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Regional: Improving the Performance of Labor Markets in the Pacific

Promoting Skills Formation through Public Investment Projects: Case Studies from ADB-financed Infrastructure Projects in Papua New Guinea

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For Asian Development Bank

Asian Development Bank

ABBREVIATIONS

ADB	–	Asian Development Bank
PNG	–	Papua New Guinea
TVET	–	technical and vocational education and training
VTC	–	vocational training center

NOTE

In this note, "$" refers to US dollars unless otherwise stated.

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EXECUTIVE SUMMARY

1. Pacific countries lack construction skills and rely on large firms to import skilled workers for large infrastructure projects. Papua New Guinea (PNG), in particular, has large domestic skill shortages and skill gaps in its construction workforce. The Asian Development Bank (ADB) has noted "the limited capacity of privately owned civil works companies jeopardizes project quality and efficiency, with the few construction contractors capable of executing large transport projects often being overcommitted and missing deadlines."[1] In response, ADB in PNG encouraged the entry of strong foreign contractors to implement a series of major infrastructure projects, which in 2014 totaled $1.01 billion.[2] ADB's intention was build competition in the market and at the same time to strengthen local civil works companies.[3]

2. PNG has a lower share of qualified domestic workers in construction than for the formal economy as a whole and has few workers in key construction occupations. At the same time, construction companies have imported a large number of foreign skilled workers to work on large infrastructure projects. While some skills transfer to domestic workers may occur on these work sites, there are no collective arrangements in place on these infrastructure projects to ensure that domestic workers can acquire skills in a systematic and measurable way.

A. Focus of the Paper

3. The aim of this paper is to analyze the nature and extent of the skills gaps in PNG's construction industry, and to identify options to promote the greater transfer of skills to and improved employment outcomes for PNG's workforce. The paper begins by describing the nature of the skills challenge in PNG, with a focus on census and administrative data on skills gaps in the construction sector. The paper then uses a case study approach to analyze the profile of skills for foreign and PNG workers deployed by different contractors on six contracts awarded under four ADB-financed infrastructure projects. The analysis considers the factors that influence the choices contractors make when deciding how and where to obtain the skilled and unskilled labor they need for a project. The paper concludes by presenting contract-related and wider policy recommendations designed to improve opportunities for developing the skills of PNG workers through their engagement in publicly funded infrastructure projects.

B. Key Findings

4. The case studies show that construction firms follow markedly different skills sourcing strategies. At one end of the spectrum is a strategy based on minimizing costs. This is done when a construction firm only employs a small number of highly skilled staff from high-income countries and some skilled staff from lower-income countries. Most of the workforce is sourced from national labor market or local labor markets in PNG. This applies to not only skilled PNG workers drawn from a core workforce with a long track record of employment with the company. It also applies to skilled workers recruited from the local labor market. Unskilled workers are usually sourced as a group from local communities adjacent to the work site.

5. At the other end of the spectrum is the skills sourcing strategy of international construction companies used to lower operational risks. This strategy is more likely to be used by firms for their first large project in-country or with only a record of recent projects and hence

[1] ADB. 2015. *Asian Development Bank and Papua New Guinea Fact Sheet*. April. Manila.
[2] Footnote 1.
[3] Footnote 1.

with little chance to build up a local core workforce. This risk minimization strategy limits the number of PNG workers in jobs as supervisors, trades workers, equipment operators, or heavy truck drivers, with preference given to experienced workers from the company's country of origin. This is done to reduce the transaction costs of managing work on a complex construction site. In addition, the language barrier increases greatly the chances that work directions are misunderstood, causing delays and the greater likelihood of accidents. Workers are recruited from communities next to the work site for work that can be done with skills learnt quickly on-the-job and performed with simple directions.

6. These findings show the importance of developing specific options to promote skills transfer opportunities that take into account the particular skills sourcing strategy adopted by a construction company on a large project.

C. Recommendations

7. The options for encouraging the transfer of skills need to be based on a number of separate but related recommendations involving a number of different stakeholders. No single or stand-alone initiative is likely to work and no single stakeholder acting alone will be able to achieve worthwhile results.

8. The six recommendations are proposed. The first two concern the need to identify the skill sets to be transferred and the obligation for the contractor to transfer skills based on changes to existing contract requirements. Also needed is an incentive structure to encourage construction companies to go beyond a narrow compliance with a contract provision. Putting this incentive structure in place involves two recommended steps: a regional framework agreement and a country-specific policy and legislative change. The fifth recommendation is to extend the skills transfer process beyond the life of any one construction project. The last proposed recommendation is to set up better processes for monitoring workforce skills and the skills transfer process on large projects.

9. The recommendations proposed include not only specific changes to existing contract requirements. The options may also include changing the traditional contract design to focus on delivering a performance outcome in relation to skills transfer. Sole focus on the contract obligation, however, has major limitations, due to the use of penalties for non-compliance. Construction firms are more likely to respond in a more committed way if they can see more clearly the benefits for their reputation of having an enhanced social license to operate.

1. This type of incentive could be offered to construction firms through the use of a framework agreement to apply to all ADB-financed projects in the Pacific region. The purpose of the agreement would be to encourage firms to deliver social objectives in close conjunction with their traditional contract requirements of completing work on time, at cost and at agreed quality standards. Government policy statements backed by changes to work permit legislation requesting evidence of the nature and extent of skills transfer are also proposed. To continue the skills transfer process beyond the life of any one contract, options to promote skills transfer need to include skills formation brokers such as professional associations. The agreed sets of arrangements need to be monitored on a project-by-project basis as part of the role of the supervising engineer. The information collected from each project about the extent of and the type of skills transferred should be made public, via a dedicated website. Government also needs to report publicly and regularly on the data collected on the occupations and industry of employment of the foreign work permit holders.

I. INTRODUCTION

1. Formal employment opportunities in many Pacific Island countries (PICs) are extremely scarce. In Papua New Guinea (PNG), for example, less than 10% of the working-age population in 2011 is estimated to be in formal paid employment.[1] Due to the limited opportunities to find and hold a wage job, many people in the Pacific are unable to secure an adequate level of productive work at a fair income. This is especially true in countries where the subsistence sector constitutes a large part of the overall economy. For example, PNG, Solomon Islands, and Vanuatu are estimated to have 41%, 78%, and 60% of their respective labor forces in the subsistence sector.

2. Large-scale public investment projects implemented by a range of international and local contractors can provide important opportunities to upgrade the skills of local workers to enable them to participate more effectively in the formal economy. Some countries, including Australia, the United Kingdom (UK), and the United States (US), have sought to maximize skill development opportunities from large-scale public investment projects by requiring contractors that bid on publicly funded projects to incorporate commitments to improve skills development opportunities.[2]

3. The Asian Development Bank (ADB), as well as other international development partners, is investing substantial resources in large-scale infrastructure development projects in PICs.[3] Contractors exhibit various approaches to meeting the substantial labor requirements needed to implement such projects. Some use mostly foreign labor to meet project requirements for all levels of skill except for unskilled labor, which is typically sourced from nearby communities. Others have been able to partner with local contractors to mobilize workers with a higher level of skill. Local sourcing applies especially for mid-level skills in construction trades, but also some extent for higher skill levels at technical, supervisory, or managerial levels.

4. To further investigate options for boosting skills development opportunities in the Pacific, this paper analyzes the different approaches used by contractors to secure the necessary labor inputs to effectively implement large-scale infrastructure projects in PNG. The paper begins by describing the nature of the skills challenge in PNG, with a focus on census and administrative data on skills gaps in the construction sector. Using a case study approach, the paper then analyzes the profile of skills used by different contractors on six contracts awarded under four ADB-financed infrastructure projects. The analysis considers the factors that influence the choice contractors make when deciding how and where to obtain the labor they need for effective project implementation. Drawing on the data analysis and the findings from the case studies, the paper concludes by presenting project-related and policy recommendations designed to improve opportunities for developing the skills of PNG workers through their employment on publicly funded infrastructure projects.

[1] Author's calculations based on demographic indicators rural, urban, and total population by citizenship, age, and sex, and a special tabulation citizen population 15 years and over in wage jobs by occupation (2 digits) and post-school qualifications from the 2011 national census, provided by PNG National Statistical Office (NSO).

[2] See Appendix 1 on experience of Australia, the UK, and the US with requirements for contractors to provide training for apprentices and other opportunities for skills transfer.

[3] For example, in the Pacific, the value of ADB loans and grants to PNG as totaled $1.1 billion (2005–2015), with a portfolio of projects in energy, finance, health, and transport.

II. THE SKILLS CHALLENGE IN PAPUA NEW GUINEA

5. A country's pool of skills shapes its development potential. The education level of the workforce is an important indicator of its skill level and, more importantly, of workers' capacity and opportunity to acquire more skills. Research shows that employers are more likely to provide training for their employees in a skilled job if they have more education and higher levels of literacy and numeracy, producing a virtuous cycle of further skills acquisition.[4] The reverse also applies; employers are much less likely to provide training for workers in low-skilled jobs who have low levels of literacy and numeracy.[5]

6. PNG faces a large and growing challenge to create sufficient decent work opportunities for its people. As the country's population grows from 7.5 million in 2014 to an estimated 10.5 million by 2030, around 2.2 million people will be added to the working-age population—an annual equivalent of almost 150,000 people per year. The proportion of jobholders with a post-school qualification provides a useful measure of the education required for many occupations in a modern economy. In PNG, in 2011, just over one-third of those aged 15 years and above are in wage jobs have a post-school qualification—35% in total, 32% for men, and 40% for women. This is much the same as Fiji's post-school qualification rate of 32% of those in wage jobs.[6] However, compared to a more diverse economy such as Australia's, PNG's post-school qualification rate is considerably lower. More than half of Australia's population aged 15–64 years has a post-school qualification—57% for men and 56% for women.[7]

7. Occupations based on mid- and high-level skills typically require a post-school qualification. In PNG's case, three-quarters of jobholders (76%) in professional occupations, excluding foreign workers, have a post-school qualification. This share with post-school qualification compares with 81% in Fiji.[8] Over half of the Papua New Guineans (54%) in jobs as technicians or associate professionals have a post-school qualification. This compares with 61% of Fijians in the same type of jobs.

A. Skills Gaps in the Construction Sector

8. There is a particularly pronounced skills gap in PNG's construction sector. Few PNG construction workers are in the high skills occupations and those who have a low post-school qualification rate. In addition, key occupations in the sector have low numbers. This low skills profile for the domestic workforce is confirmed by the large number of foreign work permits approved for construction-related trades. Three types of evidence support these conclusions.

9. First, the PNG workforce in the construction sector has a much lower share of professionals and technicians compared with the formal sector as a whole—3% and 0.7%

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[4] A report by the Organisation for Economic Co-operation and Development (OECD) notes that literacy and numeracy levels as well as the educational attainment of workers is strongly related to participation in employer-sponsored training in all 20 OECD countries surveyed, which creates a "virtuous circle for persons with high skills proficiency and educational attainment who tend to acquire yet more skills through attending adult education activities." Survey results show that about 60% of workers aged 25–64 years in the most skilled occupations took part in employer-sponsored training compared with only 25% of workers in elementary occupations. OECD. 2015. *Education at a Glance 2015: OECD Indicators*. Paris. pp. 384–385 http://download.ei-ie.org/Docs/WebDepot/EaG2015_EN.pdf

[5] OECD. 2015. *Education at a Glance 2015*. p. 385.

[6] Fiji Bureau of Statistics. (n.d.). *Fiji Employment and Unemployment Survey 2011.* Suva. Special tabulation based on non-agricultural employed workforce.

