

CIVIL WORKS CAPACITY CONSTRAINTS¹

I. INTRODUCTION

1. The intention of this discussion paper is to provide background on the performance, market structure and the procurement process in the construction sector, and stimulate thought on actions the Government of Papua New Guinea (PNG) and its development partners might pursue to improve the construction sector's capacity. The hope is that readers will provide more insight into the structural challenges, and potential approaches to support a more robust construction sector providing more choices for public and private decision makers, and over time actively pursue new policies towards that aim.

2. The construction sector has a very poor record of completing contracts on time and within budget. Various structural factors in the national economy and the construction sector, the procurement and large-scale contracting processes, community compensation, compounded by the market power the small number of construction firms wield, plus security concerns, combine to delay implementation and raise costs in the implementation of road, airport, and other infrastructure projects. The contracting agencies and foreign assistance community would like to avoid past poor performers and give business to other companies, but there are no real alternatives among the small number of players.

3. The road construction industry has contracted in recent years. The declining economy in the early/mid 2000s led to reduced revenues and less Department of Works (DOW) contracts, cost-cutting, and poor supervision, while security declined in the Highlands, causing companies to look elsewhere and move offshore.

4. The much anticipated PNG liquefied natural gas project is a combination of a number of very large-scale production, pipeline and associated logistics projects representing the largest private-sector investment in the country's history. The project will create considerable demand for construction services, and it is not quite clear how the project will obtain the skills needed for its construction program, although it has already announced large investments in vocational and technical schools. Their demands have the potential to "crowd out" the already limited capacity in the sector and lead to large cost increases in the near term, but could also create the critical market stimulus necessary to attract more market players over the longer term.

II. BACKGROUND OBSERVATIONS ON THE PNG CONSTRUCTION SECTOR

5. The background first describes some of the scheduling and cost problems the Asian Development Bank (ADB) and other foreign assistance providers have encountered in contracting civil works for roads and other infrastructure projects; and concentrates on identifying the most common challenges to an effective construction sector.

A. ADB/Australian Agency for International Development (AusAID) Experience

6. Civil works projects in PNG have slow rates of implementation and disbursement and cost overruns. ADB's experience is that procurement and works in Pacific island nations, including PNG, generally have half the disbursement rates of other ADB borrowing countries.

¹ This report was prepared by D. Lucius, a long term transport consultant funded under TA6475-REG: Enhancing Engagement with Pacific Member Countries.

7. Take the example of the ADB's Road Maintenance and Upgrading (Sector) Project Supplementary Loan, (itself a new loan created out of the unused portion of a 6-year-old project), 226 kilometers (km) of road projects were identified in 2006, and as the project approached its close and received an extension, 9.6 km section had been completed, 149.2 km is under construction, with another 18.6 km approved but not commenced. Of ADB's US\$53 million commitment, US\$33 million has been awarded, and US\$8.8 million disbursed.

B. Identification of Key Problems

8. The most common explanations of this poor performance include the construction sector's limited and overstretched capacity, lack of competition, plus a structure of technical, financial, procurement and contracting factors constraining the capacity of even the most well-intentioned civil works contractor.

9. There are fewer than 15 national contractors, and less than 5 international companies, with the technical knowledge, capital equipment and financial means to execute large civil works contracts on Department of Works' road projects funded by ADB.² Most, if not all, companies are over-extended in their commitments, causing delays when they do participate, and limited competition when they don't. Lack of response to tenders takes many manifestations, including re-bids, even several rounds of re-bids, and delays in procurement. Bids are often significantly larger than engineers' estimates. Smaller bidders may attempt to bid, but lack the necessary financial capacity to sustain efforts on large contracts.³

10. DOW and other government agencies are aware of companies regularly failing to meet schedule and otherwise under-performing, but profess they have little choice but to accept their bids. Recent initiatives are attempting to include past contractor performance in tender evaluation criteria, while also improving the monitoring of contractor performance.

11. Once contracts are awarded, a series of problems are likely to ensue. Work stoppages are common for various reasons discussed below. Cost overruns are the rule, and quality difficult to control. Contractors who turn to sub-contractors to fill gaps in their own capacity often fail to provide supervision, leading to sub-standard work, disputes with implementing agencies, and prolonged finger-pointing.

