



A Technical Evaluation of PNPM-RESPEK
Infrastructure Built by the Barefoot Engineers
Technical Facilitator Training Program in Papua

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TERMS AND ABBREVIATIONS

Bamuskam	<i>Badan Musyawarah Kampung</i> (village Legislative Body)
BLM	<i>Bantuan Langsung Masyarakat</i> (Direct Community Assistance)
Distrik	A term equivalent to sub-district (<i>kecamatan</i>) used in Papua and West Papua provinces
Faskab	<i>Pendamping Kabupaten</i> (district facilitators), consisting of technical, social and financial facilitators
FK	Facilitators at the level of sub-district or <i>pendamping Distrik</i> (<i>Pendis</i> or sub-district facilitator). There are two types of facilitators, namely technical (engineering) and social facilitators.
FT	Technical facilitator at the sub-district level or technical <i>Pendis</i> (<i>Pendis Teknik</i>)
Kampung	A term equivalent to village used in Papua and West Papua provinces
NT	Non-Technical, referring to sub-district without the presence/assistance of technical facilitator
RAB	<i>Rencana Anggaran Biaya</i> (Expenditure Budget Plan)
PAH	<i>Penampung Air Hujan</i> (Rainwater Catchment)
PAUD	<i>Pendidikan Anak Usia Dini</i> (Early Childhood Learning Centres)
PMA	<i>Penampung Mata Air</i> (Spring-water Catchment)
PMD	<i>Pemberdayaan Masyarakat Desa</i> (Directorate General for Village and Community Empowerment, Ministry of Home Affairs)
Posyandu	<i>Pos Pelayanan Terpadu</i> (Integrated Health Posts)
PTO	<i>Petunjuk Teknik Operasional</i> (Operational Technical Guideline)
PU	<i>Pekerja Umum</i> (General Construction), a local government's (district/municipality) office with the task of construction management
Pustu	<i>Puskesmas Pembantu</i> (Satellite Community Health Centre)
REG	Regular, referring to sub-district with/assisted by technical facilitator with a bachelor degree and has received direct training from PNPM
RESPEK	<i>Rencana Strategis Pembangunan Kampung</i> (Strategic Plan for Village Development), special autonomy fund of provinces (Provincial Expenditure Budget or APBD Propinsi) given to villages.
Satker PNPM	<i>Satuan Kerja PNPM Mandiri</i> (PNPM Mandiri Task Force)
Technical Specialists	Specialists are professional human resources with the task of intensive assistance and guidance as well as technical support to improve infrastructure quality to program managers at the district level
TPKD	<i>Tim Pelaksana Kegiatan Kecamatan</i> (Sub-district Activity Executive Team)
TPKK	<i>Tim Pelaksana Kegiatan Kampung</i> (Village Activity Implementation Team)
Tukang	<i>A construction labor</i>

1. INTRODUCTION

1.1 Background

PNPM Mandiri is an Indonesia-wide community-driven development program. In Papua and West Papua provinces, PNPM Mandiri has reached 87% of all villages (approximately 4,000). In Papua, PNPM Mandiri serves as the delivery mechanism for the provincial RESPEK (*Rencana Strategis Pembangunan Kampung* or Strategic Plan for Village Development) top-up program. In addition to BLM (*Bantuan Langsung Masyarakat* or Direct Community Assistance) funds, RESPEK is funded by the Provincial Expenditure Budget (APBD Propinsi), and it provides 120 million IDR directly to every village in the province. RESPEK is intended to address five sectoral priorities, of which one is village infrastructure. Facilitators guide PNPM-RESPEK's CDD processes: *Pendamping Distrik*¹ *Teknis* or sub-district Technical Facilitators, as well as *Pendamping Kecamatan Pemberdayaan* or Sub-district Social Facilitators.

The Barefoot Engineers project trains local high school graduates to become PNPM technical facilitators Papua and Papua Barat, in order to improve the quality of the small-scale infrastructure projects there. The project addressed Tanah Papua's chronic shortage of engineers and skilled construction workers and the persistent vacancies found in Tanah Papua's difficult and remote working conditions. Under the project, applicants possessing the minimum of a high school diploma are screened and accepted into an intensive 6-month residential training project. Those accepted in the scheme are provided with basic training in civil engineering, mechanics, construction, budgeting/ planning, and facilitation. The infrastructure projects most commonly selected by communities are prioritized in the training.

BE I had 228 enrollees and all passed. BEII had 122 enrollees of which 106 passed. Of these 334, between 80 and 110 remain with the program. The third round of the BE project was approved in February 2011 and began in October 2012: at the time of BEIII's launch, 300 technical facilitator positions were empty, and so 300 trainees were selected during a rushed and limited recruitment process. Of the selected trainees, 29 percent were women. BaKTI managed this training with support from LPPM-UNCEN. BEIII graduated 290 technical facilitators in March of 2013. All 290 were accepted by the local SatKers and deployed, thus filling all of the vacant technical facilitator positions in Tanah Papua.