[7] Australian Bureau of Statistics. 2012. Education Differences between Women and Men. 4102.0—Australian Social Trends. September. http://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/4102.0Main+Features20Sep+2012

[8] Footnote 10.

compared with 21% and 8% respectively (Table A2.1 in Appendix 2). Second, the PNG construction sector has fewer jobholders in skilled occupations with a post-school qualification compared with all employees in the formal sector in PNG—28% compared with 35% (see Table 1). Table 1 also provides more detail on the qualifications of the PNG workforce in three of the largest construction occupations. Only 6% of PNG jobholders in building trades occupations in the construction sector in 2011 have a trade qualification based on an apprenticeship and a further 7% have completed technical college (see Table 1). Some 13% have completed vocational training center (VTC) certificates. This is not really a post-school qualification which assumes post-school is completion of most or all of secondary education. Vocational training centers enroll post-primary school students for training courses of one or two years duration, based on some general education with a skill or craft, such as business subjects, clothing, cookery, carpentry, automotive, and metal fabrication.[9]

Table 1: Proportion of Selected Occupations in Construction with Post-school Qualifications, Papua New Guinea Census 2011 (Percent and number in each occupation)

Construction Occupations	Percent (%)						Number
	Vocational Training Center	Technical College	Trades Apprentice-ship	All Other Qualifications	Total Qualified	Total Not Qualified	
Carpenters and joiners	15.2	4.7	4.3	2.5	26.7	73.3	18,785
Plumbers and pipe fitters	14.2	5.3	7.4	2.9	29.8	70.2	3,128
Building and related electricians	3.7	29.1	15.2	7.2	55.2	44.8	1,503
Extraction and building trades workers supervisor	8.7	10.1	13.0	26.2	58.0	42.0	69
Building trades workers - Total	12.9	6.5	5.6	3.0	28.0	72.0	30,428

Note: PNG citizen population 15 years and over in wage jobs by occupation (construction) and post-school qualifications.
Source: Government of PNG, National Statistical Office. 2011 Census. Tabulation provided by National Statistical Office.

10. One-in-four carpenters and joiners (27%), the largest building trade occupation, have some formal education related to their occupation. Only 4% of those working as carpenters and joiners have apprenticeship-based trade qualifications, 5% have completed technical college, and 15% have elementary VTC certificates. Building regulations should require all or most building and related electricians and plumbers and pipe fitters to undergo formal training and meet licensing requirements. However only 15% of building and related electricians have trade qualifications, 29% have finished technical college, and 4% have completed elementary VCT certificates. For plumbers and pipe fitters, only 7% have gained trade qualifications, 5% have completed technical college, and 14% have received elementary VTC certificates.

11. Third, the 2011 Census shows that important occupations in construction have few PNG jobholders. This applies especially to the occupation category extraction and building trades

[9] Horne, R., K. Ngangan, S. Tavil-Melachon, and J. Brown. 2015. *Research into the Financing of Technical and Vocational Education and Training (TVET) in the Pacific: Papua New Guinea Country Report*. Melbourne: Australian Council for Education Research. p 49. http://research.acer.edu.au/transitions_misc/22/

workers supervisors, which only has 69 PNG workers (Table 1). Of this number, only 13% have trade qualifications, 10% have completed technical college, and 9% have VCT certificates. There is also a low number of PNG workers in the jobs of roofers, floor layers and tile setters, plasterers, insulation workers, and glaziers (Table A2.4). Other notable shortages can be identified in construction-related occupations, e.g., motor vehicle mechanics and fitters (140 jobholders); machinery installers, repairers, fitters, and assemblers (120); electrical equipment mechanics, fitters, and installers (111); and electronic machinery mechanics, fitters, and installers (18).

B. Role of Foreign Workers

12. Given the country's skills shortages, the PNG Government permits the entry of foreign workers under a work permit scheme to fill positions on a temporary basis. The total number of occupations that have granted work permits to foreign workers for 2013 and 2014 provide the opportunity for more detailed analysis of the depth and the range of PNG's skill shortages, particularly for the construction sector.[10] Table 2 shows the distribution of occupations approved in 2014 by major group and skill levels (Appendix 3 has more details).

Table 2: Distribution of Occupations by Major Group of Work Permits Approved in 2014 (Percent)

ISCO Major Group	% of total
1. Managers	38
2. Professionals	12
3. Technicians and associate professionals	28
4. Clerical support workers	0
5. Services and sales workers	3
6. Skilled agricultural, forestry, and fishery workers	5
7. Craft and related trades workers	12
8. Plant and machine operators and assemblers	2
9. Elementary occupations	0
	100
Total number of work permits issued	**17,346**

ISCO=International Standard Classification of Occupations.
Source: Author's calculations from data provided by Department of Labour and Industrial Relations.

13. The managers group is the largest occupation cluster with 38% of total work permits. Professional occupations account for 12% and technicians and associate professionals account for 28% of all work permits. Craft and related trades workers account for 12% of work permits approved. Skilled forestry and fishery workers account for 5%, services and sales workers (mainly security consultants) account for 3%, and plant and machine operators account for 2%. This analysis shows that largest groups of occupations experiencing skills shortages in PNG are managers and technicians and associate professionals.

14. One-half of the work permits for occupations approved in 2013 and 2014 were in the construction sector. This sector accounted for the two largest occupational groups granted work permits during this period—technicians and trade coordinators and supervisors with 5,700 work permits) and specialist heavy machinery mechanics or technicians with 2,337 work permits. (Table 3). These two occupation groups account for 20% of all work permits approved for 2013 and 2014. The relatively large number of work permit holders listed as "technicians and trade coordinators and supervisors" may be inflated by employers wanting to gain approval for a

[10] Work permit data provided to Ministry of Higher Education, Research, Science and Technology.

trade-qualified worker. This is suggested by the process for approving for work permits which favors some occupations over others.

15. The Work Permit Guidelines identify three types of occupations. “Open occupations,” indicated by the color green, are suitable for the employment of either PNG citizens or non-citizens.[11] “Reserved occupations”, indicated by the color red, are for the employment of PNG citizens only. The third category refers to “advertised occupations,” shown in color yellow, denoting caution. This means employers are required to provide evidence that a skills shortage exists. Jobs in these occupations must be advertised within PNG to seek out local job seekers with relevant skills before a work permit can be issued to a non-citizen employee.

16. This classification system provides a strong incentive for employers to select an open occupation when applying for work permit visa. All trade-level occupations in construction are classified as “advertised occupations,” requiring evidence that workers in that occupation are not available. However, a large range of technician-level occupations and trades coordinators and supervisors are “open occupations” which means that vacancies in these occupations do not have to be advertised. Nominating someone for a work permit for an advertised occupation requires placing an advertisement at least twice in national newspapers and providing a statement outlining why a citizen could not be found to fill the vacancy.[12]

17. The detailed information on occupations in the following section, making use of data from the case studies of construction projects, suggests that foreign workers are performing work at lower skill levels than implied by the skill profile of occupations indicated in their approved work permits. This applies in particular to the occupation category “technicians and trade coordinators and supervisors” which accounts for over a third (36%) of the occupations of foreign work permit holders in construction.

18. The top 15 construction sector–related occupations listed in the foreign work permit applications, account for almost two-fifths of all work permits issued for 2013 and 2014 (Table 3). The large number of specific occupations related to construction approved for work permits shows that it is possible to identify specific skills sets for the PNG government to target for skills transfer (Appendix 4 has a note on PNG skill qualifications).

[11] PNG Government’s Department of Labour and Industrial Relations has two Work Permit Guideline publications: (i) *Work Permit Guideline: A Guide to the Foreign Employment System in Papua New Guinea*, and (ii) *Work Permit Guideline: A Guide to the Foreign Employment Industrial Divisions and Classification of Occupations.*

[12] Government of PNG, Department of Labour and Industrial Relations. 2009. *Work Permit Guideline: A Guide to Foreign Employment, Industrial Divisions and Classification of Occupations*. Port Moresby. p. 8. http://www.workpermits.gov.pg/pdfs/Guid_Clasi_1208.pdf

Table 3: The Top 15 Construction-related Occupations Listed in Work Permits Approved in 2013 and 2014
(Number of occupations)

Occupations	Number
Technicians and trade coordinators and supervisors	5,700
Specialist heavy machinery mechanic or technician	2,337
Steel fixer	1,743
Scaffolder	1,022
Structural steel erector	849
Construction rigger	722
Metal fabricator	714
Building and construction manager	604
Crane, hoist, or lift operator (Special)	418
Professional builder	345
Electrician	332
Fitter (General)	275
Occupational health and safety adviser	269
Safety inspector	258
Welder	209
Total	**15,797**

Source: PNG Work Permit approved by occupation 2013 and 2014.

III. ANALYZING SKILLS PROFILES ON ADB-FINANCED PROJECTS

19. Construction firms in bidding for large infrastructure projects have to show they have sufficient financial, technical, and human resources to meet the project specifications defined in each set of bid documents (Appendix 5 has further details). These tender specifications require bidders to show evidence of considerable capital resources, and to demonstrate they have completed a number of recent large-scale projects. Tender requirements also include the need for large construction firms to have their own core technical and supervisory workforce available for the project. This specific contract requirement puts the responsibility on the successful bidder to mobilize its own technical and supervisory workforce to implement the project.

20. Large infrastructure projects with their significant resource inputs that typically include a sizable foreign workforce requirement, therefore, have a high profile in PNG. They not only show a scale of activity that few local communities have experienced. They also raise questions about the immediate benefits local communities can expect to secure through participation in project activities—directly or indirectly. Common community concerns are whether there are opportunities for work on such projects and whether the foreign workers are displacing capable local workers. Government officials may also request evidence from contractors when renewing a work permit of whether they have fulfilled their obligation to transfer skills to the PNG national workforce, in accordance with PNG government policy under the terms of works permits issued to foreign workers.[13]

21. To investigate these issues further, data were compiled from the profile of occupations of foreign and domestic workers on ADB-financed projects contained in on-site workforce records. These records are included in the main contractor's monthly report to the project's supervising engineer and the information is usually provided for each workday of the month. These monthly occupational profiles are available for most of the current or recent ADB-financed projects in PNG.

[13] PNG Government. 2007. *Employment of Non-citizens Act 2007*. Part VII: Renewal of Work Permits. Port Moresby.

22. The collection of this quantitative information was complemented by site visits to road construction projects in the Highlands and to bridge construction projects in Central Province and West New Britain. These field visits were undertaken to obtain a more in-depth understanding of how skills were deployed on-site. Interviews were conducted for the assignment with a range of people with key roles in project supervision and implementation. The interviewees included senior management and on-site managers in foreign and PNG construction firms, supervising engineers responsible for oversight of contract implementation, officials from government agencies responsible for supervising infrastructure projects, development partners, and in-country ADB officers involved in approving and overseeing infrastructure investment. Also interviewed were office holders in professional associations for architects, engineers, and human resource personnel; officers involved in analysis of the census at the National Statistical Office; academic researchers analyzing the PNG labor market; and advisers knowledgeable about industry training needs and current arrangements.

23. Information was collected on the workforce by occupation and nationality from six different contractors under four ADB infrastructure projects: (i) Lae Port Development Project: Phase One—the largest project ever supported by ADB in the Pacific, costing over $200 million; (ii) two contracts amounting to $109 million for road construction and long-term road maintenance projects for further improvements to the Highlands Highway; (iii) two bridge replacement contracts for improved rural access in Central and West New Britain Provinces, valued at $28 million; and (iv) the construction of the new domestic and international terminal building and associated works at Mount Hagen Airport, financed through the Civil Aviation Development Investment Program (CADIP), costing $130 million.

24. A fifth project was also scrutinized: the $16.7 million Wutung Pilot Border Trade and Investment Development Project. The project was implemented through two contracts awarded to the same contractor. However due to data limitations on the occupations of the workforce, the project was not analyzed in this report. However, useful background information on the limitations of “build only” contracts was collected through interviews with the executing agency and feedback from the supervising engineer for the project.

25. Projects were selected for the case studies because they were current. As the aim of the assignment was not only to collect data from the project reports it also required to visit ongoing construction projects. However, since the current ADB-financed projects involved road and bridge construction, these only offered information about the skills needed for one type of construction. Therefore, additional information was collected on recently completed projects covering a more diverse range of construction activities such as the development of the Lae Port, the construction of the Mount Hagen Airport Terminal, and the construction of the Wutung Border Facilities.

