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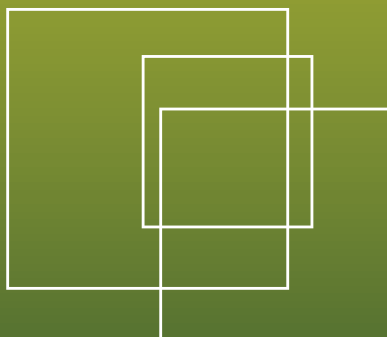
CTP No. 174

Comparative costs and benefits of the local resource-based approach to rural road development

Synopsis of findings from Aceh



Creating jobs: Capacity building for local resource-based road works in selected districts in NAD and Nias





The Multi Donor Fund for Aceh and Nias (MDF) was established to support the implementation of the Government of Indonesia's (GOI's) rehabilitation and reconstruction program after the December 2004 tsunami and subsequent March 2005 earthquake. At the request of the government, the World Bank serves as the trustee to administer the MDF which is in turn governed by a Steering Committee comprised of donors, GOI, and civil society representatives, with the United Nations and international non-governmental organizations participating as observers. The donors contributing to the MDF are: the European Union, the Netherlands, the United Kingdom, the World Bank, Sweden, Denmark, Norway, Germany, Canada, the Asian Development Bank, the United States of America, Belgium, Finland, New Zealand and Ireland. The MDF pools about US\$685 million in grant resources provided by these 15 donors, an amount equivalent to about 10% of the overall reconstruction efforts. As of March 30, 2010, the MDF has committed US\$623 million to 23 projects in five outcome areas: recovery of communities, infrastructure and transportation, strengthening capacity and rebuilding governance, supporting sustainable management of the environment and economic development.



The Employment-Intensive Investment Programme (EIIIP) is a global programme of the International Labour Organization, which leads work on the development and implementation of employment-intensive approaches to infrastructure investment. The EIIIP supports governments, employers' and workers' organizations, the private sector and community associations in enhancing the employment content of infrastructure investments and in improving access of the poor to basic goods and services.

The EIIIP provides advice and tools that facilitate policy-making and standard setting in favour of employment generation, develop entrepreneurship and build capacity, and enhance social dialogue through infrastructure works. This is carried out in both urban and rural areas, during times of crisis and also as part of a longer-term strategy for local development that makes contributes towards the creation of sustainable institutional and economic environments.

The EIIIP works in more than 70 countries in Africa, Asia and Latin America. At macro level the EIIIP systematically engages with key ministries to promote employment in various productive sectors and collaborates extensively with key technical line ministries (Labour, Public Works, Agriculture, Rural Development, Finance, Environment, and various social sectors) to demonstrate how infrastructure investments can increase local employment, income, skills and capacities. The EIIIP provides advice to requesting governments on the employment impact of infrastructure investments and on active labour market policies related to infrastructure. At local level, the EIIIP works with municipalities and communities through active local-level planning to create a maximum number of productive jobs using labour-based technologies. The EIIIP also works on institutional development and capacity building, with both the private sector and civil society, to guarantee the successful implementation of employment-intensive infrastructure programmes.



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Synopsis of findings from Aceh

**ILO Country Office for Indonesia
and Timor-Leste**

**Employment Intensive
Investment Programme
(EMP/INVEST)**

**Employment Policy Department
(EMP/POLICY)**

Employment Sector

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Foreword

The tsunami that hit Indonesia in 2004 swept away the infrastructure and the livelihoods of many communities in Nias and Aceh. To respond to the need for restoration of livelihoods and the associated need for capacity building that would facilitate these reconstruction efforts, the ILO established a project titled “Creating Jobs : Capacity Building for Local Resource-based Road Works in Selected Districts in NAD and Nias” with funds from the Multi Donor Fund for Aceh and Nias. The project applies an approach to road construction that is known as the ‘Local Resource-Based approach’.

The Local Resource-Based approach seeks to find the optimal balance between use of local labour, local resources and light equipment in order to generate quality assets for communities. This method of infrastructure development ensured that the quality of the asset under construction was maintained, that employment opportunities and investments in the local economy were optimized, and that appropriate environmentally-friendly technologies were incorporated.

The project achieved several notable outcomes. It produced high quality rural roads; it delivered outputs in a cost-effective way and in good time; it provided employment to both women and men; it improved the capacity of local small scale contractors and the Department of Public Works staff regarding the planning, design, contracting and implementation of rural roads infrastructure; and it increased community participation in rural road maintenance.

