

# Public-Private-People Partnerships (4P) for Disaster Preparedness, Mitigation and Post-disaster Reconstruction

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Post-disaster reconstruction, while clearly critical in restoring the affected community, can also provide new opportunities for economic growth, future vulnerability reduction and sustainable development. However, previous studies reveal that many reconstruction projects failed to deliver on time or within budget, and performed poorly in both strategic planning and coordination of multiple participants. Imperatives are thus noted to improve performance levels of reconstruction projects. Since Public-Private Partnerships (PPP) perform better compared to the traditional approach in some new infrastructure construction projects, PPP could also be one procurement option for certain reconstruction projects.

This research aims to improve disaster management and to target future sustainable development by developing suitable Public-Private-People Partnership (4P) systems. The proposed 4P approach is tailored to deliver reconstruction projects by integrating the 4th 'P' - People into PPP and formulating 4P beforehand. Here 'people' refers to key stakeholders in reconstruction, such as Non-Governmental Organizations (NGOs), local communities, professional groups, academia and media. The proposed 4P arrangements would set up pre-disaster 'framework agreements' linking potential participants in disaster-prone areas in advance. This will enable formal post-disaster arrangements to be mobilized faster, to efficiently organize diverse potential participants who otherwise usually come together in an ad hoc and less effective way.

A proposed preliminary framework for the above is developed, based on findings from a literature review, the first round of semi-structured interviews and two parallel sets of questionnaire surveys targeting different stakeholder groups. This paper summarizes the above findings and presents the preliminary framework. A flowchart is presented showing the envisaged 4P procedures including four major steps: preparation, forming framework agreements, 4P procurement and services delivery. The proposed 4P network addressing partnerships between different parties is presented next. Second round interviews, case studies and a focus group meeting will be conducted to refine and validate the framework in future research.

*Key Words: Public-Private-People Partnerships, 4P, reconstruction, disaster management*

## 1. INTRODUCTION

Natural disasters have destroyed infrastructure, economies and claimed hundreds of thousands of human lives, becoming more devastating in recent years. The 2004 Indian Ocean Tsunami caused 350,000 deaths, which includes 142,000 missing people<sup>1</sup>). The economic damage from the March, 2011 Japanese earthquake and tsunami is estimated at \$235 by the World Bank<sup>2</sup>). Therefore, there is an urgent need to improve disaster management globally to reduce loss to life and property. Generally, there are three phases in a disaster management cycle, which are pre-disaster phase in order to reduce disaster risks by adopting preparedness and mitigation measures, immediate aftermath phase aiming at response and rescue, and recovery phase focusing on long-term recovery and reconstruction<sup>3, 4, 5</sup>).

Post-disaster reconstruction can provide new opportunities for employment generation, investment and growth, vulnerability reduction and sustainable development<sup>6, 7)</sup>. However, in reality, the reconstruction projects are often carried out on an ad hoc and emergency basis without appropriate policies and guidelines, leading to poor outcomes, particularly after large-scale disasters<sup>8)</sup>. Previous studies reveal that many reconstruction projects failed to deliver on time or within budget, while failing to integrate sustainable development priorities into reconstruction processes either<sup>9, 10, 11)</sup>. It is therefore important to improve performance levels of reconstruction projects through appropriate procurement approaches and more structured co-ordination of the various stakeholders and contributors.

On the other hand, Public-Private Partnership (PPP), which is now increasingly applied to deliver selected public services worldwide, has performed better than the traditional approach on certain types of new infrastructure development. Offering better services and ‘value for money’, PPP type procurement could be one option to deliver some components in certain types of reconstruction projects<sup>12)</sup>. However, typical PPP approaches may not work in disaster scenarios demanding rapid responses and involving ‘people’- those affected, as well as those who help. This research project aims at improving disaster management, infrastructure resilience and the sustainability of post-disaster reconstruction by directly involving such ‘people’ and developing Public-Private-People Partnerships (4P) systems. The 4P systems, developed on the base of PPP approach, can be tailored to deliver reconstruction projects by integrating the 4th ‘P’- People into PPP. Here ‘people’ refers to key stakeholders that will contribute significantly and play critical roles in reconstruction, such as Non-Governmental Organizations (NGOs), local communities, professional groups, academia and media<sup>13)</sup>. These identified major groups of ‘people’ would participate in reconstruction anyway, though mostly in an inefficient and unorganized manner. Therefore, 4P targets for formalizing their relationships into effective partnerships, as presented in Fig. 2, section 4.