Beginning in the summer of 2013, provincial technical facilitator trainers provided a first round of mentoring for all BE graduates, and conducted a qualitative evaluation of remaining training needs in the process. A post-mentoring/ coaching evaluation and refresher training design workshop was then held in Sorong in Sept 2013. Meanwhile, the BEIII graduates began community facilitation of new projects in November- December 2013. The first refresher training rounds in support of those ongoing facilitations and designs occurred in January – March 2014, followed by additional mentoring. Another round of refresher trainings by region will occur starting in September 2014,

¹ In Papua provinces, the term '*Distrik*' refers to the administrative area equivalent to sub-district. This report uses the nationally-recognized term sub-district or kecamatan in place of *Distrik*.

with the project closing on Dec 30 2014. BaKTI is also beginning a mentoring and coaching program for district social facilitators.

A technical evaluation is considered by the PSF to be necessary in order for *Kementrian Desa* to consider the possibility of continuing the project in Tanah Papua as well as possibly expanding the project to other remote areas of Indonesia with the same remote conditions and lack of human resource capacity therein.

1.2 Objectives

This study analyses the quality of infrastructure built under PNPM-RESPEK, of which the technical quality of the project itself is paramount. Within this, the study also looks at the implementation of tasks, roles of the various parties/actors involved, the operational and maintenance processes, as well as the impact of infrastructure development. The team evaluated completed infrastructure in 3 different categories of sub-district:

- Sub-districts with projects facilitated by BEIII graduate technical facilitators;
- Sub-districts with projects facilitated by non-BEIII technical facilitators (who have engineering degrees);
- Sub-districts with projects where there were no technical facilitators present (commonly termed 'Non-Technical' or NT).

The study's specific objectives are:

1. To measure the quality of PNPM-RESPEK infrastructure resulting from projects facilitated by BEIII technical facilitators, regular technical facilitators, or no facilitators, encompassing:
 - The appropriateness of infrastructure with the Design and Budget Plan;
 - Structure and construction;
 - Architectural and functional aspect of buildings;
 - Operations and maintenance (O&M).
2. To survey the utilization of completed infrastructure related to the anticipated versus actual use of the project by the community in the community;
3. To analyse factors and processes affecting the quality of infrastructure, such as the quality of technical facilitators at the planning and implementation stages, supervision of district technical facilitators (*Faskab Teknis*), and the competence and availability of program actors at the village level such as TPKK and *tukang*;
4. To the study environmental and social impacts (especially regarding land ownership and holding) of infrastructure projects.

1.3 Research Questions

With the above-listed objectives, the key questions are:

1. What is the quality of infrastructure built in each of the three mentioned-categories of conditions?
 - Does the infrastructure meet the planned design and budget?
 - What is the physical condition of the infrastructure?
 - What are the technical, functional and architectural conditions of the infrastructure?
 - Is the infrastructure run and utilized according to the intended function/purpose?
2. What is the utilization of the infrastructure like?
3. What factors result in differences found in the quality of infrastructure across sub-districts?
What, if any, role do technical facilitators play in the difference in outcomes?
4. What are the social and environmental impacts (especially relating to land/ ownership issues) resulting from the infrastructure project?

2. METHODOLOGY

2.1 Evaluation of Infrastructure Quality and Technical Data Collecting

The study used evaluation forms to assess the quality of infrastructure including the evaluation forms in the PNPM PTO. Supplementary forms were created after consultations with PNPM technical specialists. The forms can be seen in Appendix 1. The forms consisted of reviews for the following types of infrastructure, namely:

1. Roads and culverts;
2. Bridges;
3. Irrigation and drainage systems;
4. Other buildings (markets, Posyandu, Pustu, meeting venues, schools, pre-school centres (PAUD));
5. Public latrines;
6. Clean water (PAH, PMA);
7. Wells.

Throughout the study, we found types of infrastructure that do not fall under the existing categories provided in the forms, such as talud and soil-slope supporting wall. The researchers used the Other Buildings form but incorporated aspects relevant to talud and soil-slope supporting wall. Further explanation on the types of infrastructure assessed can be seen in section **3.1**.

The assessment forms consist of several evaluation aspects related to the quality of infrastructure, such as: foundations, lower constructions, upper constructions, building layouts, architectural aspects, supporting structures, pavement (specifically for roads), soil-slope supporting wall steepness, drainage systems (specifically for roads), culverts (specifically for roads), water sources (specifically for clean water and latrines), operations and maintenance, and environmental impact. Every assessment form contained different aspects appropriate to the type of infrastructure. Explanations for each aspect can be seen in **Appendix 2**.

Every assessment aspect contains 5 categories, where researchers assess by ticking [Ø] the provided boxes according to observations made in the field. The researchers using the forms conducted pre-fieldwork tryouts. The categories are: (1) Sufficient, (2) Moderately Insufficient, (3) Insufficient, (4) Unexamined, and (5) Absent. In conducting the observation, the researchers used the Good & Bad Infrastructure Book (*Buku Infrastruktur Baik & Buruk*²) issued by PNPM, as a reference for the study.