To learn from the experiences in Aceh and Nias, the ILO commissioned a study that was to give insight into the effectiveness and relevance of the Local Resource-Based approach. This report presents a synthesis of the key findings from this study. One of the most interesting innovations to be taken from this study is associated with the successful and effective integration of capacity building, reconstruction of infrastructure and the creation of jobs – all of which contribute to poverty reduction. The project has illustrated that adopting a Local Resource-Based approach to infrastructure development provides much more than just a wage income transfer – it also enhances employability, improves community facilities and helps to build cohesive communities. These results provide important contributions to the livelihood of communities.

The ILO hopes that the report will contribute to the improvement of practices on rural road development programmes, at both the local and national level.

Peter van Rooij
Director
ILO Country Office for Indonesia and Timor Leste



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List of abbreviations

BKRA	Aceh Reconstruction Sustainability Agency
BKRN	Nias Reconstruction Sustainability Agency
BOQ	Bill of Quantities
BRR	Badan Pelaksana Rehabilitasi dan Rekonstruksi; Aceh and Nias Rehabilitation and Reconstruction Agency
EE	Engineer's Estimate
ETB	Emulsion Treated Base
FIDIC	International Federation of Consulting Engineers
ILO	International Labour Organization
IREP	Infrastructure Reconstruction Enabling Project
KDP	Kecamatan Development Program
LRB	Local Resource-Based
MDF	Multi Donor Fund for Aceh and Nias
PWD	Public Works Department
QC/QA	Quality control and quality assurance
UNDP	United Nations Development Programme
USD	United States Dollar

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The views and opinions expressed in this publication are the views of the author and do not necessarily represent the views or opinions of the Government of Indonesia, the United Nations Development programme, or the Multi Donor Fund for Aceh and Nias.



Executive summary

Between 2006 and 2010 the International Labour Organization (ILO) with the United Nations Development Programme (UNDP) as a Partner Agency, implemented a project titled 'Creating Jobs: Capacity Building for Local Resource-Based Road Works in Selected Districts in NAD and Nias' with financing in the order of \$11.7 million USD from the Multi Donor Fund for Aceh and Nias (MDF). The project responded to the need for increasing the implementation capacity of essential infrastructure reconstruction activities after the tsunami in 2004.



The project used the Local Resource-Based (LRB) approach to rural road development to assist in the rehabilitation and maintenance of rural transport infrastructure in Aceh. The 'Local Resource-Based' approach seeks to find the optimal balance between use of local labour, local resources and light equipment in order to generate

quality assets for communities. This approach to infrastructure development ensured that the quality of the asset under construction was maintained, that employment opportunities and investments in the local economy were optimized for both women and men, and that appropriate environmentally-friendly technologies were incorporated.

The purpose of the project, as its name suggests, relates to improving the connectivity of rural transport infrastructure, boosting local employment,

contributing to recovery of the local economy and enhancing the institutional and technical capacities of those in the construction sector. These include local contractors and their staff and also their associations, as well as the local government, the district public works departments (PWD) and communities benefiting from the project.

The purpose of this study was therefore to compare the approach and methods used by the project for development of rural transport infrastructure with those of other road construction activities in the area. The findings of study aim to achieve a better understanding of the potential of the LRB approach for rural transport infrastructure investments in Aceh.

Findings indicate that the project was able to deliver high quality outputs in both a timely and cost-effective manner. The success is attributed to improved quality control and quality assurance, the selection of appropriate LRB designs and construction technologies, and the use of different procurement procedures. Further, the project was able to demonstrate the usefulness and cost-effectiveness of preserving infrastructure assets, through the introduction of appropriate and inexpensive community-based routine maintenance systems.

Employment outcomes that were associated with the project were also strong, with findings indicating that when compared to other approaches, the LRB approach creates between five to ten per cent more employment opportunities. The methods used to promote the involvement of women in the project's activities have shown success, with women now constituting approximately 30 per cent of the workforce. Moreover, as the employment created through the project was essentially for local people (rather than 'imported' labour), the use of local resources was optimized and subsequently substantial amounts of liquidity were injected into the local economy.



Introduction

1

Between 2006 and 2010 the International Labour Organization (ILO) with the United Nations Development Programme (UNDP) as a Partner Agency, implemented a project titled *'Creating Jobs: Capacity Building for Local Resource-based Road Works in Selected Districts in NAD and Nias'* with financing in the order of \$11.7 million USD from the Multi Donor Fund for Aceh and Nias (MDF). The project responded to the need for increasing implementation capacities of reconstruction efforts following the tsunami in 2004. The project assisted in the recovery of essential infrastructure by integrating capacity building activities with road construction in five selected districts, three of which were included in this study.¹

The project sought to improve road connectivity, boost local employment, contribute to recovery of the local economy and enhance the institutional and technical capacities of those working in the construction sector. These include local contractors and their staff and also their associations, as well as the local government, the district public works departments (PWD) and communities benefiting from the project.