In this paper, section 2 introduces and describes the 4P systems. Discussions of research findings from questionnaires and semi-structured interviews are in section 3. The proposed preliminary framework of 4P is presented in section 4, which consists of a flowchart showing 4P procedures and a diagrammatic representation of partnerships between multiple participating parties. The paper ends with the conclusion and perspectives for future development.

## 2. PUBLIC-PRIVATE-PEOPLE PARTNERSHIPS

The development level of the disaster management systems vary from nation to nation. Developed countries, such as Japan and US, have already established relevant policies, regulations and structured institutions to manage natural disasters from preparedness, mitigation to response and recovery. However, the unsatisfactory responses to the 2011 Japan earthquake and 2005 Katrina Hurricane revealed that even the disaster management systems in developed countries can have serious inadequacies. On the other hand, many developing countries, some of them even suffering from extreme poverty or wars, have far less capacities and incomplete systems to deal with natural disasters.

Therefore, there is an urgent need to improve disaster management systems globally. Instead of studying the whole cycle of disaster management, this paper will only focus on the recovery and post-disaster reconstruction phase, but at the same time take future disaster risk reduction into consideration. In the complex and emergency situations after large-scale destructive natural disasters, the public sector can not handle the reconstruction and rehabilitation alone. The recovery process requires participation and contributions from the whole society, including broader communities and multiple private parties<sup>14)</sup>. In fact, NGOs, the private sector, affected and general communities, professional groups, media and other parties do get involved in the recovery and support activities, but mostly in an ad hoc and inefficient manner. So why not formalize their participation from the outset and provide a platform for them to cooperate efficiently and effectively? A 4P approach is proposed to answer this question.

PPP is being more widely applied to deliver public infrastructure, aiming at synergizing the advantages of both public and private sectors through a comprehensive partnership between them. Previous research revealed that PPP projects have performed better in many respects compared to the traditional approach where they have been applied<sup>15, 16, 17, 18)</sup>. It is therefore proposed that PPP could be one of the procurement options that could be considered to deliver specific reconstruction projects after sufficient research and development.

Tailored to deliver selected public infrastructure reconstruction projects, Public-Private-People Partnerships (4P) could integrate ‘People’ into PPP to improve reconstruction, disaster management and target future sustainable development. 4P would enable the public, private and ‘people’ to work together to deliver public

infrastructure in formal partnerships legalized by contracts and cemented with the spirit of mutual trust, openness, transparency and commitment. Public and private sectors are obviously critical to any project procured by PPP and the proposed 4P procurement. The following part of this section will discuss the significant role of each party under the category of ‘people’ in disaster management.

The concept of community-based approach in disaster management is widely accepted and promoted around the world<sup>19)</sup>. ‘Community-based’ means people’s participation should be mobilized and sustained throughout the disaster management cycle starting from the very beginning of planning and not ending until the achievement of desired goals and institutionalization in the community<sup>20)</sup>. It is very common to underestimate the importance and value of local communities’ participation in reconstruction. Local people are familiar with their culture, history, customs in general and building materials, architectural styles in construction. These valuable knowledge and experience pools could provide critical references in planning, design and reconstruction of affected public infrastructure. By actively involving local communities in planning and decision making processes, the reconstruction projects would be more likely to meet end-users needs. Therefore, communities’ participation is at the heart of the recovery programme<sup>21)</sup>.

NGOs are non-profit organizations independent from the governments. They are more flexible, democratic and can communicate directly and efficiently with the general public with the focus on services<sup>22)</sup>. NGOs can play important roles to rescue and/or rehabilitate human lives, and to provide living essentials like shelter, food and water to the victims in the response phase. They also participate in the long-term reconstruction and recovery through donations and providing professional assistance such as psychological consultations and medical services. With their professional background and rich experience in disaster management, NGOs have great potential in ‘software building’ in reconstruction. ‘Software’ targets social, economic and health issues that must necessarily complement the ‘hardware’ in-built infrastructure for meaningful rehabilitation.