A. Road Construction on the Highlands Highway

26. The same construction company undertook two road improvement contracts for the Highlands Highway over the same time period. At the time of a field visit in October 2015, the work had just been completed and final documentation was being prepared. The workforces for the two contracts have been combined for analysis purposes to give a better picture of the skills profile of a major road construction project. The total number of foreign and domestic workers, on the combined road projects averaged over the life of each project was 589. This workforce included both the prime contractor’s workforce and the workers of three PNG subcontractors.

27. The overall skills profile for combined road construction projects shows that 19% of workers were working in the skilled occupations of managers, professionals, and technicians;

19% were equipment operators or trades workers; 5% were support workers, such as security guards; and 57% of the workforce were laborers. This skills profile, however, differs greatly by a worker's country of origin. Three-fourths (75%) of the workforce from the contractor's country of origin were in the skilled occupations of managers, professionals, and technicians; 11% were trades workers; and 7% were equipment operators. By contrast, only 6% of the PNG workers were in the skilled occupations of professionals, technicians, or supervisors; 19% were equipment operators, drivers, or trades workers; 5% were support workers, mostly security guards; and, 70% of the PNG workforce were laborers.

B. Bridge Replacement for Improved Rural Access

28. The contracts for two prime contractors were studied under the PNG Bridge Replacement for Improved Rural Access Project located in different parts of the country. One contract is to construct six bridges along Magi and Hiritano highways in Central Province, and the other is to construct 12 bridges along New Britain Highway in West New Britain Province.

29. The workforce size, composition, and skills profiles of the two contracts differed considerably. The size of workforce for the six bridges in Central Province is an average of 426 personnel, all engaged by the prime contractor. By contrast, the workforce for the 12 bridges in West New Britain numbers 100 personnel, also all engaged by the prime contractor. Over half (58%) of the workforce in the Central Province contract are foreign workers, while in the case of the West New Britain contractor, only 9% of the workforce are of foreign origin.

30. For the Central Province contractor, 33% of the foreign workforce are managers, professionals, mainly engineers, technicians, and supervisors; 14% are equipment operators; and 50% are trades workers. The specific trades occupations of the foreign workforce are, in order of their numbers: steel fixers, mechanics, carpenters, welders, riggers, masons, and electricians. For the PNG workforce, 19% are in a skilled occupation (listed as technicians and two foremen); 13% are security guards; 3% are listed as storekeeper"; and 65% are defined as site workers or workers in the site camp.

31. In West New Britain, of the 10 foreign workers, seven are senior project managers or professionals and three are trades workers (two boilermakers and a senior heavy diesel fitter). Of the PNG workforce, 16% are mostly professionals and technicians and some are supervisors; 30% workers are in trade occupations, such as carpenters, heavy diesel fitters, riggers, welders, boilermakers, and mechanics. In addition, 22% of the workforce are equipment operators, such as truck drivers, excavator operators, open crane operators, front-end loader operators, semi-trailer operator/driver, batching operator, crusher operator, and grader operator.

C. Lae Port Development Project

32. The Lae Port Development Project involved the construction of a range of new facilities. These included a dredging a tidal basin, building a multipurpose berth, and building a new port terminal. The work involved the construction of new buildings, storage areas, roads, as well as providing drainage, water, electricity, and sewerage services. The workforce was large, with an average of 600 workers, based on a sample of 5 months' records over a 13-month period. Of this number, 140 were foreign workers, all of whom were sourced from the contractor's home country. They worked in the following broad occupation groups: professionals, mainly engineers (33%); technicians (20%); plant and machine operators (33%); and managers or senior supervisors (7%). By contrast, nearly all (97%) of the PNG workforce were employed as laborers. These figures represent the entire workforce for the project as the monthly reports do not indicate that any PNG construction companies were involved as subcontractors.

D. New Terminal Building and Associated Works for Mount Hagen Airport

33. Workforce data were collected for the building of a new runway apron/taxiway and construction of terminal building for domestic and international passengers and cargo at Mount Hagen in the Western Highlands. This work is part of a larger $640 million Civil Aviation Development Investment Program (CADIP) financed by ADB over 9 years from 2009 to upgrade facilities at PNG's 22 national airports. The same construction firm that implemented the two Highlands road improvement contracts was also the sole contractor for the Mount Hagen Airport contract.

34. Reflecting the much higher capital requirements of the Mount Hagen Airport project, an average of only 66 workers were required over the life of the project, ranging from 37 workers in the early stages to 76 workers at the end of the project. The workforce profile for June 2015 at the end of the project indicates that 24% are foreign workers, all of whom are professionals, technicians, or supervisors. The PNG workforce is employed under two categories: national staff and local casual workers: 16% as professionals, technicians, or supervisors; 28% as service workers, mainly security guards; 53% are laborers; with only 3% in semi-skilled occupations, such as equipment operators or drivers.

35. The overall skills profile of workers differs by project type. Road construction projects typically entail a higher level of labor input, with about 80% of the workforce hired as casual, unskilled labor; 15% in technical or skilled occupations; and 5% as senior managers and/or engineers. For building projects, the shares are unskilled labor (50%), skilled workers (35%), and senior managers and/or engineers (15%).

IV. IDENTIFYING TWO SKILLS SOURCING STRATEGIES

36. The following analysis of the case study data shows that construction firms follow markedly different skills sourcing strategies. At one end of the spectrum is a strategy construction firms follow to minimize costs. This involves only employing a small number of highly skilled staff from high-income countries, and some skilled staff from lower-income countries such as the Philippines. However, most of the workforce is sourced from the national labor market or local labor markets in PNG. This applies to skilled PNG workers drawn from a core workforce with a long track record of employment with the company. It also applies to skilled workers recruited from the local labor market. Unskilled workers are usually sourced as a group from local communities adjacent to the work site.

37. At the other end of the spectrum is a skills sourcing strategy based on lowering operational risks. International construction firms are more likely to use this strategy for their first or early projects in-country because they have had little chance to build up a local core workforce. This risk minimization strategy limits the number of PNG workers in the jobs of supervisor, trades worker, equipment operator, or heavy truck driver level in preference to experienced workers from the company's country of origin. This is done to reduce the transaction costs of managing work on a complex construction site. In addition, the language barrier increases greatly the chances that work directions are misunderstood, causing delays, and greater likelihood of accidents. Workers for tasks that can be done with skills learnt quickly on-the-job and with simple directions are recruited from communities next to the work site.

A. Evidence of Skills Sourcing Strategies from Two Case Studies

1. West New Britain Bridges Project

38. The bridge contracts provide evidence of the two contrasting enterprise strategies for sourcing their skilled workers. One construction company is a joint venture between an Australian company based in Queensland and a long-established PNG company that has a permanent PNG workforce of 400. The joint venture operation for the West New Britain bridge replacement contract had minimized its use of foreign workers by employing most of its skilled, as well as its unskilled workforce (90%) from PNG. One group of PNG workers are employed on national contracts as staff workers (26% of the total workforce). This form of employment includes providing full accommodation on-site and air fares to and from the worker's home base. The other group of both skilled and unskilled PNG workers (64%) the company has employed have been recruited locally. They have been employed on a casual, day-labor basis, which means they were responsible for finding their accommodation near the work site.

39. Two-fifths of PNG workers on national contracts are employed in the top three skill occupation groups of managers, professionals, and technicians. Another one-third of the PNG workforce on national contracts are employed in trades positions, and one-fifth are employed as equipment operators. For PNG's casual day–labor workforce, half are employed in trades and equipment operator jobs (Appendix 6 has a detailed list of the occupations by type of employment contract for the PNG workforce). The skills profile of half the casual day-labor workforce shows that workers with trade skills and experience as equipment operators were recruited from the immediate vicinity of the project.

2. Central Province Bridges Project

40. The skills profile of the Central Province bridge contractor and their recruitment source was notably different. Based on the distinctions made by the company in its monthly progress report, the following categories were employed: key staff, foreign skilled workers, and PNG workers. These categories reflect differences in contract pay and conditions. On the basis of positions held, the latter group has been further divided into national contracts and casual labor based on the skill level of the jobs they were doing (Appendix 7).

41. The resulting employment contract profile shows that 10% of the workforce designated as key staff are foreign workers. Altogether near to half (47%) of the company's workforce are foreign skilled workers. PNG workers in skilled jobs such as technicians and foremen and who are likely to be on national contracts make up 10% of the total workforce. A third of the company's workforce (33%) are PNG workers in unskilled jobs such as site laborers, camp attendants, and security guards, and are likely to be employed on a casual, day-labor basis (Appendix 6 has a detailed listing of occupations by skill level and country recruited from).

42. The Central Province bridge contractor's reasons for its skills sourcing strategy can be inferred from a company representative's explanation of the reasons they did or did not recruit workers locally. The company had received complaints from local communities about the relatively small number of PNG site workers compared with the larger number of foreign workers and had demanded that more local workers be employed. The construction company agreed to do this for gang work, which is hard work but mostly unskilled. However, the company had found it more difficult to recruit PNG workers for the jobs of truck driver and quarry crusher operator. A company representative explained that the machinery they used, such as graders and mobile cranes, was expensive and needed experienced operators. The representative also noted that the company had found it hard to recruit PNG supervisors. He noted that five of the

20 works supervisors were from PNG, and that half the equipment operators and drivers were PNG workers. However, the data in the monthly progress report shows that only two foremen are from PNG and all equipment operators, including heavy trucks, are foreign workers (Appendix 6). The reliance of the company on foreign workers to drive heavy duty trucks, for example, had exposed them to repeated police checks to see if they have a PNG license.

43. These different skills sourcing strategies also involved different approaches to training arrangements for the workforce (Appendix 8 outlines these different approaches).

V. MAIN FINDINGS

44. Information presented above on the census and work permit data analysis, the case study skills profiles of the workforce and interviews with key stakeholders point to a number of key findings and conclusions. The main findings are the following:

(i) Contractors who have established a long-term presence in PNG do employ local workers—the high cost of engaging foreign workers ensures this. International competitive bidding required in ADB projects has encouraged the entry of experienced foreign contractors to improve competition due to the lack of capacity of PNG construction firms. To qualify to bid for a tender for a large infrastructure project, a company is required to have recent experience in implementing similar large projects, and to show it has access to a workforce with the necessary skills. Any company which is a newcomer to construction work in PNG, therefore, has to mobilize most of its skilled workforce from elsewhere with few experienced workers recruited domestically. Tender requirements for large projects and the high transaction costs of setting up in a new country encourage international firms to initially avoid employing skilled PNG workers.

(ii) Foreign construction firms are reluctant, despite skill shortages and the gaps in the skills of workers, to invest in training their existing PNG workforce due to the limited duration of projects, and a desire to avoid extra costs not covered in their contract. Another common concern is the risk that other construction firms may "poach" workers if they do make an extra effort to provide skills training. A requirement included in construction contracts to train workers would place an equal obligation on all contractors.

(iii) Contractors with a longer presence in PNG and better established local networks have been able to build up over time their own core workforce of PNG nationals including those employed in more skilled positions. In contrast, contractors faced with building a large infrastructure project and with only recent in-country experience and few if any local networks rely more on foreign workers to meet most of their skill needs.

This suggests that if foreign construction firms stay on in the country to take on other projects, it is possible for more PNG nationals to get work at different skill levels on infrastructure projects. This applies especially to jobs requiring mid-level skills but also, though to a lesser extent, to jobs requiring professional and technical skills as well as supervisory positions. The decision of a foreign construction firm to stay beyond an initial project may be related to the high cost of setting up in PNG, the lower costs of subsequent bids for other large projects, and a desire to recoup the costs of its initial investment.