1. **Sufficient:** When the aspect was judged appropriate to the design; met the technical aspects (even when there were changes in materials used, but technical standards were still met and could withstand mechanical burdens); was in good condition; was easily used; did not create problems, and was utilized by the community for a long period of time;
2. **Moderately Insufficient:** When the aspect was judged not appropriate to the design and technical standards, but was still used without posing any danger to the user; with possibly low

²*Buku Infrastruktur Baik & Buruk* consists of 6 volumes. Three are used in the study, namely: (1) *Jalan & jembatan* (Roads and Bridges), (2) *Air bersih & sanitasi* (Clean Water and Sanitation), and (3) *Prasarana lain* (Other Facilities).

comfort level; the potential of compromising other aspects, and/or requiring immediate mild repair to maintain or improve the quality of infrastructure;

3. **Insufficient:** When the aspect is judged not appropriate to the design and technical standards; endangers users; is in damaged condition; compromises the function of infrastructure; is causing other problems, and requires large scale repair to improve the quality of infrastructure;
4. **Unexamined:** When the aspect cannot be observed directly, for instance in aspects such as building foundations, roof trusses, and pavement foundations for roads, and when information on unexamined aspects cannot be obtained through other means such as from key informants in the field (technical facilitators, village leaders, laborers, etc);
5. **Absent:** When the aspect is not present (not applicable) in the type of infrastructure being examined, for instance parking ground in buildings with no parking areas.

From the forms, researchers conducted additional analysis to obtain information on the quality of infrastructure, categorized as Excellent (*Sangat Baik*), Good (*Baik*), Sufficient (*Cukup*), Insufficient (*Agak Kurang*), and Poor (*Kurang*). Afterwards, researchers calculated the scores of Sufficient, Moderately Insufficient and Insufficient categories, while the scores for Unexamined and Absent are irrelevant in determining the quality of infrastructure. The following formula³ was used:

$$N (\%) = \frac{(Cukup - 4xKurang)}{(Cukup + Agak Kurang + Kurang)} \times 100$$

Where N = Quality of Infrastructure (%)

From the calculation using the above formula, a percentage of quality of infrastructure is obtained. The figures are classified according to the following grades:

Excellent	Quality of infrastructure above 80%
Good	Quality of infrastructure between 60% - 80%
Sufficient	Quality of infrastructure between 40% - 60%
Insufficient	Quality of infrastructure between 0% - 40%
Poor	Quality of infrastructure less than 0% (negative value)

This quality of infrastructure will be used as a reference for the next stage of analysis, where the assessment was combined with other information that allowed for a finding or conclusion to be obtained.

The assessment on infrastructure in NT Sub-district, especially infrastructure built in 2012, was done with a different method, where researchers had to find information⁴ on the conditions of the infrastructure in 2013. This is as an effort to control for the age of infrastructure between those built in 2012 and those built in 2013 (after 1 year of use).

³ Source: *Effective Supervision Guidelines for PNPM Perdesaan*

⁴ The information was obtained from written and verbal reports from village actors, sub-district facilitators, or community members who utilize the infrastructure. The information was rigorously detailed and was triangulated.

2.2 Extent of Information from Qualitative Data

2.2.1 Processes or Factors Assumed to Affect Infrastructure Quality

Based on literature reviews and AKATIGA's experience in conducting PNPM infrastructure studies in Papua and West Papua (PSF 2012, AKATIGA 2010, 2012), the aspect and extent of information (definition and limitation of information) assumed to affect the quality of infrastructure, and sought after in this study, are as follows:

Quality of sub-district technical facilitators, divided into information on:

- Processes and quality of technical facilitators at the stage of infrastructure planning, starting from the conducting of survey (field visits), design of infrastructure, ToS (*take of sheet*) and Budget Planning (*Rencana anggaran biaya* or RAB). Included in this aspect is: (1) effective communication conducted by technical facilitators with Technical *Faskab* or Barefoot specialists as well as with village actors for consultations in designing and budget planning, especially in troubleshooting, (2) quality of technical facilitators in their activities in villages to obtain relevant information to assure that infrastructure design fits local needs and conditions;
- Processes and quality of technical facilitators at the stage of infrastructure project implementation, starting with troubleshooting efforts during the building period to ensure the infrastructure was built according to the design and budget plan, with good quality. In this stage, aspects to be explored are the quality of field visits by technical facilitators, encompassing the ability to identify problems arising in the field and the ability to mediate between village actors (TPKK, *tukang*, etc);
- Profile or background of technical facilitators, including educational background, previous trainings or employment in civil engineering, as well as experience with PNPM-RESPEK or similar programs.

Support from other actors

Support from other actors was analysed, especially Technical *Faskab*, BEIII specialists, and village Kaders who were given the responsibility to assist technical facilitators. Crucial support in the form of inputs and assistance in troubleshooting in the event of problems faced by technical facilitators, reviewing designs and budget plans, and guidance for the technical facilitators in the village, were analysed as well.

Quality and Availability of Actors in Village

In addition to the quality and process of technical facilitation, the quality of infrastructure was also affected by the availability and quality of village actors (TPKK and *tukang*). TPKK are responsible for the implementation of infrastructure projects in the village. The management of infrastructure implementation conducted by a TPKK includes selecting the *tukang*, supervising the daily work of the *tukang* and communicating with technical facilitators.