Professional organizations like Institutions of Engineers, Architects and Medicaid Doctors are usually non-profit organizations engaged in particular professions. Professional organizations have been defined as a group of professional practitioners ‘who are entrusted with maintaining control or oversight of the legitimate practice’ also acting to safeguard the public interest<sup>23, 24)</sup>. In this research project, relevant professional organizations are those engaged in construction-related professions and disaster management profession. Their training experience and capacities enable them to play significant roles in post-disaster reconstruction and in potential 4P projects. Taking the American Society of Civil engineers (ASCE) as an example; ASCE believes that civil engineers have great responsibility to minimize loss to life and property from natural disasters through preparedness and mitigation of buildings and infrastructure<sup>25)</sup>. In addition, ASCE has long history to lend a hand in disaster relief and recovery, such as sending technical teams to assess damage to critical infrastructure in disaster affected areas<sup>25)</sup>. Academia plays similar roles to professional organizations in serving as expert consultants in particularly complex scenarios.

The media can play very important role in disseminating information and obtaining quick feedbacks, as also can the general community, with the rapid development of new media such as Facebook and Twitter. In 4P, such networks provide essential tools to get the right messages across and communicate rapidly between major stakeholders. What should be noted is to prioritize and present important facts first, rather than to spread irrelevant or dangerous rumors and to mobilize resources rapidly to where more needed.

### 3. FINDINGS

The research based on the above propositions commenced with interviews and a questionnaire survey. The findings presented in this paper are consolidated from 12 semi-structured interviews and 2 sets of parallel questionnaires. Interviewees are experts, scholars or civil engineers with rich practice or research experience in PPP, disaster management or post-disaster reconstruction activities. Table 1 summarizes the profile of the 12 interviewees:

**Table 1** Profile of interviewees

Working area	Profile
Disaster management	3 ( 1 senior manager from an NGO + 2 ‘Hong Kong Humanity Award’ winners)
Post-disaster reconstruction	6 (3 civil engineers + 2 academics +1 officer from Hong Kong Development Bureau)
PPP	3 (1 senior manager from Hong Kong Airport Authority + 2 academics)

Since there are few experts with both PPP and disaster management knowledge and experience, 2 parallel sets of questionnaires are designed with some common general and some different specific questions; and distributed separately in each field. Questionnaires are designed based on literature review and previous semi-structured interviews. PPP based questionnaires were sent through emails to members of NCPPP (National Council for Public-Private Partnerships), Partnerships Bulletin, NZCID (New Zealand Council for Infrastructure Development), Partnerships Victoria and other such PPP organizations. Disaster management (DM) questionnaires were sent to government agencies and NGOs focusing on disaster management in Australia, US, India, China, Hong Kong etc. Currently, 41 responses to the PPP based questionnaire and 40 responses to the DM based questionnaire have been received. However, some of the responses were incomplete, hence the actual response numbers to each individual question may be lower.

#### a) Reconstruction

The major differences between reconstruction and general construction projects and common problems existing in reconstruction projects are presented to identify the hypothesized gaps and hence justify the needs to target better reconstruction. The answer options are in an increasing agreement scale from 1-4, in which 1 stands for disagree, 2 for neutral, 3 for agree and 4 for strongly agree. In Table 2, the mean score, standard deviation (SD), rankings from the highest mean score to the lowest and one-sample t-test results are presented under the second column 'individual', which are analyzed responses from PPP-based questionnaires in the upper row and responses from DM-based questionnaires in the lower row. The test value in one-sample t-test is fixed at 2, referring to the neutral attitude, with the significance level of 5%. Therefore, p under 0.05, indicating the mean score is above 2, implies that the respondents agree/strongly agree with the statements. In addition, the overall ranking, mean and SD of all responses from both questionnaire are shown under the third main column 'overall'. Results of the independent t-test to compare the mean score of PPP group and DM group are also presented. Under independent t-test, q value below 0.05 suggests that the two means are significantly different. Otherwise, q value larger than 0.05 indicates that the two groups of respondents hold the same opinion.

The first question was stated as: To what extent do you agree with the identified main differences between reconstruction projects and normal construction projects?