12. The country presents considerable demands on the civil works sector in terms of large transportation and other infrastructure. The capacity of the sector to respond is strained. The new PNG liquefied natural gas (LNG) project will raise demand considerably, and could likely overheat the market, making it even more difficult to complete, or even commence, transportation projects in the near term. At the same time, this stimulus could engender greater competition and more responsive civil works contractors.

² See for instance ADB. 2009. Technical Assistance Report, *Papua New Guinea: Improving Road User Charges and Private Sector Participation in Road Development*, Manila; ADB. 2008. *Foundation for Growth: A Private Sector Assessment of Papua New Guinea*, Manila; and ADB. 2008. *The Challenges of Doing Business in Papua New Guinea: An Analytic Survey of the 2007 Business Environment Survey by the Institute of National Affairs*, Manila.

³ TSSP has begun to include small works contracts suitable for smaller, local businesses in DOW projects they fund: see *Current Government Approaches*.

III. ANALYSIS OF KEY PROBLEMS

A. Challenges

13. Having highlighted the most common performance shortfalls in general terms, the narrative in this section seeks to analyze the underlying problems. The text comprises various explanations of the causes of unsatisfactory performance, plus a few notes on the likely progression of future events.

14. **Skills Shortage.** One of the most commonly cited problems is a shortage of skilled workers, and others suggest it is the most difficult impediment to overcome. The Works Institute of Training in Madang closed 10 years ago, and although several vocational high schools and colleges offer training to future plumbers, carpenters and electricians, none appear to offer training in skills directly useful in civil works. The skills shortage extends from laborers and equipment operators on up to qualified engineers. The country's only engineering program at Unitech Lae recently produced 28 graduates in the civil engineering field, compared to 162 in mining engineering. When available, skilled labor is expensive. Anecdotes indicate Australians and Asians are arriving in large numbers to fill the gap.

15. The government, AusAID, and above all the PNG LNG project are expanding vocational skills training, but it is difficult to find national trainers, and there is little resolution to the skills shortage over the near term.

16. **Materials Quality and Materials Testing.** The geology of PNG varies greatly over short distances, and materials meeting minimum quality standards may not be immediately available on site. The conscientious company is at a disadvantage against a less scrupulous one that will sacrifice quality standards to control costs.

17. DOW offices have material testing laboratories, but many suffer from poorly trained staff and limited maintenance. The Department has initiated efforts to train staff to maintain and calibrate the laboratory equipment, but more remains to be done.

18. **Cost of Materials.** The uncertain availability and quality of materials is a significant variable leading to delays and cost overruns. Sand and other materials needed in the Highlands are often sourced from the coast. Even when quality inputs are available locally, negotiations with local communities to quarry sand or aggregate can be protracted and uncertain, and possibly further complicated by other compensation issues surrounding the project. Whether imported from abroad or domestically produced, most materials are expensive and bear large transportation costs.

19. **Shipping and Logistics Costs.** High transportation costs and cost overruns is a feature common to Pacific island states, a process particularly accentuated by cost of oil increases since 2005.

20. The shortage of suitable materials near site and the limited development of the PNG's manufacturing sector forces civil works contractors to haul inputs and capital equipment long distances. Manufactured goods such as cement, but even raw materials such as sand, are often sourced over long distances. There is only one cement producer supplying the entire country.

21. The weak transportation infrastructure pushes costs up further. One PNG contractor claimed that hauling costs in PNG were roughly four times those in Australia.

22. A hypothetical contractor in Lae faces enormous costs in shipping equipment to Port Moresby, and if it does, the equipment is tied up in the southern coast and cannot be transferred back to the Highlands to serve short-term needs: that capital becomes a sunk medium-term investment with large opportunity costs. The introduction of the PNG LNG project is introducing opportunities for equipment leasing in the Highlands, although its effectiveness remains to be seen. The construction company's solution appears to lie in market segmentation by region, with limited competition within a province.

23. **Utility Costs.** As with materials, power and clean water are often unavailable, requiring makeshift arrangements, all of which are costly.

