

## **PRECONDITIONS FOR VALUE IMPROVEMENTS IN THE ACEH RECONSTRUCTION PROJECT**

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### **Abstract**

**The main challenge in Aceh's post-disaster infrastructure rehabilitation and reconstruction is to complete all the stages of project delivery in a very short time, without neglecting quality, economic viability, environmental conservation, and social acceptance. Involvement of local stakeholders in this process is highly desired. Application of value improvement methods is one of the means to meet project requirements. These methods have never been applied in any construction project delivery process involving Aceh's construction industry before. The objective of this research is to study the preconditions that have to be fulfilled by the players of the Aceh construction industry before the adoption of those methods.**

**Six variables, i.e. commitment of the construction industry players for value improvement, importance awareness, management support and participation, human resources qualification and capacity, availability of potential projects, and existence and extent of implementation of value related regulations, are identified and represent the preconditions. An opinion survey is conducted to assess their fulfilment. Questionnaires are distributed to three groups of respondents, i.e. owners, local design consultants, and local contractors as part of Aceh's construction industry. Samples are picked from 7 among 22 counties of the Aceh Province. Scoring is based on a Likert-like scale.**

**Results indicate that human resource quality and capacity is the most important precondition and that local contractors operating in Aceh are the weakest when compared to owners and consultants. Owners are weakest in their awareness of and support for the methods although, in their opinion, project delivery process quality is the most important objective in infrastructure reconstruction. The highest overall fulfilment score is achieved by design consultants.**

**Keywords:** Value Improvement; Reconstruction; Infrastructure; Project Delivery.

### **Introduction**

The earthquake and tsunami on 26 December 2004 devastated the Province of Aceh in Indonesia. The main physical infrastructure in this area, including 2300 km of road, 9 sea ports, 8 airports, 120 main bridges and 1500 smaller bridges, was significantly damaged. This condition was worsened by the high level of groundwater pollution, bad sanitation, damaged irrigation systems and a minimum electric power supply. It was estimated that about 110,000 houses

needed to be built for the 500,000 people who lost their homes due to this disaster. An estimated 2.66 billion US\$ is needed for the reconstruction of the whole area's infrastructure.

The Aceh reconstruction project involves the Government of Indonesia and several other parties, including donor countries and agencies, international NGOs, multilateral cooperation agencies, and the United Nations. The Government of Indonesia has established a special unit, called the Agency of the Rehabilitation and Reconstruction for the Region and Community of Aceh and Nias (BRR), to coordinate the rehabilitation and reconstruction activities, and to ultimately redevelop the stricken area. One of the main tasks of this agency, which will operate until 2009, is the coordination of physical infrastructure rehabilitation and reconstruction. After 2009 all of the operations have to be taken over by the local government. The complete activities are carried out through several project stages which consist of conception, planning, design, bidding, and construction. In this delivery process, complex criteria of planning have to be considered which concern regional spatial planning, land use change, vulnerability of the region towards disaster reoccurrence, social and cultural aspects, and environmental protection. Considering the urgency of infrastructure reconstruction, the whole process is expected to be completed in a short time (4 years) without neglecting quality requirements. Involvement of local stakeholders in the project delivery process is highly desired.

After 3 years of reconstruction execution, the project's time and quality requirements have not been totally met. A number of constructed facilities are low quality and unutilized due to, among others: poor workmanship, and unsuitable choice of materials or location. Some construction completion delays occurred due to needs for redesign and overlapping of assignments given to construction companies. Besides socially related approaches, the application of value improvement methods through all the project delivery stages should have been considered to avoid such problems. Although methods, such as Value Engineering (VE), have been widely applied in important public-financed infrastructure projects in developed countries, they are rarely adopted in similar projects in Indonesia. Besides, due to limited project time and resources, VE applications in the design process particularly have been rather unpopular in Indonesia because most of the original design teams are quite reluctant to have the output of their work restudied by the VE team. This attitude has, to a certain extent, also discouraged the inclusion of VE in the construction process. As a matter of fact, this value methodology is not part of a conventional project delivery process. Therefore, some preconditions are deemed necessary to be able to apply this method in Indonesia and particularly in the context of the Aceh reconstruction project.

This research is aimed at identifying the essential preconditions to be fulfilled before the application of value improvement methods in the Aceh reconstruction project delivery process. Focusing on these identified requirements, a survey was conducted through questionnaires which were distributed among local owners, consultants, and contractors involved in the project. Results of this survey reveal the existing condition which would give an idea of the local construction industry's readiness for the integration of this method into the reconstruction project's delivery process.