**Table 2** Major differences between reconstruction and general construction projects

Answer Options	Separated (PPP & DM) Sub-groups					Combined Group			
	Sub-group	Rank	Mean	SD	t-test p	Rank	Mean	SD	t-test q
A. More complex, dynamic and with multiple projects proceeding at the same time	PPP	1	3.07	0.83	0.000	3	2.94	0.73	0.084
	DM	4	2.78	0.53	0.000				
B. More risky and depend on administrative, political, social, economic and culture context	PPP	3	2.83	0.87	0.000	4	2.77	0.83	0.364
	DM	5	2.68	0.78	0.001				
C. Building procedures are simplified by the approval of the government	PPP	6	2.33	0.92	0.057	6	2.38	0.87	0.845
	DM	6	2.45	0.80	0.015				
D. Inadequate capacity of construction industry--shortage of competent technical staff, labor and materials	PPP	5	2.50	1.01	0.011	5	2.69	0.96	0.137
	DM	3	2.95	0.84	0.000				
E. Funding mainly comes from governments and donations	PPP	3	2.83	0.79	0.000	2	2.96	0.82	0.189
	DM	2	3.14	0.85	0.000				
F. Multiplicity of participate parties - public sector, NGOs, private and volunteer groups and etc	PPP	2	3.03	0.67	0.000	1	3.10	0.67	0.416
	DM	1	3.19	0.68	0.000				

As shown in Table 2, suggested by p value, respondents agree with the identified six major differences, except that PPP professionals display an opposing opinion on option C. With regard to the rankings, C is ranked last in both sets of questionnaires, indicating that there are least agreements with C from both PPP and DM fields. Interviewees from Sichuan reconstruction also expressed that building procedures have not been simplified, but only have stricter time constraints. On the other hand, q value implies that DM and PPP professionals have no significantly different perspectives in all six identified differences. In summary, reconstruction projects are involving more diverse parties (3.10), mainly financed by government funding and donations (2.96) and more complex and dynamic (2.94).

Table 3 presents the survey results from responses to the question: To what extent do you agree with the identified problems existing in reconstruction process?

**Table 3** Current problems in reconstruction

Answer Options	Separated (PPP & DM) Sub-groups					Combined Group			
	Sub-group	Rank	Mean	SD	t-test p	Rank	Mean	SD	t-test q
A. Sacrifice of sustainable long term development for rapid and visible solutions	PPP	3	2.71	1.01	0.001	3	2.80	0.93	0.486
	DM	5	2.90	0.83	0.000				
B. Lack of adequate relevant policies and legal systems	PPP	7	2.52	1.02	0.011	7	2.66	0.92	0.176
	DM	6	2.86	0.73	0.000				
C. Lack of systematic recovery plans	PPP	4	2.61	1.07	0.006	2	2.82	0.95	0.060
	DM	2	3.10	0.70	0.000				
D. Corruption, lack of transparency and accountability problems	PPP	5	2.57	0.96	0.004	4	2.78	0.92	0.072
	DM	3	3.05	0.80	0.000				
E. Economically or politically powerful groups/persons dominate planning and decision making process	PPP	1	2.89	0.96	0.000	1	3.00	0.91	0.348
	DM	4	3.14	0.85	0.000				
F. Cost and time overruns are common in reconstruction projects	PPP	5	2.57	0.96	0.004	5	2.73	0.88	0.137
	DM	1	2.95	0.74	0.000				
G. New and appropriate technologies are rarely used	PPP	8	2.32	1.06	0.119	8	2.33	1.03	0.969
	DM	8	2.33	1.02	0.149				
H. Construction market is fragile and not functioning well	PPP	9	2.18	0.82	0.259	9	2.14	0.79	0.719
	DM	9	2.10	0.77	0.576				
I. Lack of communication and coordination among stakeholders	PPP	2	2.79	0.96	0.000	6	2.71	0.91	0.533
	DM	7	2.62	0.86	0.004				

As suggested by the one-sample t-test results, both PPP and DM respondents do not agree on G and H. While, the other seven identified problems are agreed existing in reconstruction. The two groups hold the same opinions regarding each single statement implied by the independent t-test. The most widely agreed three concerns are economical and political power dominating in planning and decision making (3.00), lack of systematic recovery plans (2.82) and sacrifice of sustainable recovery to rapid and visible solutions (2.80).