1 Districts included in this study were Bireuen, Aceh Besar and Pidie in Aceh. The project also operated in Nias and Nias Selatan on Nias Islands.

The project uses a Local Resource-Based (LRB) approach to assist in the rehabilitation and maintenance of village roads. The Local Resource-Based approach seeks to find the optimal balance between use of local

labour, local resources and light equipment in order to generate quality assets for communities. This approach to infrastructure development ensured that the quality of the asset under construction was maintained, that employment opportunities and investments in the local economy were optimized for both women and men, and that appropriate environmentally-friendly technologies were incorporated.

The Local Resource-Based approach

The Local Resource-Based approach to infrastructure development combines the use of an optimum mix of labour and light equipment to ensure that required quality standards can be maintained, while at the same time optimizing the potentials of generating local employment for women and men.

The study presented in this document compares the methods used by the project with those of other road construction activities being implemented in the project area. The following section outlines the purpose and scope of the study. Section three presents an overview of findings from the study, with sub-sections that focus on cost, quality, employment, community participation and the involvement of women, capacity building, procurement procedures, maintenance, appropriate technologies and environmental safeguards. The findings of the study aim to achieve a better understanding of the potential of the LRB approach for rural road infrastructure investments.



The parameters of the study

2

The purpose of this study was to compare the benefits and costs of the implementation of road works using LRB methods on the project titled *'Creating Jobs: Capacity Building for Local Resource-based Road Works in Selected Districts in NAD and Nias'* (hereafter called 'the project'), with those of other road construction activities implemented in the area of the project. This study aims to contribute to a better understanding of the potentials of the application of LRB approaches – vis-à-vis conventional methods – for investments in rural transport infrastructure made through small and medium scale contractors in Aceh.

Several different parameters were reviewed during the study, including:

- ◆ Construction costs;
- ◆ Quality of the works;
- ◆ Generation of short-term employment opportunities;
- ◆ Community participation;
- ◆ Capacity building;
- ◆ Small-scale contracting.

It is important to note that when comparing the costs and benefits of road construction works across projects, it is vital that key parameters of the roads that are being compared are similar, to ensure that the assessment is meaningful. Important key parameters are outlined in the table below.

Table 1: Key parameters for comparing the costs and benefits of rural roads

Key parameter	Rationale
Design specifications and construction standards	Compare low-volume and light traffic road design specifications for narrow gravel village roads with similar roads.
Investment requirements	Investment requirements in road works, drainage structures, culverts and bridges alter the absolute investment costs and the absolute or relative contribution of labour.
Availability of local materials	Substantial differences in transportation time between the localities where local materials are available can have a substantial impact on the total costs and on the relative contribution of labour.
The working environment	Climatologic and terrain conditions, as well as the degree to which the environment is enabling for private sector operations, impact on efficiency.
The developmental setting	In (post-) conflict or disaster settings where the speed of outreach and the scale of coverage are important criteria for the delivery of investments, there may be comparatively less attention (and capacity) to adhere to considerations of efficiency, quality and cost-effectiveness. ²

Source: Authors' own analysis

In comparing the construction costs of road works undertaken by the project with those of other projects and agencies,³ the study has disaggregated and extrapolated the available data, in order to create a basis for comparing the costs for a “standard” road.

-
- 2 In this context it is important to note that cost-effectiveness considerations in the implementation of road reconstruction and rehabilitation works through BRR during the post-tsunami and post-earthquake period were not a main criterion in the approach. A quick and large scale set-up and implementation of reconstruction works was the main priority.
 - 3 Including projects of PWD, BRR, World Bank.

Findings

3

The main focus of the project - *‘Creating Jobs: Capacity Building for Local Resource-based Road Works in Selected Districts in NAD and Nias’* – was on the rehabilitation of rural roads. The District Public Works Department (PWD) was the government implementation partner of the project.

The ILO procurement procedures were used for the procurement of works, goods and services. In terms of annual investments in road works, the project made a relatively small investment compared to those available from the government agencies, such as PWD and the Aceh and Nias Rehabilitation and Reconstruction Agency (BRR)⁴ or other donor-funded projects like the MDF funded Infrastructure Reconstruction Enabling Project (IREP).

As per 1st January 2009 the former Kimpraswil (District Public Works Department) was split in two Departments. In Aceh the newly formed Department “Dinas Maga dan Cipta Karya” is responsible for roads and bridges, and for housing.