24. **Compensation and the Cost of Doing Business.** The subject of road and other civil works would not be complete without reference to communities seeking compensation. Development partner policies, including those of the ADB, require community participation, a resettlement framework, and compensation for land takings, damage to farmland, crops, trees and temporary buildings, fences and other structures, possibly lost income to ensure effected communities are not worse off by projects that widen roads and construction camps that occupy land; and include a grievance redress program. The DOW traditionally sought approval from communities and obtains a memorandum of agreement, and the indefinite nature of this arrangement often lead to interruptions.

25. The burden of initially negotiating compensation falls partly on the contractor and the process does not start until they begin to assemble equipment at the site and break ground. The compensation settlement is then passed on to the DOW for estimation and approval, with further delays and cost increases.

26. In addition, local governments are known to demand their own form of compensation in the form of new taxes instituted at the commencement of construction.

27. No matter how well prepared in terms of compensation, the process nonetheless represents a direct costs in terms of payments made in cash and other forms the government must pay to communities, and also raises contractors' cost in terms of delays and all that represents in terms of wages, cost of equipment, finance, plus the unpredictability of trying to manage an engineering project involving many material and capital inputs without a clear start-up time.

28. The government is considering a Protection of Transport Infrastructure Act to make road right-of-way available for use and improvements, secure and protected, and free from encroachment and unjustified compensation claims. The hope is that this will minimize misunderstandings, reduce conflict, and streamline implementation.

29. **The Procurement Process.** The procurement process is cumbersome, and slow. Most road and civil works contracts have values greater than Kina 10 million, requiring approval from the National Executive Committee (NEC), or cabinet, and that can delay awards by as much as six months, even more.

30. The public procurement of large civil works contracts is prone to corruption in all countries, and Papua New Guinea is no exception. According to Transparency International, the country ranks 162 out of 179 (or 17th from the bottom) on 2007 Corruption Perceptions Index, and the phenomenon may impact the country's civil works procurement. Partial remedies attempting to overcome corruption and the lack of capacity in line ministries can lead to

cumbersome processes. Bidders require time to complete extensive forms, and then the government requires more time to process those forms and award contracts. Each additional requirement creates new opportunities for corruption. Donor-funded projects attempt to avoid corruption with their own processes modeled on international best practices, which the construction sector complains is duplicative, even more cumbersome, and delays processes.

31. **Predictability and Continuity of Work.** Any delay, be it for reasons of weather, supply of materials or equipment, variations and contractual disagreements, or disputes with local communities, as well as compensation and procurement mentioned above, represents a large cost in terms of wages, cash flow and financial expenses, and the opportunity costs associated with not proceeding with construction at other sites. The annual budget cycle can delay the actual payment further.

32. **Unsatisfactory Subcontracting Agreements.** Contracting agencies and contractors alike both agree that sub-contracting arrangements in the construction sector are unsatisfactory. Prime contractors often call on sub-contractors when competing commitments and logistics prevent them from executing work, sometimes assigning an entire phase to ill-prepared small construction firms. The prime firm often neglects the supervision a subcontracting arrangement requires, or is hampered by unreliable communications, producing unsatisfactory results and finger-pointing. Reporting suffers gaps and delays, and enforcement of penalties on contractors' performance is rare.

33. More often than not, it is not possible to locate subcontractors when the circumstances require. The construction sector is so concentrated that the step from the 20 large, vertically integrated, prime contractors to smaller sub-contractors is a sharp drop down to small companies with only a few people with competent technical skills, weak project management processes, a few pieces of inadequate equipment, limited capital and less access to finance, and persistent cash flow problems leading to repeated work stoppages. Sometimes a large contracting firm will turn to another large competitor, raising questions about collusion.

34. The complications of subcontracting encourage civil works contractors to become all the more vertically integrated, limiting the number of new entrants into the construction sector, and restricting competition. This in turn makes construction businesses compartmentalized and unable to easily shift equipment between locations (see "Shipping and Logistics Costs" above).

35. **Scoping and Variations.** The survey and design process preceding release of a civil works tender is characterized by limited capacity in both executing agencies and the engineering design firms they subcontract the detailed engineering to. The process is cost driven, with engineers preparing scopes according to poorly established standard rates (e.g., million kina per km), with little attention to existing conditions a thorough survey would reveal. The scope appearing in the tender often does not include enough consideration of the availability of materials, weather conditions and timing, and other local variables. Many times, the scopes contain only bills of quantities, with no detailed design or only simple cross-sections.