#### b) PPP for reconstruction

This part aims to explore the feasibility of using PPP for some reconstruction projects, which is the basis for further research on 4P for reconstruction, in comparison with the traditional approach. Survey results of the strengths and weaknesses of adopting PPP for reconstruction from the perspectives of PPP professionals are presented in Table 4 and 5. Then Table 6 shows to what extent PPP can help to reduce the problems in reconstruction identified before.

The first question was: To what extent do you agree with the identified potential benefits of applying PPP for reconstruction projects after natural disasters?

**Table 4** Benefits of applying PPP for reconstruction

Answer Options	Rank	Mean	SD	T-test p
A. Efficient and cost effective	5	2.85	0.91	0.000
B. Sufficient funding from the government and donations	6	2.46	0.86	0.011
C. Better risk transfer and sharing	4	2.93	0.96	0.000
D. Performance incentive	2	2.96	0.94	0.000
E. Speedy once started	1	3.15	0.88	0.000
F. Sustainable development by considering the whole life cycle of reconstructed infrastructure	2	2.96	0.94	0.000

The next relevant question was: To what extent do you agree with the identified potential concerns of adopting PPP for reconstruction projects?

**Table 5** Concerns of applying PPP for reconstruction

Answer Options	Rank	Mean	SD	T-test p
A. High risks	4	2.30	0.99	0.133
B. Long time to prepare and complex negotiation	1	3.00	0.92	0.000
C. High costs in tendering	2	2.89	0.85	0.000
D. The private sector is less motivated to innovate and save cost since they may not be the financiers	6	1.81	0.83	0.259
E. Low profits in reconstruction projects constrain the interest of private sectors	5	1.89	0.97	0.558
F. People are suspicious about the private sector delivering public infrastructure	3	2.48	0.98	0.016

As shown in Table 4, all p values are less than 0.05, confirming that a PPP approach has great potential to benefit reconstruction projects. The major concern is that PPP projects need a long time to negotiate and prepare. In other words, they can not start as quickly as the projects procured by a traditional approach. Besides, complex negotiation and preparation bring higher tendering costs. Therefore, concern A and D together with concern F are generally agreed by the respondents as threats for PPP to deliver public infrastructure. However, the other three concerns are not agreed since the p values are larger than 0.05, leading to the conclusion that they may not be major obstacles for implementing PPP in reconstruction. The proposed 4P approach intends to address some concerns by setting up pre-disaster ‘framework agreements’ linking potential participants in advance, which would help to deliver reconstruction projects much more quickly and effectively. This would reduce the concern of long and complex preparation processes as in general PPP projects.

Table 6 presents the survey results from the question: To what extent can these problems be addressed by using PPP for reconstruction? In this question, 1 is represented as ‘can not eliminate’, 2 as ‘reduce partly’ and 3 as ‘reduce a lot’. The test value in one-sample t-test is set at 1, hence a significant different value from 1 means the concerns could be reduced to a certain extent.

**Table 6** Problems addressed by using PPP for reconstruction

Answer Options	Rank	Mean	SD	T-test p
A. Sacrifice of sustainable long term development for rapid and visible solutions	3	2.08	0.84	0.000
B. Lack of adequate relevant policies and legal systems	4	1.96	0.82	0.000
C. Lack of systematic recovery plans	4	1.96	0.86	0.000
D. Corruption, lack of transparency and accountability problems	6	1.84	0.80	0.000
E. Economically or politically powerful groups/persons dominate planning and decision making process	7	1.52	0.65	0.001
F. Cost and time overruns are common in reconstruction projects	1	2.44	0.65	0.000
G. Lack of communication and coordination among stakeholders	2	2.25	0.68	0.000

As shown in Table 6, with the mean score of 2.44, PPP approach can reduce cost and time overruns greatly, which is consistent with a number of studies comparing the performance levels between PPP and traditional procured projects<sup>17, 18</sup>). Meanwhile, the mutual trust and cooperation expected in PPP projects would greatly improve the communication and coordination among stakeholders, which explains the second ranking of G (2.25). In addition, PPP can play a significant role in addressing issue A B and C with mean scores around 2.00. However, D and E are closely related to the government behavior and policy, PPP’s role is relatively weak. Despite this, respondents still believe that PPP can make a difference in D and E as p indicated.