Village Context: social dynamics and accessibility

Another factor which affects the quality of infrastructure is community social dynamics and accessibility, as was shown by a previous AKATIGA study (2012). Social aspects can affect technical quality, both at the planning and implementation stages. Social dynamics in Papuan communities-- including pre-existing community/ clan conflicts, disputed land, and the village kinship structure,

have caused delays in infrastructure construction. Meanwhile, accessibility is defined as the degree of difficulty to access the village, measured by distance, time of travel and cost of transport required. Accessibility affects project quality due to the lack of facilitation, and barriers to the entry of materials (PSF 2012, AKATIGA 2012) especially relating to high costs.

2.2.2 Infrastructure Utilization

The study also sought to measure utilization of infrastructure by communities, including who users are and frequency of utilization. The user aspect questions if the infrastructure is only utilized by a small or exclusive portion of the community such as village elites, or if the infrastructure is relevant to the wider community; if access to the infrastructure is exclusive (limited to a certain subset of the population and inaccessible to others) or inclusive (for everyone's use). The frequency of utilization refers to intervals of use (daily, weekly or monthly, or irregular).

2.2.3 Environmental and Social Safeguards

The last aspect that the study attempts to analyse is environmental and social safeguard aspects. Environmental aspects have broad dimensions. However, the time limitations under which this study occurred means that the researchers only considered whether the infrastructure has the potential to result in land, water and air pollution. Social safeguard aspects were limited to land issues: if the condition of ownership of land is contested by individuals or communities, if communal/traditional rights were violated in acquisition; and so on.

2.3 Data Collection Methods

The study is based on primary data collection through fieldwork in selected sub-districts and villages, supported by secondary data. The methods for data collection are qualitative, through in-depth interviews and participant observations around the studied infrastructure objects. Both methods complement each other, where the observation findings can be used for further probes through in-depth interviews, and vice versa.

Observations of completed infrastructure were especially utilized to seek further information relating to the assessment of quality of infrastructure. Participant observations were also carried out to complement the data on infrastructure utilization and environmental impact.

Meanwhile, the qualitative approach through semi-structured in-depth interviews was used to seek in-depth information on factors affecting the quality of infrastructure, and to explore the processes and impacts of various factors that impacted the quality of infrastructure. Interviews were conducted with various actors at the district level (Technical and Social *Faskab*), Sub-district (technical and social facilitators), village (TPKK, *tukang*, village facilitators) as well as community groups (both users and non users).

Table 1 Aspects Explored and Methods Used

Aspects/Information Explored	Methods	Actors Interviewed
Infrastructure assessment	Observation to fill out forms for infrastructure assessment at the studied object (infrastructure), complemented by semi-structured in-depth interviews.	<ul style="list-style-type: none"> • Technical facilitators • TPKK • (When available) <i>Tukang</i>
Aspects affecting quality	Semi-structured interview	<ul style="list-style-type: none"> • Technical facilitators complemented by social facilitators • Technical <i>Faskab</i> complemented by Social <i>Faskab</i> • TPKK • <i>Tukang</i> • Head of village
Quality of technical facilitators	Semi-structured interviews	<ul style="list-style-type: none"> • Technical facilitators • Cross-checking with Technical <i>Faskab</i>, social facilitators, TPKK and PK (village facilitators)
Support from Technical <i>Faskab</i>	Semi-structured interviews	<ul style="list-style-type: none"> • Technical <i>Faskab</i> • Cross-checking with social <i>faskab</i> and technical facilitators.
Social dynamic in the village	Semi-structured interviews	<ul style="list-style-type: none"> • Technical facilitators • TPKK • Interviews with relevant actors such as head of village or village community leaders.
Accessibility	<ul style="list-style-type: none"> • Researchers' own experience to reach the village • Quantitative calculation of distance, time of travel and cost of travel 	
Infrastructure utilization	Observation at studied objects complemented with interviews of users and non-users randomly selected	<ul style="list-style-type: none"> • Users • Non-users
Environmental and Social Safeguarding	<ul style="list-style-type: none"> • Observations at the studied objects (infrastructure) • Interviews 	<ul style="list-style-type: none"> • Technical facilitators • TPKK • (When relevant) cross-checked with community members involved

Cross-checking was done to enhance data validity and mitigate bias. Cross-checking was conducted by triangulating information between sources (informants), between methods (interviews and observations) as well as between research team members.

Under the methods employed, the research team did not only consist of technical researchers (with a civil engineering background) but also from the social sciences (anthropology). Team members were also involved previously with PNPM-RESPEK studies in Tanah Papua.

6 teams conducted the study; each team was in the field for 16-17 days.

The two methods (interviews and observations) were supported by secondary data in the form of reviews of important documents related to infrastructure. The documents include:

- Design and budget plans (RAB);
- Implementation reports and progress reports.

Usually the documents were compiled in a single document commonly referred to as LAS (*Laporan Akhir Siklus* or End of Cycle Report), available at the sub-district and district level.

2.4 Study Locations

The study was conducted in 6 Districts across Papua and Papua Barat. Districts were predetermined in the PSF ToR and were selected by the World Bank, DFAT, PMD and others to represent the diversity of Tanah Papua's geographical conditions (coastal and mountain). For each district, 3 sub-districts were chosen, and in each sub-district a minimum of 4 types of infrastructure were sampled.