### **Value improvement methods in project delivery process**

The delivery of an infrastructure project generally comprises a process which includes planning, environmental review, design, contracting, construction, maintenance, and operations. This process is usually adjustable according to the project's characteristics, the agreement amongst involved parties, and local laws and regulations, especially in the case of public projects.

The most common project delivery option is the design-bid-build system which involves three prime players, i.e. owner, designer and builder (contractor). Two separate entities are engaged for design and construction, and award of the design contract is based on a quality-based selection. Design is followed by construction, which is generally bid competitively, and then by

some sort of inspection/quality assurance or even complete construction management services (Mahdi and Alreshaid, 2005). Other project delivery options include the design-build and build-operate-transfer systems.

The main objective of value improvement methods application in project delivery process is to improve total project performance and ultimately fulfil user needs. The underlying approach of these methods is the principle that there is always more than one way to achieve project objectives and that examination of the alternatives will produce the most acceptable conclusion. It recognises that at the core of the process is the analysis of functions from the point of view of the system as a whole, including the relationship or cost impact of design decisions on the project and/or scheme operation (Male and Kelly, 2004). Presently, value methodology studies are not only used to seek solutions for cost saving but are also widely applied to facilitate strategic decisions, to enhance communications and reach a consensus among stakeholders, to define the scope for a proposed project, and to set priorities for the requirements of a project (Shen and Liu, 2003). Later on, Pulaski and Horman (2005) suggest to integrate sustainability aspects into a continuous value enhancement process by applying project management tools which combine the best practices from several fields including constructability, value engineering, and lean production, to improve the management of projects with sustainable objectives.

Value engineering, in particular, was first applied in construction projects in the 1960s through the introduction of Value Engineering Change Proposal (VECP) in construction contracts. The objective of VECP is to push contractors to suggest cost saving and quality improvement ideas in construction, through the introduction of better construction methods and more suitable materials. The idea is then submitted to the owner and a decision to accept or to reject the proposal is taken by the owner after its feasibility evaluation. If accepted, the contractor will receive 50% of the identified savings. VECP process involves the contractor, the owner, the designer, the construction manager, and the user.

Although VECP is the first methodology of value engineering to be introduced in construction projects, value improvement methods in general will actually be most beneficial when applied very early in the project delivery process (NCHRP, 2005). This is mainly due to the fact that 80-90% of impacts on project quality and cost are determined by decisions taken during the planning and design phases. Early application of the method also allows the project team to effectively define the concept of the project. The team will then also have the benefit of the involvement of the stakeholders from the beginning, to reach a consensus that will shorten the total time needed to deliver an optimum solution. A value study which is undertaken during an environmental assessment phase, for example, will provide a valuable contribution to the quality enhancement of a construction project. Cost savings or cost effectiveness, as one of the main objectives, could be expected in terms of the first cost or the life cycle cost of the infrastructure in question.

### **Aceh reconstruction project delivery process**

The recovery process after the December 2004 tsunami in the Province of Aceh consists of three stages, i.e. emergency response (January - March 2005), rehabilitation (April 2005 - December 2006), and reconstruction (July 2006 – December 2009). The infrastructure reconstruction project is part of the last stage which is mainly aimed at redeveloping the area, and its social and economic activities. Sustainable development of infrastructure is one of the principles adopted in this reconstruction project which is expected to produce economically viable, socially acceptable and environmentally sound facilities.

The strategy and priority setting of Aceh's infrastructure reconstruction is based on several considerations which include: a) basic needs requirements fulfilment and facilitation of logistic distribution, b) re-establishment of inter-area and inter-provincial communication, c) re-

establishment of social and economic activities, d) sustainable provision of food, and e) guarantee of public safety against recurrence of natural disasters and their impacts.

Therefore, the reconstruction project is mainly focused on the following infrastructures: a) housing, drinking water provision facilities, sanitation, and drainage, b) strategic seaports, airports, and their access roads, c) national highways and integrated transportation systems, d) telecommunication facilities, e) electric power distribution, f) irrigation networks, g) flood control, and h) early warning systems and escape facilities.

The total funding needed for the whole rehabilitation of Aceh and Nias is estimated to be 7.48 billion US\$ that includes the 2.66 billion US\$ needed for the reconstruction of infrastructures according to the National Development Agency and the World Bank. Funding sources consist of the national budget, contributions from donor countries, foreign and national NGOs, multi lateral collaboration agencies, international financial institutions, and the United Nations. Around 44 donor countries and 300 NGOs have been contributing their support to this recovery process.