(iv) While long-established foreign contractors have been able to successfully mobilize and deploy PNG nationals to fill trades, engineering, and some supervisory level positions, this process has taken a long time and will continue to do so if left to market pressures alone. The limited overall number of trained PNG nationals in the construction sector, as shown in the 2011 census data, constrains the extent to which foreign construction firms can recruit PNG skilled workers on the open labor market. Simply waiting for foreign companies to recruit more skilled workers locally will not provide more expanded skills transfer opportunities to PNG workers. Construction firms need to provide, in a more systematic and accountable way, a range of opportunities to transfer skills to PNG workers.

(v) The challenge for government in developing a policy to promote skills transfer is to first find out about the particular skills sourcing strategy for what types and levels of skills a construction company on a large project is planning to adopt. The next step is for government to work out skills transfer opportunities that respond to and build on the specific sourcing strategy for what type of skills a firm is adopting.

(vi) The case studies and administrative data on work permits provide information about the different types of skills that could be transferred. The greatest potential demand for PNG workers on infrastructure projects is in mid-level skill occupations, especially construction-related trades. Just over 6,000 work permits were approved in 2013–2014 for mid-level skill construction occupations of steel fixer, scaffolder, structural steel erector, construction rigger, metal fabricator, crane, hoist or lift operator (special), electrician, and fitter (general). These and other similar middle-skill occupations offer the greatest potential for PNG workers to substitute for foreign workers within the shortest period of time, and in the most cost-effective way.

(vii) According to stakeholders interviewed, which included project managers, supervising engineers, and professional associations, there is a need to identify more and better construction-related skills at all levels. These ranged from the value of providing for training in basic skills for casual day laborers, the importance of enhancing trade and technical level skills and of extending professional and managerial skills. In relation to basic skills training, large infrastructure projects provide local communities with much needed income-earning opportunities through the employment opportunities for unskilled labor. However, a PNG construction firm noted that there is also scope for large contractors to make structured efforts to upskill workers who have the potential to learn basic construction-related skills. This would enable locally hired workers to acquire skills that could be used on other construction projects, as well as contributing to improved community-based maintenance service delivery.

In addition to skills gaps in individual workers, some stakeholders also identified organization-wide skill needs of PNG contractors. Specific organizational skills gaps mentioned were in managing a complex project at all levels and in implementing systems of quality and workplace health and safety checks.

VI. OPTIONS FOR PROMOTING SKILLS TRANSFER OPPORTUNITIES

45. Encouraging large construction firms to transfer skills to PNG workers will require a number of separate but related recommendations. It will also need to include a number of stakeholders as well. No single or stand-alone initiative is likely to work and no single stakeholder acting alone will be able to achieve worthwhile results.

46. The six recommendations are proposed. The first two relate to identifying the skill sets that need to be transferred and to the changes needed to existing contract requirements. Also needed is an incentive structure to encourage constructions to go beyond a narrow compliance with a contract provision. Putting this incentive structure in place involves two recommended steps: a regional framework agreement and a country-specific policy and legislative change. The fifth recommendation is to put in place a mechanism to extend the skills transfer process beyond the life of any one construction project. The last proposed recommendation is to set up better processes for monitoring workforce skills and the skills transfer process. The following section elaborates on each of the six key elements of a skills transfer process.

1. Identify the type of skills to be the focus of the skills transfer arrangements

47. The focus of skills transfer should be four broad sets of skills from basic skills to middle- and high-level skills for individuals as well as organizational skill sets. The focus could be on basic skills for casual day laborers, such as basic skills training at the start of the work to locally recruited workers with some background in construction work. Supervisors of locally recruited workers could also be trained in how to pass on basic skills to workers. An example of such training was provided by a PNG-based construction company in the form of an elementary 3–4 day course in the basics of using battery-powered hand tools efficiently and effectively such as an angle grinder.

48. A second focus of skills transfer could be on trade and technical level skills to extend or deepen the skills of workers who have already been trained formerly or informally. The third focus could be on professional and managerial skills. Graduate engineers and architects, for example, have to undertake extended periods of on-the-job skills learning to meet the registration requirements to become full members of their professional associations.

49. The fourth area of potential focus for skills transfer could be on the organization-wide skill needs of PNG contractors. Mention was made in particular of the need for skills at all levels in managing a complex project and in implementing systems of quality and workplace health and safety checks.

2. Work out appropriate contractual requirements for skills transfer

50. There are several options for framing an explicit obligation on all contractors to provide skills transfer opportunities. One is to simply specify in the contract a required input such as a certain number of training places for PNG workers based on the size of the contract. This option, however, does not address the issue what the output is, i.e., what skills have those in the training places acquired. Nor is the issue of the outcome achieved addressed such as the quality of the skills transferred.

51. To focus on the quality of the outcome, a contract could provide for a separate skills development budget to enable contractors to cover the costs associated with providing skills transfer opportunities. This allows bidders to be aware from the beginning of their obligation, what it involves and how this obligation can be costed separately from their tender bid. The

procurement process can propose a specific set of requirements for skills transfer that are to be costed separately. Provision for paying these costs is included in the contract as a "provisional sum."[14] The costs of meeting the skills transfer requirements are worked out separately once the details are known after the contract has started. The advantage of this mechanism is that cost of the training arrangements are not subject to competitive tender.

52. However, this type of skills transfer arrangement is only suited to projects where longer-term outcomes are not considered important. Recent road improvement contracts for the Highlands Highway now include innovative provisions related to maintaining the asset after the completion of the initial work.[15] The initial build-and-maintain contracts were for 10 years but more recent contracts have reduced the maintenance requirement to 5 years. Skills transfer requirements linked to an outcomes focus are important for construction projects where maintenance of the facility and continuing need for skilled personnel to do this maintenance work is crucial to the success of the project.

53. The benefits of a performance or outcomes-based contract include a greater focus on the needs of the client commissioning the work, and greater scope to find more efficient and innovative ways to deliver the specified outcomes. Another important feature of this contract approach is a sharing of the risks of failure to meet the desired outcomes. This also applies to a sharing of the rewards for achieving the desired outcomes with more efficient means.

3. Use a framework agreement to provide contractors with a positive incentive to meet social and environmental impact objectives

54. Construction firms also need positive incentives to provide skills transfer opportunities. Penalizing contractors for not complying may create a perverse incentive for them to simply pay a penalty rather than take on an obligation with hard-to-predict transaction costs. In contrast, positive incentives could take the form of an invitation to join a panel of firms who agree to follow good corporate practice in meeting social and environment objectives. The major incentive for an international company is the prospect of improving its chances of winning future tenders based on a record of good social and environmental impact performance. A framework agreement based on positive incentives to meet social goals could be a process for generating a so-called "white list" of good corporate performers—the positive version of the ADB's practice of blacklisting of firms banned from future tenders due to poor performance on previous ADB-financed contracts.

55. An organizing principle for the agreement could be the concept of "creating shared value." This corporate strategy involves going beyond the practice of corporate social responsibility which seeks to merely minimize harm to society and the company. The creating shared value approach asks enterprises to seek opportunities to solve social problems as a means of strengthening its reputation and increasing profits.[16] The concept underpins the approach of a number of companies in PNG such as Oil Search and Digicel PNG (Box 1). It has

[14] A "provisional sum" refers to where the parties to a construction contract do not try to price the specified work accurately because the nature of the work is not able to be clearly defined. A provisional sum refers to the parties agreed 'best guess'. Thomson Reuters. 2010. *Ask the Team: What are Provisional Sums*. Practical Law Construction Blog. http://construction.practicallaw.com/blog/construction/plc/?p=402

[15] ADB. 2015. *Asian Development Bank and Papua New Guinea Fact Sheet*. April. Manila. p. 3.

[16] Porter, M., and M. Kramer. 2011. Creating Shared Value. *Harvard Business Review*. January–February. See also, Oil Search Limited. 2015. *Shared Value Overview for PNG*. Palladium. 2015. *Positive Impact Series: The Impact Economy—Creating Shared Value for Social Impact and Financial Return*, 10 December. The seminar, involving speakers from five major PNG companies, explored how private sector organizations can do good socially and do well financially at the same time, building powerful coalitions that address complex societal issues. http://thepalladiumgroup.com/knowledge/palladium-hosts-shared-value-event-png

also spurred significant collective action aimed at addressing major public health problem. The Oil Search Health Foundation, using the concept of creating shared value, has worked with 18 major resource companies in the country to implement a national malaria control strategy. The PNG Industry Malaria Initiative (PIMI) is based on a public private–partnership with the Department of Health and has the goal of eliminating malaria by 2050.[17]

Box 1: Promoting Social Responsibility

At Oil Search, social responsibility encompasses five key principles:

- **Operating with integrity.** Operate ethically and adopt and advocate for principles, practices, and standards that respect diversity, local culture, human rights, labor rights, and the environment, and which contribute toward combating corruption.
- **Enhancing social license to operate.** Support continued business operations, by maintaining strong mutually beneficial relationships directly with stakeholders, monitoring the impact of the company's activities, and leaving a long-term positive social development legacy.
- **Generating shared value.** Generate positive sustainable outcomes for the communities in which the company operates by creating opportunities which benefit the community and contribute to the continuity of its operations.
- **Managing resources responsibly.** Minimize its environmental impact and operate in an environmentally sustainable way through the adoption of a precautionary approach and consideration of effective and efficient use and re-use of resources.
- **Continuous performance improvement.** Continue to grow and leverage the company's sustainability capability by seeking ways to enhance its approach through improved monitoring, measurement, and innovation.

The Board's commitment to these principles is outlined in the Oil Search's Social Responsibility Policy (http://www.oilsearch.com/Corporate-Governance/Charters-and-Policies.html)

Source: Oil Search. Principles and Values. http://socialresponsibility.oilsearch.com/approach/fundamentals/principles-and-values/

56. The proposed role of large construction contractors in enhancing social performance in developing countries was advocated over a decade ago by the UK's Overseas Development Institute (ODI). The ODI Briefing Note highlights how the construction of capital projects in undeveloped areas offer considerable opportunity through direct employment and procurement to deliver local economic and social benefits. Responding to these opportunities can help counter project-related social risks and enhance the reputation of both the contractor and the client. One suggested element of a new approach is a "social performance strategy" based on the allocation of key tasks to major stakeholders.[18]

57. It is proposed that ADB develops a framework agreement based on a set of social and environment impact objectives, driven by the concept of encouraging enterprises to create shared value. One of the objectives should be skills transfer based on a commitment to building up the domestic skills pool to maintain the infrastructure in the future. The agreement should be open to all companies wishing to tender for major infrastructure projects in the Pacific region.

[17] PIMI supports public–private partnerships to control and eliminate malaria in PNG. The initiative plans to include major resource operators (energy, mining, and agribusiness) in PNG to create public–private partnerships with their host provinces to progress malaria control. It is notable that construction firms are not included. http://www.pimi.org.pg/

[18] Warner, M. 2004. Involving Large Contractors in Enhancing Social Performance during Construction. *ODI Business and Development Performance Briefing Note* No. 2. London. https://www.odi.org/publications/1419-involving-large-contractors-enhancing-social-performance-during-construction

However, company participation in the agreement should not be a precondition for eligibility to submit a tender. Nevertheless, the tender evaluation criteria should include evidence of a commitment to meeting a specified social or environmental objective or objectives. Construction firms participating in the agreement should also agree to provide performance data on how well they are meeting their nominated objectives.

4. Set up a country-specific political imperative

58. A policy statement by the PNG government is also needed, backed by legislative changes, making more explicit the obligation of employers of foreign workers to transfer skills to local workers. The policy statement should highlight the need for foreign companies to train up existing and new PNG workers. The legislative changes to the requirements of companies applying for work permits should cover an obligation on the employer to transfer skills as a condition of work permit approval. This obligation should include specifying the skills transfer arrangements in place at the beginning of the employment of the foreign worker and reporting at the end of the work permit on the skills transfer outcome, as verified by an independent third party. The policy statement should also ask firms holding a large number of work permits to report publicly on their efforts to transfer skills to PNG workers. This reporting requirement, based on an agreed template, could be implemented at relatively little cost.