From the previous analysis, we could reach the conclusion that PPP has good potential to achieve better performance and sustainable development in reconstruction compared to the traditional approach. However, as discussed in questions 1 and 2, PPP by itself may not work well in disaster scenarios that require rapid response. 4P is therefore developed based on the PPP approach, but with specific improvements by integrating ‘people’ and setting up pre-disaster preparation mechanisms. The next section will present the preliminary 4P framework to illustrate how 4P will function and proceed in reconstruction.

#### 4. PRELIMINARY 4P FRAMEWORK

The proposed preliminary framework aims to provide a theoretical outline for 4P procurement. Firstly, the proposed major procedures for procuring a 4P project are presented. The four major steps are shown in Figure 1: (1) preparation (2) forming framework agreement (3) 4P procurement and (4) services delivery. The following are some basic assumptions for assessing the needs for, and possibilities of implementing 4P in certain regions.

Firstly, the country is vulnerable to natural disasters and possesses certain capacities for disaster management. Secondly, there are systematic reconstruction and recovery policies and guidelines at the national and provincial level. Thirdly, the public and private sectors have PPP experience and related PPP guidelines and regulations. 4P approach is only one of several options to deliver infrastructure reconstruction projects. Only in such countries that are more threatened by natural disasters, as well as have knowledge of PPP and strong government capacities, it is possible and worthy to establish 4P systems.

In the first stage, 'preparation' means the research and analysis to be done by the public sector to identify the scope and needs of potential 4P infrastructure reconstruction. At first, infrastructure reconstruction projects are divided into economic infrastructure (roads, airports, electricity...), social infrastructure (schools, hospitals...) and special public infrastructure (cultural and historical projects...). They are further sorted into groups according to their location, size and complexity. The sorting and categorizing are in order to set up standard requirements and descriptions for each group of infrastructure.

Reference projects or business cases are then developed by each client department to evaluate and verify whether 4P is a suitable procurement method. Comprehensive studies should be conducted to provide qualitative and quantitative evidence and support for decision making, such as techniques based on Value for Money (VFM)<sup>12)</sup> and Public Sector Comparator (PSC)<sup>26)</sup>. Further steps will only be taken after proving that 4P projects are potentially more likely to achieve superior performance than traditional or alternative means. Thus, the type of infrastructure reconstruction that can potentially use 4P are narrowed down and conveyed to specific client department that could best handle them. Project boards would be set up between the client department and outside experts for detailed analysis of typical potential 4P projects. The analysis will cover financial, technical, social-economical assessment and other important issues. 'People' are invited to contribute during this phase. For instance, public consultation is needed to draw comments and suggestions from the broad society and communities; NGOs, professional organizations and academia could assess the project from various angles, representing and protecting related interests. 'Statements of requirements for framework agreement' would be prepared and issued to invite private sectors, NGOs, professional groups and other interested parties to submit their proposals, for each infrastructure type.

A framework agreement is a general term for agreements with providers that set out terms and conditions under which specific purchases (call-offs) can be made throughout the term of the agreement<sup>27)</sup>. It encourages collaborative working in successive projects by integrated teams. The long-term relationship will bring greater efficiency, cost effectiveness, reduction in disputes and increased opportunities for innovation<sup>28)</sup>. Such framework agreements have been used by many government authorities in Europe. Both the NEC and JCT forms of contract have issued standard forms as guidance. Framework agreement can similarly save time and resources in 4P reconstruction projects. That is because framework agreements reduce the time for mobilizing same providers, administration and further negotiation, making it much easier to enter into the next-step of detailed contracts<sup>29)</sup>. 4P systems target sustainable recovery and development through long-term partnerships based on common objectives between multiple parties, which is consistent with the core values embedded in framework agreements. Framework agreements should be updated and improved by negotiation between these parties, say every 5 years to keep up with new standards and requirements.