36. Upon award and initial survey, it often becomes clear to the winning bidder that different materials and works are required, hopefully resolved before expensive equipment has been hauled into place. The costs increases can be 50% or more. Variations take time to move through responsible agencies, a little longer if foreign assistance agency approvals are required, and must return to the CSTB in cases representing more than a 20% increase in the contract value.

37. **Implementing Agency Cash Flow.** Budget disbursements to DOW and other agencies, or to provincial and local governments for that matter, appear only after delay, causing the implementing agency to make ad-hoc arrangements, often paying past-due invoices as soon as funds arise. Emergency works are common and greatly interrupt implementing agency cash flow. Delays in mobilization payments, pauses during community compensation negotiations, supply problems, or any other factor can extend project completion and represent important financial costs contractors must bear.

38. Most of the companies are large and enjoy ready access to credit, but the struggling small contractor does not typically enjoy the same financial support.

39. **Security.** Law and justice may be the principal constraint on private business in PNG. Security concerns encountered by civil works contractors range from truck hold-ups, theft of construction equipment parts, to violent threats and actions against road workers arising from land takings and the compensation process. The location of construction sites in remote locations with limited law and justice apparatus, combined with the presence of outsiders living and working in a camp surrounded by tribal communities with limited appreciation for national infrastructure priorities but a strong sense of their land rights and community compensation entitlements is a recipe for friction and conflict. All these concerns can delay project completion indefinitely, making it difficult to maintain a schedule and control costs.

40. It is possible to invest in security services, and recent ADB suggestions include a more active police, provincial, and local government role in protecting civil works sites, but no system is foolproof and all security measures raise costs.

41. Efforts to involve local communities, and provide compensation within clear limits, could help to mitigate the risk of conflict, but the process can be lengthy and would be better managed by the government in advance of contract award, as demonstrated by recent Transport Sector Support Program (TSSP) experience in Bougainville.

42. **Market Structure and Oligopoly Action.** The construction industry (including those building offices, hotels, warehouses, and houses and not just civil works) in PNG represents a very considerable 10.4% of the gross domestic product (GDP). Very few countries devote more than 7% of their GDP to construction.

43. There are fewer than 15 national contractors with the capacity to conduct civil works on roads, and less than 5 international companies. These companies are vertically integrated, concentrate in their home provinces, and exercising a high degree of monopoly power within their local markets. Together, these twenty firms' estimated turnover is Kina 300-350 million per annum, and their capacity is stretched. Demand is likely to rise, and the market is likely to become much more constrained in the near future.

44. There is often a suspicion of collusion surrounding the bidding processes on construction contracts. There are relatively few players in the national civil works market large enough to respond to a bid for a road contract, and most of them tend to concentrate in one, or in a few, provinces. The limited numbers of companies in the market, already over-extended in their commitments, and motivated partly by the costs associated with transporting equipment from one location to another, appear to silently agree to split up the market on a geographic basis, creating oligopolies, and enjoying the market power that follows.

45. Oligopoly actions take the form of few, or even no, bids in response to tender offers. Such events force several rounds of re-bidding and implementation delays. Bid prices are often much higher than DOW's estimation.

46. Important barriers to entry limiting international construction firms' participation in the Papua New Guinea market include government regulations in the form of business registrations, visas, work permits, and slow customs processes surrounding the import of construction equipment.

47. The overheated market for civil works combined with the limited competition creates a seller's market, causing construction costs to rise at a rate of 15-20% per year, or about double the official inflation rate. The DOW cites a sub-project estimated at Kina 18 million in 2006 costing Kina 48 million by the time the project was completed in 2009.

B. Future Challenges

48. The \$12–\$15 billion PNG LNG project to produce and transport natural gas via pipeline represents the largest single private-sector investment in the history of PNG, and an enormous investment in civil works to build a thousand-kilometer pipeline, including a submarine pipe leading to the liquefaction terminal near Port Moresby, with associated service roads, a large airport to transport large-scale equipment, not to mention improvements to the road and bridge system linking Hides, Juha and Angore fields in Southern Highlands and Western Province to the Lae port supply base. Reliable numbers are not available, but the PNG LNG project's preliminary estimate is that it will contract US\$0.45 billion worth of construction over the next 5 years. It stands to reason these contracts will require indirect investments in plant and facilities to support the direct construction contracts with the PNG LNG project.

