BOT/PPP arrangement applies for energy exploited projects, power station, sewage/waste treatment projects etc, which have great impact on environment quality. This is an important indicator for social impact assessment, both for common projects and BOT/PPP projects. It can be described with the formula:

$$EQI_1 = \sum \left(\frac{Qi}{Qi_0}/n\right) \qquad EQI_2 = \sum \frac{Qi}{Qi_0} W/n$$

$$\left(\sum Wi = 1, 0 \le Wi \le 1\right) \tag{4.1}$$

N - types of Pollutants, such as emissions, waste residue, noise, radiation etc. Qi - emissions of waste I, Qi_0 - maximum emissions of waste I regulated by national or local government agent. Wi - weight of social impact by waste I.

- *Efficiency of nature resources*

Natural resource is the most important material for projects; different resources should be analyzed in accordance with different projects. Take freeway project as an example, we should consider effects of energy savings, water savings, farmland savings, while for the energy exploited projects, we should analyze the reasonable exploitation of natural resource.

- *Time-saving effect*

Not revealed in the financial analysis, mitigation of transportation pressure in the BOT/PPP projects like freeway and railway brings a great benefit for user of infrastructure. Also, time-saving effect is important for developer, because the time for construction and time for operation of BOT/PPP projects are often in combination for considering, that is to say that the former is shorter, the latter is longer, and then the profit the developer can obtain is larger. Even though the time for construction and operation is separate, there is often a bonus for ahead of schedule. In a word, projects in the form of BOT/PPP can obtain great social impact through time saving. Take transportation project an example:

-Time saving effect in transit for goods

As the quicken construction of transportation, the speed of transit for goods becomes larger, the turnover of goods becomes adding up, then the profit is larger. The formula is given:

$$B_{hs} = \frac{P_r \times Q_{kk} \times T \times I}{24 \times 365} \tag{4.2}$$

B_{hs} - value of time saving in transit for goods(10^4Yuan), P_r - average shadow price(Yuan/ton), Q_{kk} - transit quantity on new freeway, T - time saving, I - social discount rate.

- Time saving effect in transit for passengers

Because of time saving, the passengers can have enough time to do other works, and then create more wealth or comfortable living environment, such as more time to read, to play, to relax etc. This indicator only reveals the time saving for purpose of production.

$$b_j = \frac{G(1+S)j}{R(1+h)j \times 251 \times 8} \tag{4.3}$$

B_{ks}- value of time saving in transit for passengers (10^4 Yuan), b - average value per unit time(Yuan / hour), T_n - time saving, Q_{rp} - quantity of personnel on the new freeway.

- Time saving effect for developers

$$P = p_o \times t + It \tag{4.4}$$

P - social impact of time saving (Yuan), p_o- the annual net profit (Yuan/year), I - annual outflow of interest during the time for construction (Yuan/year), t - time saving in the form of BOT/PPP

- *Promoting national economy development*

This indicator can refer to the national economy evaluation, such as ENPV and EIRR. Besides, social

impact of projects towards sector and regional economy development should be analyzed if necessary. Mega projects especially BOT/PPP projects are of great help to the adjustment of economy structure.

- *Employment effect*

Employment effect analysis is the main aspect of social impact assessment for common projects. However, BOT/PPP project has a long concession period, generally 20 years, which makes a difference in the definition of employment effect. The number of employee during construction and operation is different, in the former phase the number is large, while in the latter phase is small. When assessing the social impact of project, the project often in the initiation phase, therefore, the result of employment evaluation is often optimistic, this cannot reveal the real social impacts of project. In accordance with the above considering, time factor is considered.

Employment effect per unit investment is total new employee (including this project and related projects) divided by total investment (including direct and indirect investment), and then multiplied by time factor.

Time factor is $\eta = \sum \alpha \times \beta$, $\alpha = [T_n / T]$, $\beta = [N_n / N]$.

α - employment effect of type I of work, T_n - average working time of work I on the project (month), T - base time of employment (month), β - ratio of type I of work, N_n - total number of employee of type I, N - total number of new employee.