Sub-districts were chosen based on the objective of the study, and underwent several stages of sampling. Firstly, based on the objective of the study in comparing infrastructure outcomes between three sub-district condition categories particular to staffing, the choice of each sub-district was based on the following criteria:

1. Presence of technical facilitators who graduated from BEIII, where they would have only involved in infrastructure planning/ building for one period (FY 2013);
2. Presence technical facilitators who did not graduate from all batches of BE (BE-I, BE-II or BEIII); or sub-district with technical facilitators who were recruited and trained under the regular PNPM Mandiri mechanism or referred to in the study as regular technical facilitators;
3. No technical facilitators present, where infrastructure building was still implemented despite the absence of technical facilitators' assistance.

Secondly, sub-districts were selected based on local geographic and socio-economic area conditions.

Thirdly, sub-districts were selected to sample regular technical facilitators who have been recently recruited (between 2012-2013), so that the duration of experience of the regular facilitators are reasonably comparable with recently graduated BEIII technical facilitators.

Technically, the study did not have to sample locations with extremely low accessibility, such as in areas that require the use of special flights or travel on foot for longer than 1 day, in addition to

security considerations. Several areas with relatively low accessibility, such as using special vehicles and travel on foot for 8 hours, were still acceptable as study locations.

However, not all of the criteria could be met due to obstacles encountered in the field (refer to the Study Barriers and Limitations section for details). Final study locations were chosen as follows:

Table 2 Study Locations

District	Sub-District	Category	Village
SORONG	Salawati	Regular	Majaran, Matawolot
	Mayamuk	Barefoot	Makbalim, Makotiamsa
	Klamono	Non Technical (2013)	Maladuk, Klawana, Malasigit
FAK-FAK	Central Fak-fak	Barefoot/Non-Technical (2012)	Prima, Pasir Putih
	Kokas	Regular	Kokas, Sisir, Traver
MIMIKA	Kuala Kencana	Regular	Utikini Baru, Utikini 2, Karya Kencana
	Wania	Barefoot	Wonosari Jaya, Mandiri Jaya
TOLIKARA	Kondaga	Non Technical (2012)	Ganage, Yawineri
	Goyage	Regular	Goyage, Tiri
	Yuko	Barefoot	Mage, Abelom
JAYAWIJAYA	Waisaput	Regular	Kama, Mawampi, Agamua
	Walelagama	Barefoot	Pugima, Kulaken, Walelagama
	Walaik	Non Technical (2013)	Walekama
	Pisugi	Barefoot	Wara, Aikima
JAYAPURA	Sentani	Barefoot / Non Technical (2012)	Ifar Besar, Sereh
	East Sentani	Regular	Netar/Nendali, Yokiwa
	Unurum Guay	Barefoot / Non Technical (2012)	Garusa, Sawesuma

At every location, the research team sampled at least 4 types of infrastructure, divided further into 5 following categories:

1. Roads (Opening new roads, macadam, gravel surface, concrete pavement, culverts);
2. 'Wet' infrastructure for sanitation and clean water:
 - Latrines (as well as for washing and showers)
 - Clean water supply (well, piping, PAH, PMA)
3. Drainage/irrigation;
4. Bridges, which may consist of:
 - Boat anchorage
 - Bridges (wooden bridge, concrete bridge, hanging bridge)
5. Buildings (markets, Pustu, Posyandu, PAUD/pre-schools).

Moreover, considering how BEIII technical facilitators have only recently started their work in facilitation and construction in 2013, every infrastructure sampled in the study was built in 2013, regardless of whether the funding was approved under BLM 2013 or other funds.

2.5 Data Analysis

The analysis process of the study began by assessing the quality conditions of the three major categories of sub-district/ village (BEIII, regular and NT) according to the quality assessment guidelines, followed by a comparison of assessment results between the three groups.

Then, the qualitative data was analysed to further explain the result of the comparison of quality assessments. Qualitative data (in factors assumed to affect quality of infrastructure) was to be categorized and then the pattern was analysed through SPSS cross-tabulation. Cross-tabulation can only provide some indication of the presence of correlation but cannot explain the causal relationship. The processes or causality of relationships were analysed using qualitative analysis or through narratives obtained from interviews and field observations.

2.6 Study Barriers and Limitations

Several limitations were encountered:

1. The researchers were expected to gather information rapidly. Due to time constraints, the extent of information, such as on utilization, could only occur through projections instead of through quantitative survey data collection;
2. Field conditions and the varied experience of sampled facilitators between the 'case' group (BEIII) and 'control' group (regular or NT) made comparison occasionally difficult. Other factors that differentiate areas had to be taken into consideration with regard to varying quality of infrastructure;
3. The researchers expected similar variation of infrastructure types in study locations. However, not all selected sub-districts had the same infrastructure types built in 2013, and several types of infrastructure were only found in a limited number of study locations;
4. Changes in study locations occurred:
 - Yalimo was changed to Tolikara. In Yalimo there was only 1 BEIII facilitator and the district only hosted 5 sub-districts. Tolikara offered a greater BE presence and a wider variety of sub-districts.
 - Kaimana changed to Fak Fak, because in Kaimana there were no longer any BEIII facilitators.
 - There was no accessible sub-district in the NT category in Mimika. All accessible sub-districts there had technical facilitators, both in 2012 and 2013. Those with no technical facilitators were too distant to be included in the study.