49. The 2010 national government budget allocates Kina 0.9 billion for transportation infrastructure maintenance and rehabilitation, and the Development Strategic Plan 2010-2030 envisions Kina 100 million investments over the next 20 years, while the country's capacity to execute civil works is already highly constrained. There seems no escaping that the PNG LNG project will "crowd out" construction services the public sector can contract. This priority project's highly elastic demand has the potential to attract the best qualified companies, most skilled workers and equipment away from government contracts in the near-term. On the other hand, the increased demand could attract market entrants, capital expansion, and increase in the number of the companies capable of performing road and other large-scale civil works over the longer term.

C. Summary of challenges

50. The construction sector in PNG already exhibits capacity constraints limiting its ability to perform public-sector civil works under costs and within schedule. The high costs associated with different factors discussed above, compounded by its dependence on the import of basic inputs and scarce capital equipment, plus a constrained market structure, will rise much higher as the PNG LNG project increases demand for more construction in an already tight market.

51. The question arises: how will the government be able to sustain investment in maintaining and improving the road system in the near term, when the limited capacity to perform civil works is already strained? On the other hand, what measures are available to expand civil works capacity to meet the demand, in a way that PNG will benefit from a larger construction sector over the long term?

IV. POSSIBLE APPROACHES

52. Having explained the constraints limiting the construction sector's capacity today, and the additional demands the PNG LNG project will place on the already over-heated sector, this section explores potential remedies to expand the sector's capacity over the longer term. Wherever possible, the paper looks for opportunities to combine forces with the PNG LNG project to expand civil works capacity for everyone's benefit.

53. The following sections will briefly outline possible remedies the government and the development partners can pursue. This is a discussion paper, and the intention is to not go into too much detail, but rather introduce and stimulate ideas that may be discussed further among informed individuals and forms the basis for a technical assistance project to improve capacity in the civil works sector.

A. Current Government Approaches

54. The Government of PNG appears to be preparing for the increased demand for civil works services the PNG LNG project represents, and the need to expand the construction sector's capacity.

55. **Skills Development.** A limited number of skills training institutes providing skills in the building trades exist today. Currently, five post-secondary vocational/technical colleges exist in the country.

56. The PNG LNG project has committed to invest in the existing Port Moresby Technical College and a new school in Juni in the Southern Highlands. The PNG LNG investments vocational training facilities will produce 1,000 graduates each year, mostly those receiving one year's training in truck driving. SkillsTech, a Queensland government workforce development institute, will provide trainers. The training places great emphasis on obtaining Australian certification in the designated field, which requires a year for truck driving, more likely three years for more technical skills such as a heavy equipment operations and mechanics. Meanwhile, the PNG LNG project includes several large on-the-job training programs and training-the-trainers components. Unfortunately, it does not appear that project will produce many heavy equipment operators or mechanics, at least not in the near future.

57. **Targeting contracts for small and medium construction firms:** It is encouraging to see that the AusAID-funded Transport Sector Support Program (TSSP) project is separating out minor contracts on each of the priority roads projects so as to encourage small contractors to enter the market, and have awarded a number of smaller projects to local firms.⁴

58. **Construction Sector Broadening, Civil Works small-medium size enterprises (SME) Development and Construction Industry Policy Framework.** The Department of Commerce and Industry's Construction Industry Unit (CIU) has developed a Construction Industry Policy Framework and seeks enactment by Parliament, although its introduction and approval is far from certain. CIU has already certified many small firms, and hopes, once the framework is enacted, to enable such businesses to engage in small works, subcontracts and joint ventures. The policy framework seeks a target of small and medium PNG national contractors to gain 30% of national government contracts by reserving small contracts (contracts with values less than Kina 0.5 million) to small firms, provide tax credits, strengthen

⁴ TSSP. 2010. *Annual Plan 2009-2010*. Port Moresby.

the value of certification, and seek waivers of extra bidding requirements from development partners, promote industry associations, and provide training in technical, managerial and operational skills. The policy framework also seeks to reserve medium-sized (Kina 0.5–5.0 million) projects for citizens and national contractors.