59. The PNG legislation requiring employers to obtain a work permit for foreign workers refers to the expected benefit of transferring their skills to PNG workers. The *Employment of Non-citizens Act 2007* states that one purpose of the work permit system is to contribute to the "creation of employment, training and skills-acquisition opportunities for all Papua New Guineans."[19] However, neither the legislation nor the supporting regulations spell out how the skills transfer is to be monitored other than indirectly when an employer seeks to renew a work permit. Part VII of the Act states that the government's decision to renew a work permit will depend in part on "the commitment of the employer to the training and development of Papua New Guineans."[20] The requirements for renewal of a work permit in the guidelines for employers on the work permit system state that:

> It is essential when making application for the renewal of a work permit that appropriate evidence of training and development of Papua New Guinean workers is provided. Renewal applications that fail to provide adequate evidence of training and development will be refused.[21]

60. An example of a report on training and human resource development is provided in the work permit guidelines, based on four dot point sentences (Box 2). No specific instructions or template are provided in the guidelines to employers about how to report on the skills transfer activities of the foreign work permit holder seeking renewal and outcomes achieved. Nor are employers asked to specify what skills transfer measures they have to put in place when the foreign work permit is first granted.

[19] PNG Government. 2007. *Employment of Non-citizens Act 2007*. Part I: Purpose of Act.
[20] PNG Government. 2007. *Employment of Non-citizens Act 2007*. Part VII: Renewal of Work Permits.
[21] PNG Government, Department of Labour and Industrial Relations. 2009. *Work Permit Guideline: A General Guide to the Foreign Employment System in Papua New Guinea*. Port Moresby. p. 24. http://www.workpermits.gov.pg/pdfs/Gen_Guid_1208.pdf

Box 2: A Sample Report on Training and Human Resource Development

Renewal of Work Permit
Report on Training and Human Resource Development
Prepared by ABC Steel Works

As a company, we have provided the following training and development opportunities for our Papua New Guinean (PNG) staff:

- We recently sponsored training for 5 apprentices at the Pacific Vocational College. All of these apprentices graduated with a Certificate IV in Engineering which is recognized internationally;
- • We conduct monthly in-house training for our PNG staff. All staff receive a 'Training Book' which records their attendance. The training is conducted by our expatriate staff who use this opportunity to share their knowledge with their PNG counterparts;
- We have an informal mentoring program within our business. Under this program, our expatriates coach and mentor our younger PNG workers;
- We recently engaged the services of the National Aids Council Secretariat (NACS) to conduct HIV/Aids awareness training for all our staff.

We promote the training and development of our PNG staff in a number of other ways and would be happy to provide additional evidence to the Department if necessary.

Signed:
Mr. Peter Browne, CEO
1 July 2010

CEO = Chief Executive Officer.
Source: Government of Papua New Guinea. Department of Labour and Industrial Relations. 2009. *Work Permit Guideline: A General Guide to the Foreign Employment System in Papua New Guinea*. Port Moresby. p. 24.

61. However, a focus only on the role of construction firms, contract provisions, framework agreements and national policy statements supporting skills transfer while necessary are insufficient in themselves. Construction contracts are of limited duration and specific opportunities for skills transfer within a contract's duration may be more restricted still. Ways need to be found for contractors and other key stakeholders such as professional associations related to construction work to collaborate to ensure skills acquisition continues beyond the life of any one project.

5. Partner with professional associations to support sustainable skills development

62. The issue of skills transfer is wider than making it the responsibility of international firms. As noted above, infrastructure projects, of their nature, have a limited duration. They are best suited to relatively short- or medium-term opportunities to transfer skills. Support is needed to allow for a more prolonged transfer of skills. This applies particularly to apprenticeship training and on-the-job training of engineering and other professional graduates in construction. These graduates need to obtain professional status by meeting the requirements of their professional association. They also include associate members of the processional associations such as post-secondary qualified technicians in related occupations.

63. Professional associations in PNG have a key role to play as intermediaries in supporting professionals and technicians in construction to make the most of the skills transfer

opportunities available to them. These professional associations are the PNG Institute of Architects, the PNG Institute of Builders, the Institution of Engineers PNG, the Association of Surveyors of Papua New Guinea (ASPNG), and the PNG Human Resource Institute. Making use of the continuing professional development programs of relevant professional institutes would provide longer-term potential for skills development.

64. There is also considerable potential for closer collaboration between each of the professional associations and with other interested entities such as the universities. This collaboration could take the form of a joint venture between two or more associations such as the Human Resources Institute and the Institute of Architects. These associations, working alone or preferably in joint ventures, have major potential to support skills transfer on a large scale for a prolonged time but are operating far below their potential at present.

65. Feedback from interviews with officeholders in these professional associations shows that, despite their key role in the skills formation process, they are substantially under-performing in the contribution they could make, due to lack of resources and capability. The Institution of Engineers PNG has a 5-year program of professional development required of engineering graduates to become a full member. Its president noted that many recent engineering graduates are not pursuing the requirements to obtain their registration as professional engineers. This in large part due to the lack of resources to organize mentors for graduate engineers and to fund ways to deliver formal training at low cost and without reliance on expensive internet connections.

66. The funds to provide additional places in the continuing professional development programs of these professional associations could be sourced from a fee set as a proportion of the value of a construction contract above a certain threshold and paid to professional associations and skills training providers for specific training programs.

6. Improve through the contract supervision and work permit processes for the monitoring of workforce skills

67. The data on skills collected for the analysis presented in this paper were obtained from progress reports that contractors provide on a monthly basis to the supervising engineer. These reports include details of the number of workers by occupation and nationality. However, the PNG government or ADB does not require contractors to follow a standard template for preparing the reports and annex on workforce inputs, so the available information varies between projects and even within projects over time. To improve the assessment of workforce skills in future, the PNG government should specify a standard method of reporting. In addition, the government needs to issue instructions for the supervising engineer for the contract about how to assess the skills transfer arrangements.

68. In relation to a listing of work permit occupations, the PNG government also needs to release data publicly for each 6-month period on the occupations by the industry sector in which they are employed. This will enable training providers to identify in which occupations and industries the greatest skill shortages exist. Large occupational groups such as “technicians and trade coordinators and supervisors” need to unpacked by seeking on the work permit application more details about the specific occupations of technicians and the type of supervisory qualifications held by trade coordinators and supervisors.

69. The information provided by the contractor to the supervising engineer on the work allocation by occupation and nationality as part of the monthly progress reports should be monitored to assess the extent of skills transfer. This could be done by noting the changes over

the life of the project in the type of jobs carried out by the foreign and national workers employed on the project.

VII. IMPLEMENTING THE RECOMMENDATIONS: DIFFERENCES IN THE EFFORT, TIME, AND COSTS REQUIRED

70. Considering the amount of effort, the elapsed time, and in broad terms the cost, which of the proposed recommendations are most likely to be implemented? Some recommendations are likely to only require modest effort and can be put into effect relatively quickly with little cost. These recommendations involve few stakeholders, entail relatively minor changes, and are unlikely to meet any major obstacles. Other recommendations involving more stakeholders, more extensive changes, and longer timelines are likely to encounter greater obstacles and are more costly to implement.

A. Near-Term Recommendations

71. The easier-to-implement and lower-cost recommendations are:

(i) **Recommendation 1: Identify the type of skills to be the focus of the skills transfer arrangements.** This recommendation can be as simple as making use of the census, work permit, and project data presented in this report to work out where the focus of the skills transfer arrangements should be. More up-to-date information can come from the construction-related occupations of new work permit holders.

(ii) **Recommendation 2: Work out appropriate contractual requirements for skills transfer.** Depending on the contract change option chose, this recommendation may have different costs and time delays. Specifying skills transfer as an input or an output involves little extra effort in the preparation of a tender. However, asking a contractor to deliver a performance-based outcome will require a higher level of initial specification and consultation, similar to the extra effort required to develop a tender for a build-and-maintain road contract. Monitoring the skills transfer outcomes by the supervising engineer will also require a change to the responsibilities of this role.

(iii) **Recommendation 6: Improve, through the contract and work permit processes, the monitoring of workforce skills.** This recommendation proposes that the PNG government develop a template for the collection of the monthly data on the occupations and nationality of the workforce of the projects it finances. The work permit data will need to also include more detail about large occupational groups such as trade coordinators and supervisors on the industry in which the foreign worker is to be employed. The information can be released publicly on the government's website.

B. Medium-Term Recommendations

72. The recommendations that are likely to confront more obstacles and, hence, be prone to some time delay and be more costly:

(i) **Recommendation 3: Use a framework agreement to provide contractors with a positive incentive to meet social and environmental impact objectives.** The range of stakeholders and level of consultation required to

develop a framework agreement will be extensive. Time delays are likely to result from ADB consulting with relevant government ministers in one country or in each of its member countries. However, the consultation with construction companies may only involve limited costs for ADB. This could be achieved by asking those companies that have tendered for ADB-financed projects in the past to take part, at their own expense, in one or more workshops in Manila on the proposed agreement.

(ii) **Recommendation 4: Set up a country-specific political imperative.** If the government conducts one-to-one consultations with major foreign companies operating in PNG, it may involve time delays. However, the time line would be shorter if the consultations would take place in small groups of six to eight major firms in the major industry sectors that have extensive use of work permits. Obstacles may include a resistance from major firms to the additional requirements and the lack of political will to make the changes.

(iii) **Recommendation 5: Partner with professional associations to support sustainable skills development.** This recommendation is also likely to involve time delays due to the consultations needed to work out the best ways of supporting skills transfer arrangements in the construction sector. Funding arrangements also need to be worked out and consultations conducted to reach agreement on how best to source the funds and how to disburse them.

REFERENCES

Asian Development Bank (ADB). 2015. *Asian Development Bank and Papua New Guinea Fact Sheet*. April. Manila.

Australian Bureau of Statistics. 2012. Education Differences between Women and Men. 4102.0—Australian Social Trends. September. http://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/4102.0Main+Features20Sep+2012

Bowsher, K., and L. Martins. 2011. *London 2012 Apprenticeship Programme: Lessons Learned from the London 2012 Games Construction Project*. London: Olympic Delivery Authority. http://learninglegacy.independent.gov.uk/publications/london-2012-apprenticeship-programme.php

Council of Australian Governments. 2009. *National Partnership Agreement on Indigenous Economic Participation*. Barton, Australian Capital Territory. http://www.federalfinancialrelations.gov.au/content/npa/skills/economic_participation/national_partnership.pdf

———. 2009. *National Partnership Agreement on the East Kimberley Development Package: An Agreement between the Commonwealth of Australia and the State of Western Australia*. Barton, Australian Capital Territory. http://www.federalfinancialrelations.gov.au/content/npa/infrastructure/east_kimberley/national_partnership.pdf

Government of Australia, Department of Employment. National Partnership Agreement on Indigenous Economic Participation. https://www.employment.gov.au/national-partnership-agreement-indigenous-economic-participation

Government of Northern Ireland, Department for Communities. Sustainable Procurement in Construction. https://www.communities-ni.gov.uk/sustainable-procurement-construction

Government of Papua New Guinea. 2007. *Employment of Non-citizens Act 2007*. Port Moresby.

Government of Papua New Guinea, Department of Labour and Industrial Relations. 2009. *Work Permit Guideline: A General Guide to the Foreign Employment System in Papua New Guinea*. Port Moresby. http://www.workpermits.gov.pg/pdfs/Gen_Guid_1208.pdf

———. 2009. *Work Permit Guideline: A Guide to the Foreign Employment Industrial Divisions and Classification of Occupations*. Port Moresby. http://www.workpermits.gov.pg/pdfs/Guid_Clasi_1208.pdf

Government of Papua New Guinea, National Statistical Office. n.d. 2011 *PNG National Population and Housing Census*. Port Moresby. (http://sdd.spc.int/en/resources/document-library?view=preview&format=raw&fileId=218)

Government of the United Kingdom, Department for Business, Enterprise, and Regulatory Reform (now known as the Department for Business, Innovation and Skills). 2009. *Building Britain's Future—New Industry, New Jobs*. London. Posted on The Chartered Institute of Building website: http://www.ciob.org/news/building-britains-future-new-industry-new-jobs

Government of the United Kingdom, Office of Government Commerce. 2009. *Promoting Skills through Public Procurement*. London.