- *Revenue allocation of depressed region*

Revenue allocation is to distribute the wealth or production, which is national income created in a period among the social groups and social members. The equality of income allocation is not only an economic problem but also an important political problem, which involves allocation between the rich and the poor, allocation among different region. The indicator of Revenue allocation of depressed region is used in China.

$$Di = (\bar{G} / G)^{M} \quad DI = \sum (CI - CO)_t Di (1 + I_s)^{-T} \quad (4.5)$$

Di - Revenue allocation factor of depressed region, DI - Revenue allocation effect of depressed region, $\bar{G}$ - average national income in the time for assessment, G - the average income of affected region of the project in the meantime. M - Anti-poverty parameter regulated by the government, which reveals the judgment towards the investment allocation to depressed region.

- *Land occupied per unit investment*

As an important natural resource, farmland is also the key resource for development projects. In China, farmland is one of the rarest resources, especially for the southern provinces. Generally speaking, BOT/PPP project occupies large number of farmlands, which has been in conflict to the advantage of mitigating government financial deficiency. Besides, the transfer expenditure of concession power is generally ambiguity. In this case, there is a phenomenon that some local governments provide all kinds of favors even sacrifice state-owned assets in order to attracting foreign investment and obtaining achievement in theirs post. It harms seriously to the interests of the people. Therefore, it is necessary to assess the effect of investment. The indicators can be described as the return of investment divided by farmland occupied.

- *Sustainability of projects effect*

The main factors affecting the sustainability of project are:

- Whether the project can operate smoothly?

- are there risks of being interrupted?

- How do the changes of policy affect the sustainability of project effect?

The sustainability consists of three parts, sustainability of environment function, sustainability and stability of the growth of economy, sustainability of benefits of the project. It is the characteristic of

long period for BOT/PPP project that makes the sustainability important, all participants including government, public, developer, and banker have something with the sustainability of project effect.

- *People and leaders' attitudes towards project*

This part is explained in the background of this article, which includes: people's attitude towards the project; whether the project can be accepted by the poverty, women, and affected people; the reason of the impact and mechanization of the impact; actions mitigating the impact.

- *Democratization of decision-making*

Democratization of decision-making is an important criterion for evaluating the government's democracy and legal state. The decision-making of BOT/PPP is a complicated process, involving various problems, besides; it has a characteristic of hard cooperation among participations and high risks. Therefore, democratization of decision-making has great impact on the execution of project. What to be considered should be: procedure and transparency of decision-making, whether the government takes an attention to the position and interests of each participator in decision-making process; the attitude towards the participation of affected groups.

- *Compensation to losses*

At the time of promoting national and local economy, the arrangement of BOT/PPP inevitably results in loss to related interested groups, including loss of economy, loss of culture, change of interpersonal relationship, loss of politics position, change of brief etc, the most important of which is about resettlement of migrating.

- *Change of finance institution*

BOT/PPP projects involve large investment which is mainly provided by bank consortium. Besides, these projects are generally limited recourse or non-recourse finance projects, which are great risks for bank consortium, so in practice bank often sets up specific business of Project Finance (PF) in order to deal with project finance efficiently. In this case, the arrangement of BOT/PPP will have a great impact on the bank, especially the large number of risks including social risk, which can be mitigated by assessing potential impacts and taking some actions. The impact of BOT/PPP projects to the bank can be assessed by the indicator of the change of finance institution, including three aspects: the change of quantity, the change of business, and the change of scale of finance.

- *Change in community infrastructure*

The execution of BOT/PPP projects will have a great effect on the community's infrastructure, including the transportation tensity, increasing of prices, tension of educational facilities like school, change of commercial facilities and commercial environment, provision of energy, change of housing facilities, pollutants treatment. The change of community population will affect the demands of community infrastructure and services, economic activities of community and change of income will affect the supply of community infrastructure and Services.

- *Distribution of power and authority or interested group*

Impacts should be specified for differentially affected groups rather than measured in the aggregate. Identification of all groups likely to be affected by an agency action is central to the concept of impact equality. This indicator and the next indicator of *compare of average income* involve equality, which are explained together in this article.

in order to analyze the equality, some social development indicators are introduced, such as average income, average property, average salary, gross national product per capita, gender differences, housing facilities, communication and transportation, the opportunities that different group enjoy the social services, which are different in accordance to the specified project.