B. Additional Possible Government Approaches

59. **Skills Development.** There already exists recognition of the need to expand Papua New Guinea's skills base. The PNG LNG project has already made significant investments in vocational training institutes. The question becomes: is it possible to expand these initiatives further, and be certain there exists adequate emphasis on road building skills and other relevant civil works trades? Some ideas for discussion:

- Provide short—a few weeks, a few months—courses in basic skills, so as expand the number of individuals with better skills than today. Such short courses could be easier to establish than full-year certificate programs, provide the institutional framework for on-the-job training, and might help strengthen community relations.
- Establish scholarships to worthy individuals seeking a technical trade.
- State, church and civil society technical schools could work with the construction sector to develop combined school and on-the-job training, and create a system of apprenticeship and placement services.
- It may be possible to develop a mechanism allowing technical schools to become contractors/sub-contractors on smaller civil works project (e.g., a district road) whereby students would gain valuable on-the-job construction experience, school credit, credentials, and income.
- Provide for university-trained engineers in a manner similar to the way in which the mining engineering faculty at Unitech was expanded in 2009: invest in buildings, expand the faculty, seek accreditation, and offer scholarships. Additional options include funding scholarships, improving computer and internet facilities, and/or sponsoring student projects.

60. **Promote Small Contractors and Subcontractors.** The government could take several initiatives to promote a greater role for contractors and subcontractors, such as:

- Study further the current limitations of small contractors and sub-contractors, including access to finance, equipment lease, and identify different solutions most suitable to the PNG context.
- Engage civil society—churches, schools and other—in creating awareness of small business opportunities relevant to small works, including small business development.
- Business development/SME development including training and possible tax breaks, targeted at smaller firms and individuals in the construction sector.
- Certification of small businesses in the construction sector, potentially carrying preferences in the proposal evaluation process.
- SME training could include instruction in new construction technologies, project management, competitive bidding and business skills. Lessons learnt from other small-business development exercises indicate a strong need for bookkeeping and accounting.

- Create an “Enterprise Center” to provide small businesses with a free/low-cost assessment, followed by an appropriate training program on management finance, proposal writing, business registration, safety and health and/or consultation in their organizational structure and other needs. This may include a certification process allowing holders to bid, or receive preference in the bidding process.
- Sponsor industry associations to help develop the competence of smaller firms in business development.
- Encourage the private banking sector to create credit products suitable for small and medium civil works contractors, and support equipment hire companies.
- Identify small-scale projects and contracts open only to small-scale/local construction businesses.
- Award points in bid evaluation to large bidders including qualified small businesses/local businesses as sub-contractors in their proposals.
- Standardization of sub-contracting processes and training to ensure successful project completion, and training to large and small businesses alike.
- Encourage joint ventures between large international firms and domestic small-scale contractors with the aim of enriching foreign partners’ knowledge of the country while transferring technology to their PNG partners.
- Encourage and support DOW and other experienced government contractors to create their own civil works and engineering enterprises (either state-owned enterprises or new private ventures).
- Seek niche areas allowing easy market entry, such as equipment leasing. (If acted upon quickly, it may be possible to purchase equipment from hard-hit former boom countries during the recession.)
- Improved communications, whether cellular phone or Internet, could improve communications among all parties and help to centralize and monitor information, strengthen the sub-contracting process, and improve supervision.
- Where appropriate, foster the participation of community-owned and/or landowner small construction businesses. In particular, consider the potential for local materials providers.

61. Some of these ideas are present in the draft Construction Industry Development Framework (see above.)

62. The CrossRoads project in Uganda is an encouraging model of a multi-donor approach. It introduced contracting innovations, new construction methods, improved procurement, equipment leasing, access to finance, vocational training, business development services, the promotion of industry associations, and joint ventures between small and large contractors to create an environment for greater participation of small contractors in civil works.

63. **Community Involvement in Civil Works.** Wherever possible, the participation of selected local communities, churches and civil society in civil works should assist in project implementation and maintenance, in the hopes of fostering a sense of ownership, supplementary incomes, and reducing conflict between contractors and residents. The experience to date has been somewhat underwhelming, but perhaps new initiatives could strengthen the process. Initiatives worth discussion include:

- Require contractors to include local, unskilled, labor in appropriate projects component.