3. STUDY FINDINGS

3.1 General Overview of Infrastructure

The study looked at 96 infrastructure projects in 7 categories. Of the 6 districts studied, the most prevalent types of infrastructure were Roads and Culverts (25%) and Latrines (24%). These two types were followed by Clean Water infrastructure (16%), Buildings (15%), Bridges (8%), Wells (7%) and Drainages (5%). This overview is relatively similar to the 2012 PSF technical evaluation, which showed that the most popular types of infrastructure in Papua were Roads (28%), Latrines (18%), Bridges (10%), Clean Water facilities (15%), Drainage/ irrigation (5%), Boat Anchorage (1%), Buildings (16%) and Electricity (7%). **Figure 1** and **Table 3** below provide the data in detail.

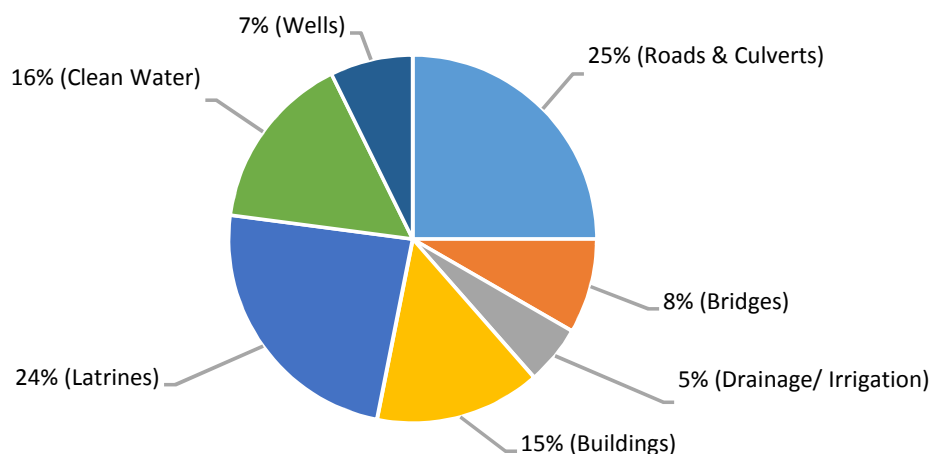


Figure 1 Profile of infrastructure in 6 districts.

Table 3 Infrastructure by Type and Study Location

District	Types of Infrastructure							Total
	Roads, Culverts	Bridges	Drainages/ Irrigation	Buildings	Latrines	Clean Water	Wells	
Sorong	7	3	-	3	-	-	-	13
Fak Fak	3	-	3	-	6	7	-	19
Mimika	7	2	-	1	-	6	-	16
Tolikara	2	1	-	3	2	2	-	10
Jayawijaya	-	2	-	4	4	-	7	17
Jayapura	5	-	2	3	11	-	-	21
Total Infrastructure	24	8	5	14	23	15	7	96

PNPM-RESPEK roads were found in all studied districts except Jayawijaya. Road building consists of two subtypes: opening new roads, and improving existing roads. New roads were often encountered in the mountains, as accessibility is one of the greatest hindrances to development and access to

services. In PNPM, expensive transportation costs and the necessity of porter services and charter flights result in high transport costs in budget planning, which had adverse effects on the end quality of completed infrastructure. Meanwhile, road improvements were more often encountered in areas with better ease of access.



A road in Nendali, East Sentani, Jayapura

Latrines in Sereh, Sentani, Jayapura

Figure 2 Examples of roads and latrines, the most common infrastructure surveyed.

Latrines were the second most prevalent type of infrastructure found in the study. They were often built in locations easily accessible to the public, such as in residential areas and adjacent to churches and village offices. However, construction often occurred without the consideration of water sources: this was the main factor determining whether the infrastructure was functional. Clean water sources such as *Penampung Air Hujan (PAH)* and *Penampung Mata Air (PMA)*, can be found in areas with few clean water sources, especially areas with rocky ground and low ground-water surface levels. Even when ground water was present, the location is often far from residential areas, which makes it necessary to have a system to channel water from the spring/water source to a water catchment located near the residential area. Moreover, wells were only found in Jayawijaya, used as clean water sources or to support latrines.

Other buildings found in the study were Meeting Venues, Posyandu, and Talud/Soil-slope supporting walls. In 2013, many communities in mountainous areas chose to build meeting venues, which function also as village offices. In addition to functioning as village PNS workplaces, the meeting venues were also used as places for community members to gather and have discussions, as well as guest houses for village guests.

3.2 Infrastructure Quality

3.2.1 Infrastructure Quality of PNPM in General

This study uses 5 categories: excellent, good, sufficient, insufficient, and poor. Of the 96 infrastructure units surveyed, about 74% are of acceptable quality. From that number, 19% are 'sufficient', 34% are 'good', and 21% are 'excellent': about 55% are either 'good' or 'excellent'. 26% fall under 'insufficient' and 'poor', as elaborated in the chart below.