BRR and IREP mainly concentrated on district and provincial roads. The district PWD was responsible for the district and village road network, while the provincial PWD was responsible for the provincial and national roads in the province.

3.1 Costs

To enable a cost comparison, a normalized cost analysis of the three main constituents of the road structure (sub-base, base and wearing course). The analysis

⁴ BRR (Badan Rehabilitasi dan Rekonstruksi NAD-Nias) was responsible for the coordination and execution of activities. Its mandate ended in April 2009. Overall coordination of the reconstruction efforts were taken over by BAPPENAS. The Coordinating Body for the Sustainability of Reconstruction in Aceh and Nias (BKRN at National level; BKRA at Aceh Provincial level and BKRN covering Nias at the North Sumatra Provincial level) was set up through Presidential Decree 3/2009 to support continuing implementation of the reconstruction efforts until December 31st, 2009. Local Government and various line ministries have assumed responsibility for continuing the reconstruction and rehabilitation of Aceh and Nias after the closure of BKRN, BKRA and BKRN, with overall coordination provided by BAPPENAS.

was limited to roads constructed by the project and by PWD, as insufficient data were available for BRR roads.

61 kilometers of road works undertaken by the project and 111 kilometers of road works carried out by PWD in Aceh Besar, Pidie and Bireuen Districts were analyzed. This analysis resulted in a cost comparison per cubic meter (or per square meter in the case of wearing course). Based on the outcome of this analysis, an overall cost estimate per kilometer of road works was derived, assuming a full ten centimeter depth of both the sub-base and the base material.

Overall investment costs per kilometer for roads constructed by BRR are about twice as high as those constructed by PWD and ILO. This is because BRR focused mainly on rehabilitation and construction works of national and provincial roads with different design specifications (i.e. more expensive), and because the BRR works were implemented in a post-disaster environment that prioritizes timely responses.

As would have been expected, the findings of this analysis indicate substantially higher costs per kilometer for roads constructed by PWD that have a high bearing capacity (asphalt concrete as a wearing course), compared to the costs of ILO constructed roads that have with lower bearing capacities (with penetration

macadam as a wearing course).



PWD and the project also used Latasir (a sand/bitumen mix) as a wearing course on a number of roads. The available information indicates that the costs per kilometer were lower for roads constructed by the project with this wearing course, compared to the costs of construction undertaken by PWD.⁵

Available data suggest that, as a percentage of the total construction costs, more investments (about 20 per cent) were made in various road drainage works on roads under the project

⁵ This finding is indicative only because the limited availability of data made it difficult to compensate for all possible incompatibility issues.

than on similar works carried out by PWD and BRR.⁶

To compensate for the difference in investments in drainage structures, comparable figures for investment costs in drainage structure have been applied (ten per cent of the total investment costs). Based on this calculation, it appears that the modified overall costs of the project's roads were lower. Table 2 presents an overview of the finding of this indicative cost comparison between roads rehabilitated or reconstructed by the project and those rehabilitated or constructed by PWD.

The overall costs per kilometer for roads rehabilitated by the project were close to \$10,000 USD less than the costs of comparable roads rehabilitated through PWD. When comparing the normalized cost of roads with a latasir wearing course, the construction costs of the roads implemented by the project were \$8,400 USD less than the costs of comparable roads that were constructed by PWD.



Table 2: Comparison of costs between the project and PWD Roads⁷

Cost comparison variable	ILO	PWD
Overall average cost per km	36,500	40,000
Overall cost per km with 10 per cent invested in drainage	32,100	41,900
Overall cost for latasir roads per km	38,200	40,100
Normalized cost latasir roads per km	28,300	36,700
Overall cost for penmac roads per km	38,400	NA
Normalized cost penmac roads per km	39,300	NA
Overall cost for asphalt concrete roads per km	NA	68,000

Source: Authors' own data; *Costs in USD; rounded figures

6 Available information indicates that, on average, 5 per cent of the total investment costs on district roads in Aceh are allocated for drainage structures.

7 There was insufficient data to enable a compatible cost comparison between hot mix asphalt and penetration macadam (based on life-time cycle costing), therefore no comparison of the normalized costs of these wearing courses could be made.

Based on the analysis and interpretation of available data, in combination with visual inspections, the ILO approach appears to be more cost-effective and the quality of the construction works was of a very high standard.

Important factors that have contributed to the cost-effectiveness of the constructed works include better construction supervision standards, which resulted in improved quality standards (based on visual inspections) and an increased life-span of the roads reconstructed or rehabilitated by the project, thereby also reducing the cycle costs of the roads.