In performing its tasks as coordinator of the reconstruction activities, the Agency of the Rehabilitation and Reconstruction for the Region and Community of Aceh and Nias (BRR) is supported by a number of project implementation units. Each project implementation unit consists of representatives from the local government's technical departments and relevant experts and is supervised by a deputy of the Executing Agency. Physical infrastructure projects are under the supervision of the Deputy for Infrastructure Development.

A mechanism has been set up to handle the administration and coordination of private participation in this project by the Executing Agency. This coordination also involves the the central and local government. The procedure consists primarily of a coordination between the Executing Agency and the local government, to evaluate the relevance of the private initiative in the reconstruction master plan and community interests. After relevance confirmation, the Executing Agency issues a technical endorsement for the initiative. A note of agreement is then signed by the Executing Agency and the respective private party. This agreement is used by the private party as a contract with a third party. The Executing Agency reports the funding involved to the Ministry of Finance and the amount is thus registered. The Executing Agency, the local government, and the private party are all involved in the project implementation phase. After the completion of this phase, the Ministry of Finance records the contribution as state revenue.

Most of the projects in Aceh's infrastructure reconstruction apply the design-bid-build project delivery option. The government as owner in these projects has the responsibility to define the projects' requirements, provide financing and standards, as well as contractual terms. Design is followed by construction which is bid competitively. International contractors are required to have local contractor partners in the construction projects.

Procurement and project management services are handled by the Head of Operations of the Executing Agency. Consultants engaged to provide consulting services and construction contractors for projects funded by multi lateral agencies such as the World Bank or the Asian Development Bank are mainly selected in accordance with the respective donor's guidelines. For example, contractor procurement in World Bank-funded projects is conducted through procedures that are specified in the World Bank's Guidelines: Procurement under IBRD Loans and IDA Credits, May 2004. Participation is open to all eligible bidders as defined in the guidelines.

The followings are examples of the delivery processes for road and bridge reconstruction projects, and for house reconstruction which represent the most common methods applied in Aceh reconstruction:

- a) Road and bridge reconstruction works are based on initial surveys and project appraisals by BRR in collaboration with the Indonesian Government's Directorate General for Highways (DGH) and the consultants (international and national). Detailed engineering designs and tender documents for the implementation of the civil works are subsequently completed by the consultants. Preparation of detailed land acquisition and resettlement action plans are initiated following the completion and approval by BRR and DGH of the detailed engineering designs for the road and bridge works. Tendering of contracts for the civil works is then commenced by BRR in conjunction with the Provincial Department of Highways. Especially for reconstruction works funded by donor institutions, the tender is open to qualified construction firms worldwide. As part of the commitment to the people affected by the disaster, community outreach is included in the project's activity.
- b) The reconstruction of houses follows two different methods: (i) house construction projects involving contractors assigned by NGOs or donor organizations, (ii) community participation based house reconstruction where funding is provided by NGOs or other donor organizations. In both methods, the funding agencies hire consultants to design the houses with the beneficiaries' participation and to subsequently monitor the construction, stressing on the progress and disbursement of funds. Active technical inspection is usually not provided, resulting in poor quality houses (Boen, 2006).

Costly and complex public physical infrastructure constructions are the main projects that would benefit from the application of value improvement methods during their delivery process. Various projects in Aceh's reconstruction meet these criteria. Based on BRR's progress report, these projects should include the rehabilitation of highways across the eastern and central parts of the province, airports and seaport design and construction, and rehabilitation of infrastructures related to water resources and sanitation. However, the readiness of the involved parties and the project environment of Aceh reconstruction to apply such methods is still questionable. This research aims to reveal the preconditions to be met by the respective construction community and the extent of their fulfilment before adopting these methods in the project delivery.

## Research methods

### Research question:

- What are the preconditions for the adoption of value improvement methods in the Aceh reconstruction project delivery process?
- To what extent are the preconditions fulfilled for the application of these methods in Aceh?

## Variables identification

### Research Objectives:

- Identification of preconditions for the adoption of value improvement methods in the Aceh reconstruction project delivery process.
- Assessment of the actual readiness for the application of value improvement methods in Aceh's reconstruction project delivery process.