It is important to analyze the distribution of benefits and its equality among different interested groups. Like the environment impact assessment whose ecological assessment pays special attentions to the endangered animals and plants, its social economic part should concern with vulnerable groups fully. These vulnerable groups include the poor, the old, the youth, the unemployed, women; the minority, and the minorities in nation, race and culture etc.

- *Compare of Average income*

This indicator means the change of average income of community, the allocation of income, the gaps between rich and poor.

- *Anti-poverty*

Poverty is a crucial threat to the economy development of China, so the execution of BOT/PPP projects should consider the indicator. This article introduces two indicators, the ratio of change of poor, and the ratio of change of poverty population's average income in the BOT/PPP projects community. Considerations should be:

Is the project meeting the demands of the poor? What is the attitude of the poor towards the project, and the degree of their participation? Whether do the culture, ethnic relations, customs, religions and beliefs, township regulations cause the failure of project?

- *Vulnerability of underrepresented groups*

There always can be winners and losers as the result of a decision to construct a dam, build a high way, or close an area to timber harvesting. However, no category of persons, particularly those that might be considered more sensitive or vulnerable as a result of age, gender, ethnicity, occupation, or other factors, should have to bear the brunt of adverse social impacts. Although most proposed projects or policies are not zero-sum situations, and there may be varying benefits for almost all involved, SIA has a special duty to identify those whose adverse impacts might get lost in the aggregate of benefits.

- *Legislation on BOT/PPP or concession*

As a main party of the arrangement of BOT/PPP, government participates in the BOT/PPP projects in some ways: the signature and execution of BOT/PPP concession agreement, the legislations about project finance (PF) by the government, the change of government agencies, and the cooperation among government agencies.

In the 1980s, BOT is introduced into China in the ways of policy encouragement and government permission, and then it develops rapidly. Therefore, legislation on BOT/PPP or concession is considered as a key aspect of social impact assessment of projects. It should include the following aspects:

- The laws or regulations on protecting the Intellectual Property

- Legislations on attracting foreign investment and encouraging private capital to infrastructure by government

- Capacity analysis of existing institution: objective, characteristics, structure, institution and procedure, incentive mechanism, resources, technique, coherency.

- The degree of open bidding and transparency in government work

- *Cooperation between government agents*

The surroundings of the projects, the extent of local leaders understanding of their responsibility and authority, and recent exercise of power capacity are the main considerations. Others are in the following:

- Whether the local authorities or leaders are united and cooperative? Whether they have conflicts (availability of conflict of interest)? Whether they take some actions on the projects, not to own personal interests?

- The ability of the existing leaders addressing the issues raised by the project

- *Performance of concession agreement*

This indicator involves characteristic of BOT/PPP, because the way the government participates in the BOT/PPP project is the signature and execution of BOT/PPP agreement. Concession agreement is the core of all documentations of BOT/PPP, if there is no concession agreement, the following execution of projects can not be realized. Performance of concession agreement has a great impact on all participators, also on social impact assessment. The indicator used is performance ratio of concession agreement which is described by the number of performed clause or provision of concession agreement divided by the total number of clause.

6 CONCLUSION AND RECOMMENDATIONS

During the last two decades, BOT/PPP is becoming one of the most prevailing ways for infrastructure development in China to meet the needs of China's economic growth. It is high time to evaluate impacts of this type of projects comprehensively and objectively. This article mainly talks about social impacts of BOT/PPP projects whose financial and environmental impacts have been paid much attention to. In the article an index system including 20 indicators is proposed, which is used for assessing social impacts for BOT/PPP projects. From the detailed descriptions above, it can be seen that it is helpful for all the participators to evaluate social impacts of BOT/PPP projects.

Since the short history of social impact assessment for development projects, social impacts of BOT/PPP project with its unique characteristics have not been paid more attention to; more researches should be carried out on the field. In that case, the application of BOT/PPP arrangement will help bring climax of economy development of China.

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