The cost analysis indicates that the LRB approach was comparatively more cost-effective than other approaches. Better construction supervision standards proved to be very important for delivery of cost effective works.

3.2 Quality

Both PWD and contractors appreciated the quality of the work undertaken by the project. Visual inspections also indicated that the quality of construction works achieved by the project was very good.

Quality indicators that were inspected included those related to the control of the vertical alignment, compaction densities, use of approved materials and improved workmanship (through on-the-job training).



The main reasons behind the successes include:

- ◆ The use of technically appropriate and sound designs that were based on good quality surveys. These surveys took into account expected traffic (bearing) requirements;
- ◆ A high level of supervision;
- ◆ Strong adherence to quality control / quality assurance procedures.⁸

Quality control was carried out by contractors, based on the ILO's design specifications and using testing equipment from the Department of Public Works. Testing included checking the required compaction levels.⁹



The following rural roads that were rehabilitated by the project were evaluated and it was found that they were still in very good condition.

District Bireuen.

1. Desa Cot Tube – Tanjong Bungong – Tanjong Mesjid – Pulo Kisa, 2100 m;
2. Tanjong Mesjid – Leubu Mesjid, 2100 m;
3. Leubu Tringgadeng – Cot Kruet.

District Pidie.

1. Desa Krueng Seumideun – Lhok Kaju – Pulo Ie – Bluek – Glee Gapul – Jabal Ghafur, 6711 m.

Technically appropriate designs, coupled with high quality supervision and quality control measures were the main reasons for the high quality of the works on the project.

⁸ This includes laboratory and field testing procedures, whereby the necessary equipment is being used.

⁹ For aggregate base material of class B, the required compaction is 60 per cent CBR. For aggregate base material of class A, a compaction of 80 per cent CBR is required.

3.3 Employment

The main focus of the project was on the rehabilitation and/or upgrading of existing roads, which required a relatively large investment in construction materials and relatively less labour inputs. This meant that the scope for the creation of additional employment opportunities under the project was relatively limited.

Another reason why the possibility for the creation of additional employment opportunities through the use of local resource-based methods was limited related to the fact that most of the agencies working on rural roads in Aceh already use labour-based methods.

Nevertheless, the project demonstrated that there were possibilities for further optimizing and increasing the use of labour. By applying local resource-based methods instead of equipment-based approaches for selected activities (such as clearing and spreading operations), the project was able to generate comparatively more employment than similar projects undertaken by PWD.



Whereas the percentage of the costs per kilometer attributed to labour were estimated to be in the range of ten to 15 per cent for construction works carried out by PWD, the labour costs for comparable works undertaken by the project were in the range of 20 to 30 per cent. This means that the project was able to spend between five to 20 per cent more on wages. In Aceh, the average number of

worker-days created per kilometer of road construction works was approximately 2,000.

By optimizing the application of local resource-based work methods, the project demonstrated that, as percentage of the total construction costs, up to 20 per cent more of the investments can be spent on wages.

3.4 Community participation and the involvement of women

The ILO project involved the communities in planning and implementation of projects. An approach that applied participatory methods to ensure local community involvement was used for the selection of the roads, the recruitment of labour, and for sharing information that related to project planning and implementation.

One of the project's contract conditions obliged contractors to employ local labour for the works. The project also pro-actively provided communities, workers and contractors with information about working conditions and labour practices. For example, the project was



successful in raising awareness, both with contractors and local communities about the principle of providing equal access to employment for both men and women. In Aceh, female participation on the project was initially as low as seven per cent, but gradually increased to between 25 to 30 per cent within one and a half years of the project's implementation period. However, the participation of women in positions in the housing and infrastructure unit of PWD, as well as in works undertaken by contractors, remained low.



The PWD needs to increase its capacity before it could take a more active role in the promotion community participation in the planning and implementation of works, and the involvement of women in the employment opportunities derived from the works. At the time that this study was conducted there was no data that was disaggregated by gender for the works activities of PWD.

Effective approaches that included community in the planning and implementation of the works were established and this created space for increases in participation of women in the project.

3.5 Capacity building

The capacity building component of the project included a detailed and comprehensive training programme, which benefited from expert inputs from international consultants. The project's training and capacity building strategy used a practical and flexible approach, with intensive capacity building activities that were linked to works activities and adapted to training requirements. One of the innovations introduced by the project was the use of mobile construction training units.