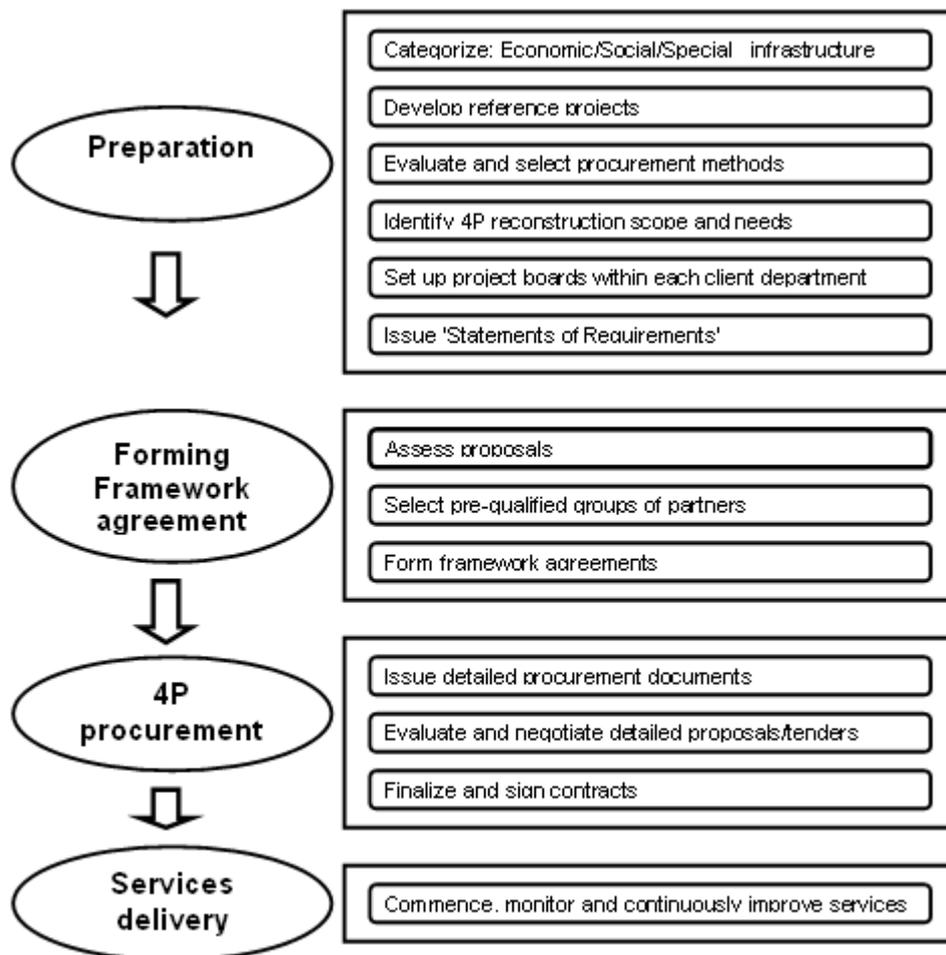


Fig.1 4P procedures

The second stage aims to establish such 'framework agreements' between the public sector and pre-qualified private sector organizations, NGOs or other such bodies. The prequalification of potential partners will be based on the following criteria: company profile and reputation, technical, financial and management capacity, as evaluated in detail from specific indications/aspects in their submitted proposals. Large companies with PPP experience and well-established NGOs are preferred since they are more likely to sustain in the longer term before and after any major disaster. Three to four pre-qualified groups of partners are selected for each project package to reach framework agreements with the public sector.

It is said that 'proper planning and prior preparation prevents poor performance'<sup>30</sup>. The above two stages are the basis to mobilize reconstruction actions faster and more efficiently in the short term, and can lead to more successful and sustainable reconstruction in the long run. The third stage will be triggered after a major disaster happens, which leads to '4P procurement'. The procedures are developed, mainly based on 'An Introductory Guide to Public Private Partnerships (PPPs)' issued by the Efficiency Unit in Hong Kong<sup>26</sup>. The major differences are: (1) in extending to 4P, although a previous study have proposed and justified the potential for 4P, more research needs to further verify the use of 4P; (2) the client department receives proposals in advance that satisfies the real need standard requirements, leading to pre-qualified groups of partners, so that contracts can be developed based on the framework agreements and awarded among the pre-qualified partners; (3) 'People' will be actively, regularly and formally involved in the whole process. Therefore, the third stage begins with the client department and the relevant project board drafting procurement documents including specific requirements for the needed services, payment mechanisms, contract duration and other critical issues. Evaluation of the specific proposals/tenders received, and negotiation on 'grey area' would precede selection and award of the contracts. The project packages could be awarded to one partner consortium or divided and awarded to several consortia according to the circumstances.