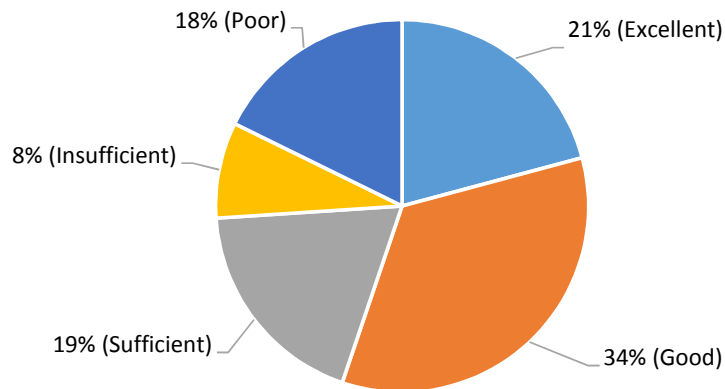


Figure 3 Chart of total infrastructure quality.

The outcome of this study has not differed much from the 2012 study commissioned by the PSF, which focused only on infrastructure (it was not BE-focused), and occurred in other districts not covered by this study. The 2012 study used 3 different quality categories: 71% of surveyed units were of high quality, 21% were of sufficient quality, and 8% were failures. Another PPK evaluation study cycle (4) in 2005 used 5 different categories: 70% of the infrastructure units surveyed were good or better than good quality, 16% were moderate, and 14% scored low. Factors affecting the quality of these infrastructure units will be discussed further in the following sub-chapter.

3.2.2 Infrastructure Quality and Technical Facilitator Types (BEIII, Regular and Non-Technical)

There is no significant correlation between the categories of facilitators (BEIII, regular, or non-existent and the quality of completed infrastructure. For each category, we found units with excellent, good, sufficient and poor quality. In each of the three categories, the percentage of infrastructure with excellent, good and sufficient quality is larger than those ranked insufficient or poor.

The percentage of infrastructure ranked 'excellent' was larger in sub-districts with BEIII technical facilitators. If we combine the three categories of excellent, good and sufficient, there is no major difference between BEIII & regular technical facilitators with engineering degrees. In sub-districts facilitated by BEIII technical facilitators, 66% of the units scored excellent, good or sufficient, while in sub-districts with regular technical facilitators, 77% scored excellent, good or sufficient.

Table 4 Infrastructure Quality According to Technical Facilitator Categories

Categories of Technical Facilitators	Units of Infrastructure Quality (%)					Total Units (%)
	Excellent	Good	Sufficient	Insufficient	Poor	
Barefoot (BE)	11 (29%)	8 (21%)	6 (16%)	6 (16%)	7 (18%)	38 (100%)
Regular (REG)	5 (15%)	15 (44%)	6 (18%)	1 (3%)	7 (20%)	34 (100%)
Non Teknik (NT)	4 (17%)	10 (42%)	6 (25%)	1 (4%)	3 (12%)	24 (100%)

In addition, sub-districts that were not facilitated by any technical facilitator scored higher in the 'excellent' category than sub-districts with regular technical facilitators. As for infrastructure units that were graded insufficient or poor, in non-facilitated areas the rate was 16%, compared to 34% in BEIII sub-districts and 23% in regular sub-districts.



Latrine in Pasir Putih, Fak Fak Tengah, Fak Fak

PAUD in Makotiamsa, Mayamuk, Sorong

Figure 4: Infrastructure units with excellent quality in sub-districts with BE facilitators.

This result does not indicate that the quality of BEIII facilitator is better than regular technical facilitators, nor does it show that the presence of NO facilitator can result in a better outcome than an area with a BEIII or regular facilitator present. When supplemented by qualitative data, results indicate that BEIII technical facilitators, with the support of other parties, can produce design quality and RAB that relatively similar to that produced by regular facilitators. Other factors shape these results, namely: TPKK and labor quality; the communication, negotiation and supervision quality of technical facilitators during the implementation stage; village social dynamics; and other factors also affects the quality of infrastructure. These factors are elaborated upon in the next sub-chapter.

3.2.3 Infrastructure Quality by Region

Fak Fak hosted the highest of excellent, good and sufficient quality infrastructure, at 95% (11% excellent, 68% good, and 16% sufficient). Sorong comes second, with 85%. On the other end of the pendulum, Jayawijaya scored last, with 47% of projects found to be insufficient (18%) or poor (29%).

Seven sub-districts had 100% of their infrastructure units fall under the excellent, good and sufficient quality: Klamono (NT), Fak Fak (BE), Kokas (REG), Kondaga (NT), Pisugi (NT), Sentani (NT) and East

Sentani (REG). 4 of these 7 sub-districts were not technically facilitated. There were also 2 sub-districts with 100% of infrastructure units rated insufficient or poor: Unurum Guay (BE) and Walaik (NT). As previously mentioned, sub-districts with technical facilitators produce varied results in terms of infrastructure quality. Sub-districts with no technical facilitators performed better than ones with technical facilitators mainly because there already existed a selection system that will be explained in **Sub-chapter 3.2**.