Governments of Australia (Commonwealth, States, and Territories). 2001. *Australian Industry Participation National Framework 2001*. http://www.industry.gov.au/industry/IndustryInitiatives/AustralianIndustryParticipation/Documents/AIPFramework.pdf

Horne, R., K. Ngangan, S. Tavil-Melachon, and J. Brown. 2015. *Research into the Financing of Technical and Vocational Education and Training (TVET) in the Pacific: Papua New Guinea Country Report*. Melbourne: Australian Council for Education Research. http://research.acer.edu.au/transitions_misc/22/

Organisation for Economic Co-operation and Development (OECD). 2015. *Education at a Glance 2015: OECD Indicators*. Paris. http://download.ei-ie.org/Docs/WebDepot/EaG2015_EN.pdf

Porter, M., and M. Kramer. 2011. Creating Shared Value. *Harvard Business Review.* January–February.

State Government of New South Wales, Department of Premier and Cabinet. 2009. *Training Management Guidelines*. Sydney. http://arp.nsw.gov.au/sites/default/files/Training_Management_Guidelines_Apprentices.pdf

State Government of South Australia, Department of Planning, Transport, and Infrastructure. Workforce Participation in Government Construction Procurement. http://www.dpti.sa.gov.au/wpgcp

———. 2011. *Workforce Participation in Government Construction Procurement: Implementation Guidelines for Contractors and Contracting Agencies*. Adelaide. http://www.dpti.sa.gov.au/__data/assets/pdf_file/0017/55601/FINAL_WPGCP_Guidelines_June2011.pdf

State Government of Western Australia. 2009. *Building Local Industry Policy: Procedural Guidelines*. West Perth. https://www.commerce.wa.gov.au/sites/default/files/atoms/files/building_local_industry_policy_procedural_guidelines_0.pdf

Thomson Reuters. 2010. Ask the Team: What are Provisional Sums? Practical Law Construction Blog. http://construction.practicallaw.com/blog/construction/plc/?p=402

United States Agency for International Development (USAID). 2012. USAID Acquisition Regulation (AIDAR): A Mandatory Reference to ADS 302. https://www.usaid.gov/sites/default/files/documents/1868/aidar.pdf

Wells, J. and J. Hawkins. 2008. *Increasing Local Content in the Procurement of Infrastructure Projects in Low Income Countries*. London: Engineers Against Poverty and Institute of Civil Engineers.http://www.engineersagainstpoverty.org/documentdownload.axd?documentresourceid=23

APPENDIXES

Appendix 1: Developing Skills through Public Investment Projects[1]

1. Countries are increasingly requiring contractors that bid on public investment projects to include provision for skills development and employment as part of the tender submission. For example, Australia, the United Kingdom (UK), and the United States (US) all have arrangements for requiring skills transfer in publicly funded contracts.[2] The UK, in particular, has made extensive use of social provisions in contracts to generate opportunities for training of apprentices and others.[3] For example, contractors constructing facilities for the London Olympics in 2012 were required to provide training places for apprentices.[4]

A. Australia

2. In Australia, the federal and state governments have agreed to the Australian Industry Participation National Framework 2001.[5] This framework requires large projects funded by the private sector to provide for the "full, fair and reasonable opportunity for Australian industries to participate in significant public and private sector activity." This includes encouraging Australian enterprises to benefit from technology and skills transfer.

3. Another federal government initiative is the National Partnership Agreement on Indigenous Economic Participation, agreed upon by the federal and state governments in 2009 and expired in June 2013.[6,7] This agreement committed Australian governments to using their procurement policies to maximize indigenous employment and opportunities to upgrade their skills. The agreement referred in particular to large construction projects, maintenance contracts, cleaning, and infrastructure projects.[8]

[1] This section is based on Attachment 3: Addressing Social Objectives in Government Contracts in Australia, [the] UK, [the] US and [the] World Bank Procurement, in ADB. 2012. The Use of ADB Infrastructure Procurement for Skills Transfer: A Concept Paper. Manila. Paper commissioned by ADB's Pacific Department and prepared by R. Curtain.

[2] Wells, J. and J. Hawkins, 2008. *Increasing Local Content in the Procurement of Infrastructure Projects in Low Income Countries*. London: Engineers Against Poverty and Institute of Civil Engineers. http://www.engineersagainstpoverty.org/documentdownload.axd?documentresourceid=23

[3] Provisions such as the following are used: "Contracts to include a requirement that the contractor either directly, or through the supply chain provides, for each £500K of contract labour value, 8 person weeks of work placement for Training for Success (TFS) trainees." Government of Northern Ireland, Department for Communities. Sustainable Procurement in Construction. https://www.communities-ni.gov.uk/sustainable-procurement-construction

[4] Bowsher, K., and L. Martins. 2011. *London 2012 Apprenticeship Programme: Lessons Learned from the London 2012 Games Construction Project*. London: Olympic Delivery Authority. http://learninglegacy.independent.gov.uk/publications/london-2012-apprenticeship-programme.php

[5] Governments of Australia. 2001. *Australian Industry Participation National Framework 2001*. http://www.industry.gov.au/industry/IndustryInitiatives/AustralianIndustryParticipation/Documents/AIPFramework.pdf

[6] Council of Australian Governments. 2009. *National Partnership Agreement on Indigenous Economic Participation*. Barton. http://www.federalfinancialrelations.gov.au/content/npa/skills/economic_participation/national_partnership.pdf

[7] Government of Australia, Department of Employment. National Partnership Agreement on Indigenous Economic Participation. https://www.employment.gov.au/national-partnership-agreement-indigenous-economic-participation

[8] Government of Australia, Department of Employment. Strengthening Government Procurement Policies https://www.employment.gov.au/strengthening-government-procurement-policies

4. Individual state governments have their own strategies in place:

(i) In New South Wales, a set of Training Management Guidelines[9] (February 2009) requires construction industry enterprises on major government projects valued at more than 1 million Australian dollars (A$) to specify apprenticeship employment targets and training targets for contractors working on these projects. These requirements must be included in tendering and contract documents and are used for contractor pre-qualification.

(ii) In Queensland, the Building and Construction Contracts Structured Training Policy, otherwise known as the "10 per cent Training Policy," is aimed at employing apprentices, trainees, cadets, and indigenous workers as well as upskilling existing workers. An Indigenous Employment Policy for Queensland Government Building and Civil Construction Projects (the "20% Indigenous Employment Policy") is also in place. This policy promotes skills development, employment, and business opportunities for Aboriginal people and Torres Strait Islanders arising from construction projects in specified communities.

(iii) The Government of South Australia requires large projects that have a total value of more than A$50 million and a minimum duration of 6 months to have a Workforce Participation and Skills Development Strategy (December 2010).[10]

(iv) In Victoria, the State government, as part of its Victorian Industry Participation Policy (2001, revised 2009), has two skills related requirements for contractors awarded projects of over A$3 million in metropolitan Melbourne or state-wide activities and A$1 million in regional areas.[11] The policy also has a Strategic Project framework for projects valued at A$50 million or more.

(v) In Western Australia, the State Government's Building Local Industry Policy: Procedural Guidelines specifies that large projects funded by the private sector are required to submit an Industry Participation Plan. This is to enable a project-wide procurement strategy to be set up to supply goods and services for the project's development and operational stages. The plan is to include, among other things, details of the jobs to be created and the skills transfer opportunities available through appropriate in-house training, technical and further education (TAFE) courses, and other recognized training schemes.[12]

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[9] State Government of New South Wales, Department of Premier and Cabinet. 2009. *Training Management Guidelines*. Sydney. http://arp.nsw.gov.au/sites/default/files/Training_Management_Guidelines_Apprentices.pdf

[10] State Government of South Australia, Department of Planning, Transport, and Infrastructure (DPTI). Workforce Participation in Government Construction Procurement. http://www.dpti.sa.gov.au/wpgcp; and, DPTI. 2011. *Implementation Guidelines for Contractors and Contracting Agencies. http://www.dpti.sa.gov.au/__data/assets/pdf_file/0017/55601/FINAL_WPGCP_Guidelines_June2011.pdf*

[11] State Government of Victoria. Victorian Industry Participation Policy. http://economicdevelopment.vic.gov.au/about-us/strategies-and-initiatives/victorian-industry-participation-policy

[12] State Government of Western Australia. 2009. *Building Local Industry Policy: Procedural Guidelines*. Perth. https://www.commerce.wa.gov.au/sites/default/files/atoms/files/building_local_industry_policy_procedural_guidelines_0.pdf

(vi) In Western Australia, a National Partnership Agreement for the East Kimberley Development Package[13] (the "East Kimberley Development Package") has been developed by the Australian and Western Australian governments. Among other things, the package requires that procurement agencies review projects to identify opportunities for indigenous employment outcomes, and skills development and to work out to sustain the jobs created. The package of measures includes encouraging government agencies to work together to develop an indigenous workforce strategy. For example, West Australia's Industry Training Unit works to identify apprenticeship opportunities on relevant projects.

B. United Kingdom

5. The UK government issued a policy statement, *Building Britain's Future—New Industry, New Jobs*, in April 2009 stating its intention to promote skills training through procurement across government.[14] This was followed by the government's announcement seeking 20,000 new apprenticeship places over 3 years through public procurement.

6. In *Promoting Skills through Public Procurement*, [15] the government asked central government departments and agencies to specify in new contracts places for apprentices as a proportion of the contractor's workforce and to work on a voluntary basis with contractors on existing contracts to provide opportunities for skills training.

7. This general instruction followed on from earlier, more specific initiatives. In 2008, the government required that the contracts for new buildings for technical and vocational education and training (TVET) have a formal training plan in place to maximize access to apprenticeships. Similarly in relation to the Building Schools for the Future programme, a target of 1,000 extra apprenticeship places was specified. Also the Olympic Delivery Authority included a condition in new contracts that 3% of the workforce working at the Olympic Park site be apprentices, creating an expected extra 250 places. Other similar initiatives to promote apprenticeship opportunities involved the National Affordable Housing Programme, and on existing housing development and regeneration projects.

8. In February 2012, the new UK government has asked suppliers bidding to design and manufacture trains for new rail project must provide details of how many apprenticeships they would provide through the project. The Scottish government is also introducing measures to promote apprenticeships through its sustainable procurement legislation.

C. United States

9. Within the US, it is common for contracts to require companies to employ people according to equal opportunity obligations. Construction contracts can also include requirements

[13] Council of Australian Governments. 2009. *National Partnership Agreement on the East Kimberley Development Package: An Agreement between the Commonwealth of Australia and the State of Western Australia*. Barton. http://www.federalfinancialrelations.gov.au/content/npa/infrastructure/east_kimberley/national_partnership.pdf

[14] Government of the United Kingdom, Department for Business, Enterprise, and Regulatory Reform (now known as the Department for Business, Innovation and Skills). 2009. *Building Britain's Future—New Industry, New Jobs*. London. Posted on The Chartered Institute of Building website: http://www.ciob.org/news/building-britains-future-new-industry-new-jobs

[15] Government of the United Kingdom, Office of Government Commerce. 2009. *Promoting Skills through Public Procurement*. London.

to give first choice of employment to specific population groups. This is the case for prime contractors for the construction of the US Marine Base in Guam.[16]

10. In relation to the US Compact for the Federated States of Micronesia and for the Republic of the Marshall Islands, a similar commitment has been given. The US Representative for the Compact on education and workforce development funding has undertaken to insert a requirement to engage apprentices in future Compact-funded infrastructure projects. The condition for funding is that the apprentices have to be enrolled in a US Department of Labor–approved apprenticeship program.[17]

11. United States Agency for International Development (USAID) has provision in its procurement contracts to include socioeconomic benefits.[18] The main illustration is of this is the assistance provided to US small businesses through the Mentor-Protégé Program. The USAID program is designed to assist US small businesses. These include veteran-owned small business, service-disabled veteran-owned small business, small socially and economically disadvantaged business, and women-owned small business. The focus is on enhancing their capabilities to perform contracts and sub-contracts for USAID and other Federal agencies.