Shen and Liu (2003) identified a number of critical success factors of value management studies in an environment where the involved parties are already familiar with the methods. Meanwhile, in

the case of Aceh's reconstruction project, the local authorities and construction industry are practically inexperienced in applying these methods. The variables identified in this research are intended to represent the preconditions to be fulfilled before their inclusion in the project delivery process.

The identification is based on several considerations. First of all, as these methods have never been applied in Aceh before, the same perception of the involved parties on the importance of value creation and value improvement in project delivery is the basis for a successful application. Moreover, as mentioned by Shen and Liu (2003), value improvement is the result of a collective effort and therefore a commitment of the projects' stakeholders to work together in applying the method is definitely needed. The recommendations of the value study would have no impacts on project performance if the project owner is not willing to implement them. Therefore, the management's support towards the efforts for value creation is most important. Secondly, a systematic working culture and an organized teamwork are important and many institutions in Aceh have yet to adapt to the relatively new changes in the process. Furthermore, to be able to come up with the best solution choices for important infrastructure projects in Aceh reconstruction, the value study has to be conducted by a competent team and applied to a suitable project. Lastly, to stress their importance, regulations related to construction of infrastructure in Aceh should include clauses which recommend the application of these methods in the delivery of projects.

Based on the above considerations, six variables are deemed the most important representation of the preconditions for the adoption of value improvement methods in Aceh reconstruction project. These variables include:

1. Commitment of the construction industry players for value improvement,
2. Awareness of the construction industry community of the method's importance in project delivery,
3. Support of the project's management for the adoption of the method and their active participation in its application,
4. Human resources qualification and capacity,
5. Availability of potential projects which are indicated by cost and degree of complexity,
6. Existence and extent of implementation of value related regulations.

## **Research questionnaires**

An opinion survey through questionnaires was conducted to collect data on the prevailing condition of the Aceh construction industry with regard to the six variables. Respondents consisted of the principle players in Aceh's reconstruction projects, i.e. the local Public Works Department's regional officials representing the government as owners after the completion of BRR's task in 2009, local engineering design consultants and local construction contractors. Each variable's indicators which serve as basis for questionnaire development are shown on Table 1.

Every question in the questionnaire is followed by several choices of answer. A Likert-like scale is used for scoring. Scores for the answer choices range from 4 (corresponding to a "very positive" attitude, support, or condition for value improvement) up to 1 (corresponding to a "very negative" attitude, support, or condition for value improvement).

Construct validity of the questionnaire is assured through discussions with experts. The questionnaire was tested by distributing them first to five respondents and improvements were made based on the feed back. The c-alpha method is used to test the reliability of the questionnaire.

**Table 1.** Indicators for precondition variables

Variables	Indicators
Commitment for value improvement	(i) Value as policy development basis, (ii) Tendency towards construction efficiency, (iii) Avoidance of non-transparent practices, (iv) Long term fundamental investment tendency, (v) Factors considered in infrastructure construction.
Awareness of value improvement importance in project delivery	(i) Familiarity with project delivery methods, (ii) Owner's attitude towards time and cost increase in design and construction, (iii) Attitude of design consultants towards suggestions for quality improvement, (iv) Owner's motivation for quality improvement, (v) Extent of coordination among involved parties, (vi) Owner's efforts to promote value improvement.
Management support and participation	(i) Quality of project reports, (ii) Quality of project records and documentation, (iii) Learning process and performance improvement, (iv) Value improvement programs integration in organization's activities, (v) Management involvement in technical meetings.
Human resources qualification and capacity	(i) Human resources educational background, (ii) Existing training programs, (iii) Access to new technologies and methods.
Availability of potential projects	(i) Characteristics and cost of infrastructure projects, (ii) Project complexity, (iii) Infrastructure development priorities.
Existence and extent of implementation of value related regulations	(i) Existing construction services law and regulations, (ii) Perception of all involved parties on existing law and regulations, (iii) perception of the authority to enforce the implementation of value related regulations.

### Research samples

Samples for this research were taken from 7 (some were from a main city in a particular county) among the 22 counties of the Aceh province. All of these counties and cities are located in the northern and eastern coasts of the province where physical infrastructures had been significantly damaged by the earthquake and tsunami in 2004. These counties are also the base of the relatively better developed construction companies and engineering consultants compared to those which are operating in the other places of the province. The counties and cities include: the county of Aceh Tamiang, the county of East Aceh, the city of Langsa, the city of Lhokseumawe, the county of Bireuen, the county of Aceh Besar, and the city of Banda Aceh.