The mobile construction training approach focused on providing solutions and emphasized provision of mentoring within the context of 'on-the-job' training. The project's 'hands-on' capacity building approach was reflected in the integration of the training and capacity building activities in the planning and implementation of the construction works. A training evaluation and certification element was included in the training strategy.

Substantial attention was also given to the provision of adequate orientation and training to the project's staff, in order to ensure that high training standards could be established.

The training was directed towards two main groups.¹⁰ Contract administration courses were given to the PWD staff and contract management training was provided to the contractors. The project continuously monitored the training activities and the performance of the trainees. Successful contract supervisors, contractors and site supervisors received a certificate of competence. The training provided to PWD staff included:

- ◆ Surveying and quality assessment;
- ◆ The preparation of tender documents, pricing and bidding processes;
- ◆ Contract mobilization and work programming;
- ◆ Road rehabilitation works (mainly base course and pavement construction, including drainage works);
- ◆ Site supervision and quality control;
- ◆ Contract management, measurements and payments;
- ◆ Special courses for soil and material testing.

The training of contractors and their staff aimed at enabling the contractors to carry out small-size road rehabilitation contracts in accordance with their technical and work organizational requirements. The training focused on a number of key areas that were regarded as essential for carrying out rural roads contracts in the specific environment of Aceh. Training was provided in the following areas:

- ◆ Tender preparation and pricing;
- ◆ Contract mobilization and work programming;

- ◆ Ensuring equal employment opportunities for women and men in local communities;
- ◆ Road rehabilitation works (mainly base course and pavement construction plus drainage works);
- ◆ Site management and quality control;
- ◆ Maintenance of completed works during the defect liability period.

Valuable training materials were developed by the project, including pre-tender guidelines, worksheets for site activities, quality control check-lists, contract administration procedures, a contract mobilization guide, a site handbook, technical guidelines and a picture guideline showing all major construction activities.



The training and capacity building efforts of the project demonstrated good results. Those individuals who received training were able to perform better. Through good quality demonstrations, the project also managed to create general awareness of the usefulness of tailored and practical training.

10 In addition, 25 PNPM/KDP facilitators were introduced to LRB construction methods in Aceh.

A summary of the results shows that 31 PWD engineers/supervisors were trained in the three districts in Aceh. In total 36 contractors and 85 contractor supervisors have undergone the ILO training. A total of 9,801 trainee days were delivered up to the end of February 2008. This is generally considered a high training output. On average, 81 days of training were provided per trainee. In overall terms, 79 per cent of the trainees performed exceeded a satisfactory level, while 21 per cent were unsuccessful. The competency levels assessed during the training course suggested that 100 per cent of the PWD supervisors performed well and should now be in a position to effectively supervise road rehabilitation works.

The total costs related to training were estimated at approximately ten per cent of the total project costs. With 9,801 trainee-days delivered, this translates to \$37.50 USD per trainee-day. These costs were low compared to the investment costs per trainee-day on other similar projects. Investment costs for training



facilities, training related logistics and other arrangements were kept at a bare minimum. Expensive training visits to far places and abroad were only made where a direct benefit to the project could be expected. As a result, the training and capacity building activities could be delivered a very cost-effective way.

The delivered training and capacity building was not only cost-effective, it was also considered to be very useful by the recipients of the training. In interviews, the trained contractors and their supervisory staff expressed their strong appreciation of the provided training.



They all spoke of their improved understanding of both contract management on the site and the development of their business skills through a better understanding of the contract procedures and tendering process. The appreciation of the capacity building and training approach was reflected in the fact that all the project partners requested the ILO to continue training and capacity building activities and increase efforts and coverage of capacity building activities during an extension of the project.

Another indication of the appreciation of the project's training and capacity building activities was the fact that the project was recognized and utilized as an advisory service provider for agencies that either operated in project areas or were directly involved in transport infrastructure projects.

3.6 Procurement procedures

The project's procurement procedures were different from those used by PWD. PWD's procurement procedures were regulated in accordance with the current national regulation; that is the Presidential Decree 80/2003. For simple works (including road works) a system of post-qualification was applied as the general rule.¹¹ However, exemptions to this rule were possible if special skills, experiences, equipment, among others, were needed. The system of post-qualification was preferred by PWD for the following reasons:

- ◆ To give equal opportunity to all registered contractors;
- ◆ To avoid collusion amongst bidders;
- ◆ Less time required for bid evaluation (detailed evaluation of the three lowest bids only).

The project's procurement procedures followed a pre-qualification system and the ILO's procurement regulations applied. The project introduced a system of pre-qualification, which aimed to increase the quality of the bids and provide better opportunities to local small and medium-size contractors. Table 3 summarizes the differences between the PWD and the project's procurement procedures.