The fourth and last stage is the commencement of the reconstruction contracts and the delivery of the re-

construction services. In a 4P contract, like in PPP projects, the group of partners will deliver all the services from design and construction, to operation and maintenance over a long period of time, such as 30 years.

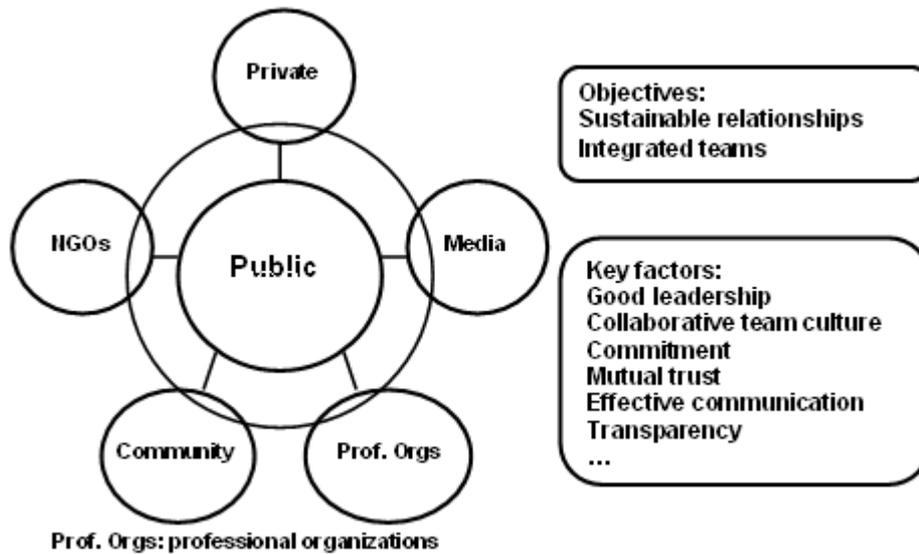


Fig.2 Relationship networks

Sustainable relationships between various stakeholders will provide the corner-stone and basis for successful 4P reconstruction. There is plenty of previous research on how to target successful partnerships/relationships/teamworking and cooperation in social science, psychology, management and specifically the in the construction industry<sup>31)</sup>. Models and frameworks have been developed for long term cooperation as well <sup>32)</sup>. In this research, the objectives are achievable through sustainable relationships between various parties, as a supplement to the regulated and systematic guidelines and procedures, to achieve better project management, hence leading to successful 4P projects.

As shown in Figure 2, the public sector functions as the leader and coordinator, focusing on core issues. Private sector companies, NGOs and other parties will bring professionalism, innovation and efficiencies to the projects and free the public sector from detailed and specific arrangements in complex and large scale reconstruction. The relationships between multiple parties are extremely important for the success of the projects. Relationship management models or integrated team building methods should be applied here<sup>32)</sup>. Also, some key criteria and performance indicators related to human factors to achieve successful partnerships should be used in monitoring and evaluation: e.g. good leadership, collaborative team culture, commitment, mutual trust, effective communication and transparency<sup>33, 34)</sup>. Further research will proceed to systematically develop the criteria and processes for better relationship management in 4P procurement for disaster-related reconstruction.

## 5. CONCLUSION

The review of the current practice of disaster management and reconstruction spotlights gaps and shortfalls that must be addressed with more effective procurement methods. 4P is proposed and introduced to provide an alternative in appropriate scenarios. The conclusion derived from interviews and questionnaire surveys is that 4P has great potential to deliver certain types of reconstruction projects better. The proposed 4P framework provides a platform to develop fruitful and practical partnerships between the public, private sector and 'people' – NGOs, communities, professional organizations, media and academia, to reconstruct certain types of public infrastructure. This framework also provides a basic methodology and conceptual foundation for academia, with pointers for further development through future research. Planned second round interviews, case studies and a focus group meeting will be conducted to further develop, refine and validate the framework in future research, with a view to developing a case for trial/pilot implementation.

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