- Expanded training and skills development to create more income opportunities for members of local communities.
- Small business development at the community level.
- Streamlining the process of negotiating the sourcing of local materials.
- Develop community-owned small businesses supplying local materials.
- Encourage the development of landowner companies in civil works, equipment leasing and so on.

64. The experience in India, Peru, Uganda, and other countries may provide some useful lessons.

65. The ongoing Extending the Socioeconomic Benefits of an Improved Road Network to Roadside Communities grant (9130-PNG) includes skills development components.

66. **Promote the Participation of Large International Contractors.** Large international contractors represent the most expedient solution to capacity constraints. The above notions of skills development, small contractors and subcontractors, and community involvement all hold potential for expanding and broadening the sector so as to respond to increased demand and it is hoped such operators can forge relationships with sub-contractors, materials suppliers, and perhaps equipment-leasing companies. However, this does not address the fundamental need for companies with the capacity to perform large contracts. Large contracts — as large as, if not larger than, existing contracts in PNG today—are necessary to develop the civil works sector's capacity to perform large maintenance, repair, rehabilitation, and upgrading contract.

67. ADB has already initiated an effort to promote the entry of large foreign contractor into PNG's road and other civil works contracts. The work under TA 7420-PNG: Improving Road User Charges and Private Sector Participation in Road Development (a policy and advisory technical assistance) includes a review of investment, contracting and other relevant policy, proposals for reform, and a "road show" to publicize PNG's need for international contractors to expand and strengthen its civil works capacity. The DOW is currently preparing "packages" of different projects to bring to the road show.

68. Construction companies and equipment leasing firms in former boom countries that have suffered large losses in demand during the recent recession may be particularly interested in placing their manpower and capital in PNG's growing civil works market.

69. International firms hold the potential to form joint ventures with national contractors, including small and medium businesses; and help to introduce more knowledge of businesses practices and skills. Industry associations can provide "match-making" services to introduce potential joint venture partners.

70. International companies familiar with maintenance contracts from other countries may be the perfect vehicle to lead the way in innovative civil works contracts in PNG.

71. There is the inevitable possibility that new international entrants into the construction sector may poach valuable talent from domestic firms and thereby weaken the capacity of national civil works companies' in the short-term, but these individuals will gain new skills, will remain in PNG, and should contribute to the nation's indigenous capacity over the longer term.

72. **Improve the Procurement Process.** The procurement process is faulty in many respects, delays implementation, and drives costs up. A more open, transparent and efficient

procurement process will reduce the risks and costs associated with road construction. It requires reform, and the urgency the PNG LNG project represents is the perfect time to press for it.

- The long delays in awarding contracts resulting from the clause requiring NEC to approve contract awards over Kina 10 million require raising the ceiling value to perhaps Kina 30 million (and NEC is in fact considering such a modification.)
- An effort must be made to simplify, streamline and strengthen the detailed design and estimation process, so as to engender a realistic bidding process and improve project implementation. Better engineering designs with realistic cost estimates will expedite the process. A first step would be to understand better the design capacity of domestic engineering companies, and consider a private sector development project.
- The possible involvement of engineering divisions within DOW and other departments, arms-length institutions associated with the executing agency, and international contractors in improving design work all deserve consideration.
- Improvements to materials testing, construction technology, project management and other aspects of construction management could also improve subsequent project implementation.
- It may be possible to reward contractors with a good history of completing projects near the time specified and within budget by awarding points in evaluation of their bids for new work. The motivation will hopefully improve performance, and allow the Department of Works to track performance and award better scores in subsequent bids to firms with good track records.
- Changes in procurement regulations could allow for prequalification. (That much said, CSTB's current policy does not allow this practice.)

73. Improve the Community Compensation Process. At present, the community compensation negotiations does not begin until contractors arrive on site and begin to break ground. Subsequent negotiations delay implementation, consume scarce funds, and complicate project management. It seems strange that government agencies can not initiate, if not complete, compensation before the project is tendered, or at least before equipment is locked into a site.

- The Department of Works could utilize its property geographic information system (GIS) database to identify such issues early on, and/or demand identification of affected properties communities as part of its survey and environmental review.
- The executing agency should have standard policies and practice for community participation, notification of takings and resettlement, and negotiation, with standard calculations of the proper compensation.
- The executing agency could institute a policy to only issue notices to proceed after compensation is complete.