[16] "We want to see local workers get first choice and will work with contractors to ensure they, too look first to workers already here on island, and those from neighboring islands, for their workforce," Retired US Marine Corps Major General David Bice remarked at the Center for Micronesian Empowerment Conference: The Untapped Potential of the Marianas and Micronesian Workforce, on 20 October 2010.
[17] Personal communication. ADB Workshop on Labor Market Information, Pohnpei, FSM, 18–19 April 2012.
[18] USAID. 2012. *USAID Acquisition Regulation (AIDAR): A Mandatory Reference for ADS Chapter 302*. This document is a partial revision. https://www.usaid.gov/sites/default/files/documents/1868/aidar.pdf

Appendix 2: Skill Profile of the Construction Workforce in Papua New Guinea

1. The National Statistical Office, on request, provided special tabulations on detailed occupations and post-school qualifications for the construction and mining industries. Table A2.1 compares the distribution of major occupation groups in the formal sector as a whole with the construction sector. There are marked differences between the two profiles. The construction sector has far fewer professionals and technicians compared with the formal sector as a whole (3% and 0.7% compared with 21% and 8% respectively). In contrast, there is a large share of craft and building trades workers in construction compared with a small share in the formal sector as a whole (79% compared with 16%).

Table A2.1: Distribution of Citizen Population 15 Years and Over in Major Occupation Groups, Total Formal Sector and Construction Compared, Papua New Guinea 2011 Census (Percent)

Major Occupations	Percent (%)	
	Formal Sector	Construction
11–13 Legislators and senior officials and managers	4.8	1.3
21–24 Professionals	21.2	2.8
31–34 Technicians and associate professionals	7.9	0.7
41–42 Office clerks	6.8	0.9
51–52 Service workers, shop and market sales workers	10.0	0.3
61–62 Agricultural animal and fishery workers	3.9	0.1
71–74 Craft and building trade workers	16.1	78.9
81–83Plant and machine operators and assemblers	8.3	6.3
91–93 Elementary occupations	20.0	8.4
Not Stated	1.0	0.3
Number	**360,732**	**38,547**

Source: Government of Papua New Guinea, National Statistical Office. n.d. 2011 *PNG National Population and Housing Census*. Special tabulation, Occupation by Industry, Formal Sector.

2. Other census results show the low proportion of jobholders in the construction sector with a post-school qualification compared with the formal sector in total (27% compared with 35%). Only 5% of jobholders in the construction sector in 2011 have a trade qualification based on an apprenticeship. A further 11% have completed vocational college and 6% have completed technical college. These three qualifications account for most of the post-school qualifications held (22%). In contrast in the formal sector as a whole, these three qualifications only account for 5% of all post-school qualifications held by jobholders (Table A2.2).

Table A2.2: Number and Distribution of Citizens 15 Years and Over with Post-school Qualifications, Formal Sector and Construction, Papua New Guinea 2011 Census

Type of Post-school Qualification	Formal Sector		Construction	
	No.	%	No.	%
With Qualification	**124,789**	**35**	**10,420**	**27**
Teachers college	37,138	10	107	0
University degree	19,795	5	911	2
Business and secretarial college	13,907	4	359	1
University/Public administration college	9,549	3	360	1
Other miscellaneous	9,182	3	489	1
Technical college	8,995	2	2,180	6
Vocational college	8,567	2	4,087	11
Health college	7,484	2	23	0
Tradesman/Apprenticeship	4,929	1	1,808	5
Protective qualification	3,484	1	63	0
Not stated	1,759	0	33	0
School Attendance	**235,943**	**65**	**28,127**	**73**
Attended school	193,148	54	24,007	62
Never attended school	42,795	12	4,120	11
Total Number	**360,732**		**38,547**	

Source: Government of Papua New Guinea, National Statistical Office. n.d. 2011 *PNG National Population and Housing Census*. Special tabulation, wage jobs by occupation (2 digits) and post school qualifications.

3. Table A2.3 shows for the construction sector the proportion of each major occupation group with post-school qualifications. Only two-thirds of professionals (68%) have a post-school qualification. About half (47%) of technicians and associate professionals have a post-school qualification and only 28% of craft and building trade workers in the sector have a post-school qualification.

Table A2.3: Number of Citizens 15 Years and Over by Major Occupation Group in Construction and Proportion with a Post-school Qualification, Papua New Guinea 2011 Census (Number and percent)

Major Occupation Group	Total	Number Qualified	PSQ (%)
Craft and building trade workers	30,428	8,518	28
Elementary occupations	3,317	345	10
Plant and machine operators and assemblers	2,440	275	11
Professionals	1,075	730	68
Legislators and senior officials and managers	489	255	52
Clerks	363	138	38
Technicians and associate professionals	279	132	47

PSQ = post-school qualification.

Source: Government of Papua New Guinea, National Statistical Office. n.d. 2011 *PNG National Population and Housing Census*. Port Moresby.

4. The low number of roofers, floor layers and tile setters, plasterers, insulation workers, glaziers, and varnishers and related painters, suggests that workers with these skills need to be imported. The low number of building trades workers supervisors in particular is a major gap in the construction domestic skills pool (Table A2.4). The table also shows the proportion of jobholders in each specific occupation with post-school qualifications. Only one-fourth of carpenters and joiners, the largest occupation, have a post-school qualification. For an occupation where post-school qualifications should be required such as building and related electricians and plumbers and pipe fitters, only just over half and less than one-third respectively are actually qualified. Similarly, only just over half of building trades workers supervisors have a post-school qualification. Few heavy truck drivers and earth moving operators are qualified (6% and 11% respectively).

Table A2.4: Number of Citizens 15 Years and Over by Detailed Occupation in Construction and Proportion with a Post-school Qualification, Papua New Guinea, 2011 Census

Occupation at Four-digit Level	Total	Number Qualified	With PSQ (%)
7121. Builders traditional materials	1,079	170	16
7122. Bricklayers and stonemasons	978	123	13
7123. Concrete placers, concrete finishers, and related workers	193	16	8
7124. Carpenters and joiners	18,785	5,014	27
7129. Other building frame and related trades workers	793	174	22
7131. Roofers	22	8	36
7132. Floor layers and tile setters	52	8	15
7133. Plasterers	50	4	8
7134. Insulation workers	135	66	49
7135. Glaziers	19	3	16
7136. Plumbers and pipe fitters	3,128	932	30
7137. Building and related electricians	1,503	829	55
7141. Painters and related workers	886	72	8
7142. Varnishers and related painters	75	16	21
7144. Extraction and building trades workers supervisors	69	40	58
7212. Welders and flame-cutters	1,521	643	42
8314. Heavy truck drivers	366	22	6
8322. Earth-moving and related machinery operators	1,071	121	11

PSQ = post-school qualification.
Source: Government of Papua New Guinea, National Statistical Office. n.d. 2011 *PNG National Population and Housing Census*.

Appendix 3: Occupation Profile of Foreign Workers in Papua New Guinea

Table A3.1: Number of Work Permits Approved for Occupations related to Construction in Papua New Guinea, 2013 and 2014 (at least 10 work permits)

Occupation	Number
Technicians and trade coordinators and supervisors	5,700
Specialist heavy machinery mechanic or technician	2,337
Steel fixer	1,743
Scaffolder	1,022
Structural steel erector	849
Construction rigger	722
Metal fabricator	714
Building and construction manager	604
Crane, hoist, or lift operator (Special)	418
Professional builder	345
Electrician	332
Fitter (General)	275
Occupational health and safety adviser	269
Safety inspector	258
Welder	209
Finance manager	187
Translator	147
Civil engineer	142
Power generation plant operator	141
Electrical engineer	115
Building inspector	114
Painting trades worker	113
Electrical engineering draftsperson or technician	109
Plumbing inspector	102
Quality assurance manager	96
Mechanical engineer	91
Construction estimator	65
Metallurgical or materials technician	64
Engineering manager	58
Fitter and turner	53
Environmental consultant	51
Earth science technician	46
Architectural draftsperson	45
Quantity surveyor	41
Mechanical engineering draftsperson or technician	36
Surveyor	34
Technicians and trades workers, n.e.c.	32
Metallurgist	31
Pressure elder	31
Architect	27
Carpenter and joiner	27
Environmental manager	24
Civil Engineering draftsperson or technician	22
Fitter-welder	22
Production or plant engineer	15
Surveying or cartographic technician	12
Building and engineering technicians, n.e.c.	11
Geotechnical engineer	10

Occupation	Number
Laboratory manager	10
Stonemason	10

n.e.c. = not elsewhere classified.
Source: Government of Papua New Guinea, National Statistical Office. n.d. 2011 *PNG National Population and Housing Census*.

Appendix 4: A Note on Skills Training Required

1. The skills underpinning some occupations are complex, requiring a solid foundation in relevant skills to benefit from on-the-job training. Skills transfer for occupations such as electrician, fitter, and metal fabricator require a prior foundation set of skills. However, other construction-related occupations listed require skills that could be acquired on-the-job through a combination of front-end formal training (Papua New Guinea Technical and Vocational Education and Training [PNG TVET] National Certificate II or III) combined with substantial on-the-job training.[1] These occupations include painting trades worker, plumber (general), carpenter and joiner, maintenance planner, construction rigger, scaffolder, stonemason, pressure welder, and welder.

2. Occupations requiring PNG TVET National Certificate IV include trade coordinator and supervisor; steel fixer; structural steel erector; "crane, hoist, or lift operator (special);" and professional builder. Skills transfer opportunities for these occupations are likely to require a prior qualification in that skill set.

3. Other occupations require a related degree. These are building and construction manager, specialist heavy machinery mechanic or technician, occupational health and safety adviser, and safety inspector. However, recent graduates would benefit greatly from the opportunity to apply this book learning to a range of real life situations in a work site.

[1] The link between occupation and PNG TVET National Certificate is based on the qualification required by the PNG government to obtain a work permit for that occupation.

Appendix 5: Tender Requirements for Bidders of Papua New Guinea Projects

A. Lae Port Development Project: Tidal Basin, Phase I

1. The tender for the Tidal Basin Phase 1 of the Lae Port Development Project required bidders to minimum average annual construction turnover of $160 million or more calculated as total certified payments received for contracts in progress or completed, within the last 5 years. They were also required to have completed recently two projects worth $215 million each.[1]

B. Highlands Highway

2. In the case of the road construction and long-term road maintenance projects for improvement of the Highlands Highway, for example, bidders were required to have a minimum of 5 years general construction experience, have successfully completed at least one contract during the last 5 years of similar size and nature to the subject contract and of value greater than $51 million, have a minimum average turnover over for the last 3 years of $38 million, and have sufficient working capital and lines of credit to cover the running costs of the prime contract together with existing contract commitments.[2] In addition to a range of equipment, bidders have to provide evidence that they have technical and supervisory personnel with a minimum of 5-year experience in the construction of similar types of work under similar conditions.