Based on the current experiences with the project's procurement procedures, it appears that some elements of the procurement procedure that were used under the project had a comparative advantage over PWD procedures. These related to packaging, training of contractors in the preparation of comprehensive bids, Quality Assurance / Quality Control procedures and the introduction of decent work conditions in contracts.¹²

Further testing of the procedures and documentation of the findings are required before more conclusive findings can be formulated. An important issue was the sustainability of the procedures applied under the project. These not only relate to the current national legislation and procedures regarding public procurement, but also to implementation capacities on the ground.

The project adopted a pre-qualification system that was aimed at an increased quality of the bids and at providing better opportunities to small and medium-sized contractors.

11 The Decree suggests to use post-qualification for simple works, but this is perceived by PWD as a must (based on information from district-level PWD of Pidie, Aceh Besar and Bireuen District in Aceh).

12 Including clauses related to discrimination in employment practices, occupational safety and health for works and the restriction of child labour. In addition, contract documents stipulate that women should be given an equal opportunity to obtain employment.



Table 3: Summary of differences between the project and PWD procurement procedures

Procedure	PWD	ILO	Description of differences
Registration and certification	Requires Certification Group of the National Construction Group of Indonesia	Requires Certification Group of the National Construction Group of Indonesia	No differences.
Qualification	Post-qualification, as per Presidential Decree 80/2003	Pre-qualification as per pre-qualification criteria established by the project	Avoiding collusion and increasing efficiency was mentioned by PWD as a reason for post-qualification. However, there were risks with a post-qualification system where only the (3) lowest bids were evaluated (e.g. contractors registering different firms and submitting low bids through these different firms). This practice could reduce the scope for competitive bidding.
Contract packaging	Contract packages were comparatively larger	Contract packages were comparatively smaller	Larger contract packages required less administration, smaller packages could be more effective in an environment with limited contractor capacities.
Advertisement	At public notice boards and through local media	At public notice boards and through local media	No differences.
Tendering procedure	Limited information was shared with contractors	Comprehensive information sharing with contractors	More information sharing increases transparency.
Preparing bid documents	The engineer's estimate (EE) was shown to contractors and any bid exceeding the EE was disqualified. As a result	The EE was confidential. Bids exceeding the EE were not automatically disqualified. The project's assumptions	Under the project approach the contractors prepared their own unit rate analysis and bills of quantity (BOQ), based on agreed measurement guidelines (with training proved by the project), so they had a good

Procedure	PWD	ILO	Description of differences
	<p>of this approach, the EE was usually high because if no bids were below this estimate, the bidding was repeated</p>	<p>can be rechecked. If correct, bids above the EE were disqualified. If the EE was too low, it was adjusted and bids were reviewed</p>	<p>understanding of the expected profits, costs and input requirements before submitting the bid. This increased the quality of the work, as the contractors knew the input requirements and organized the mobilization and utilization of the materials and labourers accordingly.</p>
Bidding procedure	<p>Competitive bidding – at least 3 bids were required</p>	<p>Competitive bidding – at least 3 bids were required</p>	<p>No differences.</p>
Evaluation of bids	<p>Steering committee; only three lowest bidders were evaluated</p>	<p>During the 1st evaluation round all bids were checked against the BOQ estimations and corrections can be made. Corrected bid sums were used for further evaluation.</p>	<p>The evaluation criteria of the project were considered more transparent. Bidding contracts were normally awarded in batches of 3-6 individual sub-projects. For training purposes these batches were implemented at the same time. One contractor could therefore only have one contract at the time. During the training for preparation of bids, the project involved as many contractors as possible.</p>
Contract documents	<p>Government contract formats</p>	<p>ILO Service Contract</p>	<p>The ILO Service Contract is a general contract and not optimal for the construction sector. It is planned to introduce FIDIC, which allows for more clauses, such as those related to decent work conditions. In the Government system standard contract formats were available, with very few clauses on decent work conditions. Districts often had additional provisions that were not always consistent with standard Government contracts.</p>