74. Improve Security Surrounding Civil Works Projects. Current security concerns raise costs at best, and often delay project completion and raise costs further. Potential solutions include:

- Processes to engage local communities better. Perhaps all contractors need to subcontract work to community development specialists.
- Police engagement in protecting contractors staff and equipment.

75. **Improving Payment Process.** Improvements to the payment process to ensure better cash flow could include:

- Reduce delays in contract award and mobilization payment.
- Introduce safeguards against demands for contractor payments before the government releases mobilization payments.
- Institutional processes to streamline approval of contractors' invoices.

C. Current Development Partners' Approaches

76. The TA for Improving Road User Charges and Private Sector Participation in Road Development (TA7420-PNG) has identified the high market concentration and reviewed the factors constraining the national and international contractors. Under the TA, a road show to raise awareness in neighboring countries of the potential for civil works contracting in PNG will be conducted with DOW.

77. As part of the Highlands Highway PPTA, ADB approached the state design engineering institutes in the People's Republic of China (PRC) that serve as public-sector centers of excellence in detailed design, economic evaluation and environmental impact assessment and other phases of project development to discuss the possibility of these institutes providing capacity building technical assistance to the DOW, and arranging training and study tours for DOW engineers (in PRC). The institutes have expressed their interest in strengthening DOW's staff capacity in the areas of engineering, quality control, and materials testing, construction technology, and project management, but the Government of PNG has not yet extended an invitation to any PRC institute to discuss such an initiative further.

78. AusAID's TSSP project will be providing the DOW assistance in strengthening the procurement, evaluation and monitoring procedures, include a streamlined bidding process, tracking contractor performance, and introducing penalties for contract breach. The TSSP project has already had some success contracting smaller companies, and hopes to expand their efforts in this respect.

D. Potential Development Partners' Approaches

79. The development partners can pursue many different approaches to support the government in remedies such as those described above. A concerted effort by all development partners to draw on their strengths in supporting small and medium enterprises would be valuable.

80. Among first actions development partners might pursue is an in-depth technical assistance study to diagnose specific issues constraining the construction sector, and seek prescriptions to remedy the situation. The scope for such a study would include a thorough review of the analysis appearing in section 3, and the potential approaches discussed above in this part.

81. One of the most obvious routes to reform demands a review of the time, materials, and cost estimation. If most projects are completed very late and well over cost, construction

companies should insist upon more realistic, or at least more relaxed, specifications. The DOW is presently considering a study to determine areas of improvement in its cost estimation procedures.

82. Development partners might also look for ways in which projects could be packaged smaller to create opportunities for smaller sub-contractors, and engender an enabling environment. The development partners should consider the CrossRoads project in Uganda as a model of a multi-donor approach introducing innovative measure producing a climate for the greater participation of small contractors in civil works.

83. ADB- or AusAID-funded technical assistance could support the DOW in revamping their materials testing laboratory equipment and skills.

84. ADB has a Private Sector Development Initiative in PNG, and the follow-on PSDI II project might be interested in expanding their scope to include small and medium enterprise development in the construction sector. Designing projects with more limited scope that small and medium enterprises could execute might complement such a program.

85. If the Department of Commerce and Industry's Construction Industry Policy Framework is approved by Parliament, specifically skills and management training, and reforming the procurement process to the advantage of small contractors. More generally, the development partners can expand its existing educational, private sector, and government reform projects to most of the government initiatives described under "Possible Government Actions" and above: skills development, SME development promoting small contractors and subcontractors, local participation, further promotion of international contractors in the PNG construction sector, reform of the procurement process, training in supervision techniques, expansion of communications, improving the community compensation process, and improved law and justice protection in rural work camps.

V. DISCUSSION TOPICS

86. This document is a knowledge paper, with the intention that it will also serve as a discussion paper, and the aim is that ADB staff and consultants, as well as host country stakeholders and development partners can contribute and clarify the best approach to strengthening the construction sector in PNG.

87. A combined approach with the support of the DOW, the National Roads Authority, and all development partners will be necessary to develop the ideas described in section IV and move these ideas forward. Inputs from ADB's Pacific Liaison and Coordination Office in Sydney, Australia could be particularly valuable. Eventually, a technical assistance synthesizing the preferred options will move these ideas forward into practice.