Respondents representing owners are the top and middle management of the local government's technical departments, i.e. the local public works departments or settlements and regional infrastructure departments, which already have experiences in managing infrastructure projects. Respondents representing local engineering consultants and contractors were those qualified in the big and middle size categories according to the Indonesian construction regulations. A total of 25 filled questionnaires are returned from 9 owners, 8 engineering consultants, and 8 contractors.

## **Research results**

The opinion survey conducted in this research gives a general impression of the extent of precondition fulfilment or readiness for the application of value improvement methods by the local community. The followings are the description of the survey results with regard to each of the precondition variables.

### **Commitment for value improvement**

All of the respondents consider value improvement methods as efforts made in order to improve project's quality in terms of project duration decrease, resources savings, decrease in maintenance cost, and work safety and health enhancement. Efficiency in resources deployment is one of their main concerns to achieve profit oriented objectives in construction projects. But, despite the positive perception of all involved parties on the importance of value improvement, non-transparent practices are still one of the main obstacles for the implementation of its methods in Aceh's construction project delivery. A fundamental reform in the entire system and investment in human resources development would be needed to solve this problem.

All respondents agree on the importance of value as policy development basis. The importance of leaders' role in value improvement is realized by all parties. In this regard, owners are the ones who obtained the least score (83% of the maximum score corresponding to a very positive answer) compared to consultants and contractors.

Respondents representing owners regard environmental protection as the most important factor to be considered in infrastructure construction projects, followed by construction quality, project duration, work safety and health, stakeholders' needs, donor's requirements, and project cost.

### **Awareness of value improvement importance in project delivery**

Although all respondents realize the importance of value improvement in project delivery, methods such as Value Engineering have not yet become an integral part of the process in Aceh and in most projects in Indonesia. Owner and contractor respondents are very familiar with the traditional design-bid-build project delivery method but have rarely or never applied or been involved in design-build or turn key projects. Owners sometimes also adopt the force account method in project delivery. Design consultant respondents are mostly used to the conventional method in design which comprises concept development, feasibility study, environmental assessment, and detailed design process. Consultants usually obtain an additional fee for major revisions in design after its completion. Answers from respondents show that owners and contractors are very familiar with contract amendments due to time and cost increases implied by these revisions. On the other hand design consultants seem uncomfortable with quality improvement suggestions from other parties during the design process. The quality of coordination among involved parties is considered not adequate by owner respondents whereas the other respondents find it sufficient. Questionnaire results show that special efforts in order to promote quality improvement have rarely been made by owners.

### **Management support and participation**

The degree of the management's support and active participation is seen through, among others, the quality of project reporting as one of the means of communication. The answers from respondents indicate that this aspect is one of the weaknesses in the management of projects especially on the owner's and the contractor's side. Moreover, the owners' and contractors' top management levels are not actively involved in technical meetings. Project documentation is also



one of the owners' weaknesses as revealed from the respondents' answers. Performance evaluation as part of a learning process for value improvement seems to be more intensively conducted by design consultants and contractors and less by owners. Value improvement actions in general have not become an integral part of the whole management programs.

### **Human resources qualification and capacity**

Questionnaire results show that most owners' and consultants' top managers have obtained master's degree. Meanwhile, members of the engineering team of owners, design consultants, and contractors generally graduated from universities or engineering vocational schools. Owners and consultants infrequently participate in project management and quality management trainings while contractors rarely participate in such trainings. Contractors are mostly interested in project financial reporting trainings. Consultants are relatively more active in knowledge updating on new technologies. Access to new technologies and methods is mainly available through magazines, experts, and study visits to related institutions.

### **Availability of potential projects**

Before the 2004 earthquake and tsunami in Aceh, local consultants and contractors were mostly involved in small size transportation infrastructure, water distribution networks, drainage, and waste water network design and construction projects. Meanwhile, high cost and more complex infrastructure projects were usually handled by bigger and more experienced companies coming from outside the province. After the devastation of the whole area, almost all of the infrastructure reconstruction projects are relatively complex and quite costly.

### **Existence and extent of implementation of value related regulations**

The prevailing law and regulations on the provision of construction services in Indonesia are actually aimed at value improvement. However, these law and regulations do not comprise any clause that explicitly mention the requirement to apply a particular value improvement method, such as, for example, Value Engineering, in project delivery process. Respondents' answers show a willingness to implement all of these regulations but also that some of the regulations are less understood compared to some others. Owner respondents seem hesitant in admitting that they have the authority to enforce value improvement method application in project delivery process, for example by including the requirement in the project's terms of reference.