Procedure	PWD	ILO	Description of differences
Approval of contracts and payment authorization	As per Government rules. Different sets of rules apply for district funds and for Central funds	As per ILO financial and procurement rules	Government rules were more decentralized, particularly for bidding and contract award procedures for works financed with district funds. There appeared to be few complaints from contractors about non- or late payments from local governments and this was an indication that the government system works reasonably well.
Contract administration	As per Government rules	As per ILO rules	Government rules were more decentralized.
Quality control and quality assurance (QC/QA)	Limited due to capacity constraints	QC/QA procedures were in place and were effectively applied	In the project the combination of 'on-the-job' training and QC/QA received positive result and ensured work quality.
Training on bidding and management	In general not done (due to capacity constraints)	Introduction training provided	The training provided aimed to improve the quality of both bids and works. Training included topics on pricing, unit rate analysis, contracting, mobilization, QC/QA, supervision and management.
Compliance with procurement rules and procedures	Scope to improve compliance by developing capacities	High level of technical assistance ensures high level compliance	Because of adequate staffing, the project was able to achieve high levels of compliance.
Monitoring on compliance with social safeguard requirements	Scope to improve monitoring on compliance of social safeguards	Advice and practical monitoring tools provided to both contractors and PWD supervisors to enable effective recruitment of women and work safety	The project regularly monitored women's participation in the project and analyses factors contributing to low participation rates. Once the contributing factors were identified, strategies were derived to overcome them. On safe working conditions, site monitoring and a checklist for site closure were used. Failure by contractors to comply with environmental safeguards was not acceptable.

Source: Authors' own data

3.7 Maintenance

The project piloted a community-based routine maintenance system for the roads that were rehabilitated under the project. This system demonstrates that effective routine maintenance procedures could be implemented with limited resources.

It also shows the importance of allocating limited funding for maintenance activities that could prolong the life of the rehabilitated roads. These activities not only preserve the asset value, but also extend the period over which the road can be utilized and therefore help to reduce transportation costs and travel time and the enhance access to economic and social services and facilities.



3.8 Appropriate technologies and environmental safeguards

Initially the project used ‘penetration macadam’ (penmac) and ‘latasir’ as a wearing course in the rehabilitation of the roads. Latasir involved mixing aggregate and bitumen by hand over an open fire. This practice can be very hazardous for workers, as poisonous asphalt fumes develop and there is little chance for labourers to work at a safe distance. In industrialized countries regulations stipulate that this process can only be carried out in specially designed containers or at a mixing plant. Apart from health hazards, there are also concerns about the quality of outputs that are mixed by hand.

Although not as poisonous as latasir, the process of preparing penmac also includes health hazards as it involves the heating of bitumen over an open fire (bitumen is heated in drums). Apart from health hazards, there can be quality related issues in the preparation of penmac as there is little control over temperature and overheating can easily result in a loss of binding capacity.



For above reasons the project introduced a bitumen emulsion technology (sometimes also referred to as ‘cold asphalt’). This environmentally-friendly and durable technology has been successfully applied in other countries and the initial findings on the demonstration sites in Aceh reveal that this approach produces a quality road.

The project successfully demonstrated the application of environmentally sound and durable technologies for the wearing course of the (re)constructed roads.

Conclusion

4

Findings from the study indicate that the project was able to deliver the planned outputs at a high quality, within the foreseen time-frame, and in a very cost-effective way. This was also been confirmed by an independent MDF mid-term review in 2008. Improved quality control and quality assurance, the selection of appropriate LRB designs and construction technologies,¹³ and the use of different procurement procedures, contributed to the satisfactory delivery of the construction works.



¹³ Including the introduction of locally appropriate, durable, and environmental-friendly wearing course technologies.

The project demonstrated the effectiveness and cost-competitiveness of integrating demand-driven capacity building and training activities over the construction cycle.¹⁴ The mobile construction training approach coupled the provision of extensive ‘on-the-job’ mentoring with some classroom training. Feedback received from PWD staff, local governments, contractors, supervisors and communities about the quality and usefulness of the provided training was very positive.

The project generated between five to ten per cent more employment opportunities for local people than similar works executed through PWD. In addition, the project made exclusive use of local contractors. The use of local workers and local contractors meant that substantial amounts of cash were able to be injected in the local economy.

The methods used to promote the involvement of local women in the workforce were quite successful and women constituted between 30 to 35 per cent of the workforce. The project also demonstrated the usefulness and cost-effectiveness of preserving the asset value of the (rehabilitated and reconstructed) roads, through the introduction of appropriate and inexpensive community-based routine maintenance systems.



This study has used the case of Aceh to consider the comparative costs and benefits of the Local Resource-Based approach to rural road development. The findings from the field indicate that the Local Resource-Based approach to infrastructure development can emphasize the

impact of infrastructure investments for local communities in a way that increases the life of the asset and the number of employment opportunities created from the investment, as well as the capacity of workers, contractors and government staff.

¹⁴ Including training and capacity building activities for surveying, budgeting, programming, designing, cost-estimation, tendering, contracting, supervision, reporting and monitoring.