A. Bridge Replacement for Improved Rural Access Project

3. A similar set of requirements applied to bidders for the Bridge Replacement for Improved Rural Access Project. These included successfully completing at least two contracts of plate girder bridge construction with a value minimum of $33 million for each contract in the last 5 years, have a minimum average turnover over for the last 3 years of $25 million, and have sufficient working capital and lines of credit to cover the running costs of the subject contract together with existing contract commitments. A similar requirement for technical and supervisory personnel "with years of total experience and similar work experience as specified for each position of personnel" is also included.[3]

[1] Tender: Lae Port Development (Sector) Project in Papua New Guinea: Construction of the Lae Port Development Tidal Basin Phase 1 Project. https://www.devex.com/projects/tenders/lae-port-development-sector-project-in-papua-new-guinea-construction-of-the-lae-port-development-tidal-basin-phase-1-project/64903

[2] Tender: Highland Region Road Improvement Investment Program (HRRIIP) in Papua New Guinea: Improvement and Long Term Performance Based Maintenance Services for Laiagam–Porgera and Mendi–Kandep Roads. https://www.devex.com/projects/tenders/highland-region-road-improvement-investment-program-hrriip-in-papua-new-guinea-improvement-and-long-term-performance-based-maintenance-services-for-laiagam-porgera-and-mendi-kandep-roads/67009

[3] Tender: Bridge Replacement For Improved Rural Access Sector Project In Papua New Guinea: Construction Of Six (6) Bridges. https://www.devex.com/projects/tenders/bridge-replacement-for-improved-rural-access-sector-project-construction-of-six-6-bridges-along-magi-and-hiritano-highways-central-province-package-1/140113

Appendix 6: Skill Level and Occupations of Workforce by Type of Contract for the Bridges Project in West New Britain

1. This table lists the number of occupations and the contracted workers by skills levels for the Bridges Project in West New Britain:

Skill Level and Occupation	Expatriate	Other Country National	National Contract	Local Hire	Total
Senior Manager	**6**				**6**
Construction manager	1				1
General manager	1				1
Project manager	1				1
Superintendent	3				3
Professional	**1**		**4**	**1**	**6**
Accountant			1		1
Engineer	1		1		2
Nurse				1	1
Site engineer			1		1
Surveyor			1		1
Technician and Associate Professional			**7**	**1**	**8**
Chef			1	1	2
Procurement officer			1		1
Safety advisor			1		1
Soil technician			1		1
Supervisor			3		3
Clerical			**1**	**2**	**3**
Admin HR and Log			1		1
Coordinator				1	1
Senior clerk				1	1
Service Work				**14**	**14**
Assistant cook				1	1
Cook				1	1
Security				12	12
Trades		**3**	**9**	**18**	**30**
Auto electrician				1	1
Boilermaker			1	1	2
Boilermaker—pipes		2			2
Carpenter				4	4
Crusher supervisor			1		1
Electrician				1	1
Foreman rigger			1		1
Heavy duty fitter				3	3
Leading hand rigger dogger			1		1
Mechanic				2	2
Painter				1	1
Panel beater/spray painter				1	1
Plumber				1	1
Rigger			3		3

Skill Level and Occupation	Expatriate	Other Country National	National Contract	Local Hire	Total
Rigger dogger			2		2
Senior heavy duty fitter/ leading hand fitter		1			1
Welder				3	3
Plant and Machine Operators			**5**	**15**	**20**
Batching operator				1	1
Crusher operator				1	1
Excavator operator			2	1	3
Front-end loader				2	2
Grader operator				1	1
Heavy duty driver				1	1
Light vehicle driver				1	1
Open crane operator			3		3
Semi operator/driver				2	2
Sign writer/driver				1	1
Truck driver				4	4
Elementary Work				**13**	**13**
Cleaner				4	4
Laborer				9	9
TOTAL	**7**	**3**	**26**	**64**	**100**

Source: Author's calculations from project data provided.

Appendix 7: Skill Level and Occupations of Workforce by Type of Contract for the Bridges Project in Central Province

1. This table lists the number of occupations and the contracted workers by skills levels for the Bridges Project in Central Province:

Skill Level and Occupation	Staff—Expatriate	Skilled Worker—Expatriate	National Contract	Local Hire	Total
Senior Manager	**5**				**5**
Commercial manager	1				1
Contractor's representative	1				1
Deputy project manager	2				2
Project manager	1				1
Professional	**43**	**3**			**46**
Bridge construction engineer	4				4
Chief surveyor	1				1
Community liaison officer	1				1
Design engineer	1				1
Doctor		3			3
Geotechnical engineer	1				1
HES engineer	1				1
Material engineer	1				1
Mechanic engineer	1				1
Other engineers and assistant engineers on project	21				21
Quality management engineer	1				1
Quantity surveyor	1				1
Road engineer	1				1
Steel construction engineer	1				1
Surveyor	7				7
Technician and Associate Professional		**25**	**34**		**59**
Foreman		3			3
Foreman			2		2
Purchaser		10			10
Safety inspector		2			2
Technician			32		32
Welding seam defect tester		10			10
Service work		**7**		**23**	**30**
Cook		7			7
Security guard				23	23
Trades		**123**			**123**
Carpenter		20			20
Electrician		6			6
Mason		14			14
Mechanic		25			25
Rigger		15			15

Skill Level and Occupation	Staff—Expatriate	Skilled Worker—Expatriate	National Contract	Local Hire	Total
Steel fixer		26			26
Welder		17			17
Plant and Machinery Operators		**35**	**6**		**41**
Equipment operator		30			30
Storekeeper		5	6		11
Elementary Work				**117**	**117**
Camp attendant worker				27	27
Site worker				90	90
TOTAL	**48**	**193**	**40**	**140**	**421**

Source: Author's calculations from project data provided.

Appendix 8: Enterprise Training Arrangements

A. Different Enterprise Approaches to Training

1. Human resources management is of prime concern to senior management of the foreign construction company which has been in Papua New Guinea (PNG) for 20 years. The company provides training for its core workforce (staff employees) in three areas: the company culture and practices, working as a team, and work methods. The first area of training includes, for example, how to analyze a list of issues first and then how to report to a senior manager and immediate boss. The issues include assessing the risks of an incident such as an accident and reporting on the situation.

2. The three components of training are education, work experience, and attitudes. The focus of training is not just the technical but also on how to promote better team work. Skills training takes place on-the-job and is the supervisor's job. The team work training is to keep workers committed to their job through fostering a team culture. The third area of training focus is on work methods to encourage change to procedures to make them more effective.

3. Training is adapted to the needs of three types of employees. For those employees that already have work experience, the focus of training is on work attitudes. For national graduates with no work experience, the team leader provides mentoring to form appropriate work attitudes also. For workers with only work experience and no theory, the focus of the training is on work behavior and attitudes. Training takes place at both headquarters and on site. For the training on-site, the supervisor plays a key role, especially for unskilled laborers recruited from nearby villages.

4. In summary, the description of training arrangements provided by the company related only to the provision of in-house training. No information was given about sending people to technical college or about links with tertiary institutions. The practice of the company appears to be to take on staff employees who are already qualified and who already have relevant work experience. There is scope to take on graduates in the professions such as engineering without work experience and to mentor them. Workers hired on a casual basis are given skills training on-the-job by their on-site supervisor. The training appeared to be developed in-house and was delivered for the most part by first-line supervisors mostly on-the-job. From the description provided by a senior manager, the training was not delivered by or in any way linked to external training providers.

5. In contrast, the PNG company involved in the joint venture on the bridge replacement project in West New Britain made greater use of formal training at different skills levels from engineers, office staff, to the heavy equipment operators. The company also has taken on recent engineering graduates and plans to take on more as part of the joint venture. They have been to the job fair at the University of Technology (Unitech) in Lae to interview prospective candidates.

6. The employment of recent graduates requires ensuring they have opportunities for accessing structured training as well as rotation through different engineering work roles. To obtain registration as a member of the Institution of Engineers, graduates have to obtain work experience in different aspects of engineering such as design. The company provided this opportunity to a recent graduate they recruited by finding a placement for him for 12 months with another construction firm with design capacity. The construction manager oversees the job rotation for new engineers but it is up to the individual graduate engineer to meet the requirements for registration as a professional engineer.

7. A trainer was brought in from Australia for a 2-week period to provide training tailored to their situation For its workforce in Pangia in the Southern Highlands. The purpose of the training was to give equipment operators with Class 7 heavy-duty vehicle license additional skills. The equipment ranges from 20-tonne to 30-tonne crushers, costing 600,000 kina (K) to K800,000 each, and a K7 million bulldozer. The skills training for operators was in how to carry out basic maintenance, such as cleaning and greasing the tracks and other moving parts, and to improve their general operating techniques. The training proved to be highly beneficial in terms of the savings on long-term maintenance costs for the expensive equipment. The trainer spent time with the heavy equipment operators, gave them formal training and provided a certificate of completion. The company kept a record of the training received by each operator and a copy of the certificate was available to workers if they left the company. The experience with this training showed the company the value of a period of short but intensive training. The training made the equipment operators more efficient, they worked safer, and maintained their equipment better. Supervisors, however, had to reinforce these new work practices.

8. The information on company training arrangements suggests a lack of a strategy in favor of a piecemeal approach. The lack of a systematic approach within a company and between companies is costly and inefficient. As noted above, the expense of flying in from Australia a trainer for 2 weeks could be reduced greatly if the trainer could also conduct other intensive training sessions for other companies. These costs are added on the contractors' costs of operation and so are reflected in a higher bid price than would be needed if lower-cost collective training options were available. An industry-wide framework agreement on issues of common interest such as training provision is needed to ensure that all contractors are operating on a level playing field. The agreement should guarantee that all construction firms are taking on the same obligations to provide training, thus stopping any free riders recruiting workers trained by other companies.

B. Other Findings on Enterprises and Training

9. It is worth noting that none of the companies interviewed referred to the Australia Pacific Technical College (APTC) as a potential partner in training up their PNG workers to meet skill shortages. The APTC offers a range of certificate III courses highly relevant to the skills needs of large construction projects. These include mechanical trade skills in fitting and machining, diesel fitting, and heavy fabrication, as well as plumbing, electrical work, and carpentry. The training courses are for five months and are mostly aimed at employees with prior relevant work experience. However, shorter duration training in skills sets, delivered on-site, is also available when requested and supported by companies.

10. One experienced construction firm manager pointed to the unexpected benefits he saw from a contract requirement for the contractor to provide basic skills training at the start of the work to locally recruited workers with some background in construction work. Supervisors were also trained in how to pass on basic skills to workers. The training was an elementary 3-4 day course in the basics of using battery-powered hand tools as well as safe working. Workers learnt, for example, how to use a power tool, such as an angle grinder, and how to save time by ensuring that it was always charged up for ready use. The benefits are in terms of better productivity and less downtime due to safe working practices.

11. Skills gaps in those already qualified as engineers and technicians in construction are a major constraint to expansion of the industry, especially for PNG construction firms. Skills gaps also applied to engineers working in government agencies designing and managing

infrastructure projects. For example, many young engineers were not registered with the Institution of Engineers. This is a 5-year process that requires obtaining on-the-job training and work experience in a number of facets of engineering, working under a professional mentor. In addition to deficiencies in engineering skills, engineers' business skills were also considered to be weak.

12. A major donor in infrastructure noted the lack of an industry commitment to training was noted for graduates in the construction sector. The situation in construction was in contrast to how the problem of vocational training for accounting graduates in PNG was solved. The lack of similar success for engineers may be to do with the fact that many engineers in PNG are employed in the public sector, which means less pressure for change from a smaller and less dynamic group of employers than the private sector. Private sector employment for engineers is more likely to be on short-term projects with lower chance of continuity with the same employer.

13. Recent contracts on the Highlands Highway have included the requirement to provide maintenance services for 5 to 10 years after the completion of the initial works. This places the responsibility back on the prime contractor to ensure that the initial work is of a standard to minimize future maintenance costs. This focus on contractor responsibility for outcomes should also apply to the skills pool needed to undertake the maintenance work. Projects that include longer-term maintenance contracts should also be asked to consider the longer-term workforce requirements compared to a build it and finish contract. Firms should be asked to state how they can secure access to a sufficiently skilled and sustainable local workforce over the period they are required to maintain the highway.