### **Importance comparison of variables**

The questionnaires also ask the respondents to answer questions which are aimed at obtaining the importance ranking of the six variables representing the preconditions to be fulfilled for the application of value improvement methods in project delivery process. The technique employed to obtain the ranking is the Analytic Hierarchy Process. Respondents are asked to compare the variables to one another in pairs and a numerical weight or priority for each variable is then derived. The average score and corresponding rankings for the variables are presented in Table 2.

**Table 2.** Importance ranking of research variables

Variable	Score	Ranking
Human resources qualification and capacity	0.205	1
Management support and participation	0.169	2
Existence and extent of implementation of value related regulations	0.168	3
Commitment for value improvement	0.163	4
Availability of potential projects	0.151	5
Awareness of value improvement importance in project delivery	0.144	6

## Discussion and conclusions

When practically the entire basic infrastructure of the Aceh province was very badly damaged by the earthquake and tsunami in 2004, the first reaction was to fulfil the needs for the immediate rebuilding of all the vital facilities which support social and economic activities. On the other hand, the rebuilding of the most important and basic infrastructures is also the chance to integrate value improvement efforts into the delivery process with the objective to achieve better plans, designs, and constructions. Various parties have been interacting in this delivery process which has involved a lot of funding from the government as well as from donor countries and institutions. The Aceh construction industry are in the centre of the reconstruction activity as partner to donors, engineering consultants and construction companies coming from outside the province and from foreign countries.

Value improvement methods have never been included as an integral part of construction projects delivery process in Aceh before. The local government who acts as the owner of the province's basic infrastructures and local companies offering engineering consultancy and construction services are only familiar with the traditional design-bid-build delivery method of relatively small and simple projects. Local contractors in particular need a lot of capacity strengthening to prepare them for the reconstruction of Aceh. They are lacking in knowledge on different construction contract and financial management systems especially those which involve funding from foreign donors. Local consultants need to have more experience in handling the design of complex projects in order to be able to realize the importance of and to be more open to value improvement methods. The local government as owner in basic infrastructure projects has practically never exercised its authority to include clauses on value improvement requirements in contract documents. Results of the survey conducted in this research are summarized in **Table 3**. 100% score percentage indicates a very positive attitude, support, or condition for value improvement in each category of respondent.

**Table 3.** Summary of survey results

Variable	Score percentage (%)			Average score (%)
	Owner	Consultant	Contractor	
Human resources qualification and capacity	64.24	61.98	53.20	59.81
Management support and participation	59.25	71.75	67.64	66.21
Existence and extent of implementation of value related regulations	68.33	71.93	67.21	69.16
Commitment for value improvement	77.25	76.46	74.31	76.01
Availability of potential projects	63.54	71.13	70.97	68.55
Awareness of value improvement importance in project delivery	58.74	62.62	63.97	61.78

The qualification and capacity of human resources involved in project delivery process represent the most important precondition to be fulfilled before applying value improvement methods. As shown by the above survey results, it is a critical factor in Aceh reconstruction since it is also the variable with the lowest score. Local contractors are the ones who would have to be given the most attention and support in this respect.

The survey also shows that owners are weakest in their awareness of and support for the methods although, in their opinion, project delivery process quality is the most important objective in infrastructure reconstruction. The highest overall fulfilment score is achieved by design consultants. Value improvement methods are not explicitly mentioned in clauses of related regulations but the parties involved seem willing to implement those regulations. However, although the respondents' answers on commitment for value improvement tend to be positive, non-transparent practices actually still exist. This situation is one of the main obstacles for value improvements in Aceh's construction project delivery and has negatively affected the extent of the industry's readiness to adopt the methods.

Finally, the inclusion of value improvement methods in the reconstruction process will undoubtedly have an impact on project time and resources but the potential trade off between those aspects and the resulting better quality and life cycle cost of the constructed facilities has made the application of these methods worth considering, especially for important and costly infrastructures in Aceh.

**Key Lessons Learned:**

- Aceh's reconstruction project is complex and costly and the local construction industry is only familiar with traditional design-bid-build delivery of relatively small and simple projects.
- Qualification and capacity of human resources are the most important precondition to be fulfilled in order to achieve project delivery value improvement.
- Non-transparent practices still exist and negatively affect the extent of the industry's readiness for the application of value improvement methods in projects.

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