Table 5 Infrastructure Quality (%) by Region

District	Quality of Infrastructure					Total
	Excellent	Good	Sufficient	Insufficient	Poor	
Sorong	69%	8%	8%	-	15%	100%
Fak Fak	11%	68%	16%	-	5%	100%
Mimika	-	13%	56%	6%	25%	100%
Tolikara	-	50%	20%	20%	10%	100%
Jayawijaya	29%	24%	-	18%	29%	100%
Jayapura	19%	38%	14%	10%	19%	100%

Table 6 Infrastructure Quality (%) by Sub-district

District	Sub-District	Quality of Infrastructure					Total
		Excellent	Good	Sufficient	Insufficient	Poor	
Sorong	Klamono (NT*)	60%	20%	20%	-	-	100%
	Salawati (REG**)	75%	-	-	-	25%	100%
	Mayamuk (BE***)	75%	-	-	-	25%	100%
Fak Fak	Fakfak Tengah (BE)	33%	67%	-	-	-	100%
	Fakfak Tengah (NT)	-	56%	33%	-	11%	100%
	Kokas (REG)	-	100%	-	-	-	100%
Mimika	Kuala Kencana (REG)	-	20%	50%	-	30%	100%
	Wania (BE)	-	-	67%	17%	16%	100%
Tolikara	Goyage (REG)	-	50%	-	25%	25%	100%
	Yuko (BE)	-	50%	25%	25%	-	100%
	Kondaga (NT)	-	50%	50%	-	-	100%
Jayawijaya	Pisugi (NT)	50%	50%	-	-	-	100%
	Walaik (NT)	-	-	-	100%	-	100%
	Walelagama (REG)	-	60%	-	-	40%	100%
	Wesaput (BE)	44%	-	-	23%	33%	100%

District	Sub-District	Quality of Infrastructure					Total
		Excellent	Good	Sufficient	Insufficient	Poor	
Jayapura	Sentani (BE)	33%	33%	17%	17%	-	100%
	Sentani (NT)	-	50%	50%	-	-	100%
	Sentani Timur (REG)	29%	57%	14%	-	-	100%
	Unurum Guay (BE)	-	-	-	33%	67%	100%
	Unurum Guay (NT)	-	33%	-	-	67%	100%

*NT = Non-Technical

**REG = Regular

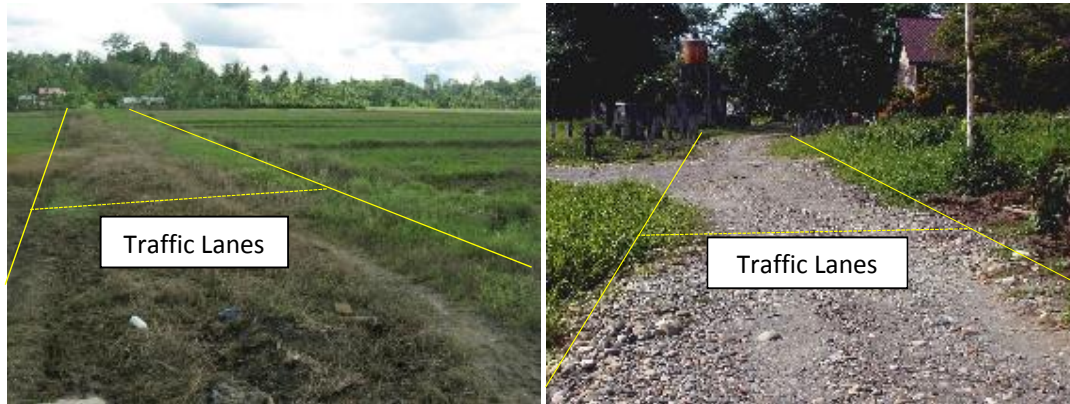
***BE = Barefoot

Fak Fak Tengah, Kokas and Sentani Timur hosted technical facilitators that were proactive and knowledgeable of design, budgeting, supervision and reporting. These sub-districts are not far from cities, have good road connections, and logistics costs are significantly low in comparison to areas such as Jayawijaya. The availability of experienced workers and TPKK were also factors in the success of these sub-districts.

As for the two lowest scoring sub-districts, Unurum Guay and Walaik (both with 100% insufficient and poor infrastructure), the negative results are not solely attributable to the facilitator: a clan war is ongoing in Unurum Guay and the area is extremely insecure, while Walaik is very remote: it is difficult to access, has never been supervised, and there are no skilled laborers available.

3.3 Frequently Encountered Technical Problems

- **Preliminary Survey Quality in determining the location of 'wet' infrastructure (toilets, clean water, wells).** Before construction begins, a technical facilitator is required to conduct a survey based on forms found in the PTO⁴, in order to gather information on springs and so determine the ideal location of infrastructure units. In reality, the survey done by facilitators often only includes measurement, and completely ignores spring locations and other issues regarding ground water levels. Given the presence of land and other conflicts, communities have often decided the location of infrastructure without considering the type of infrastructure or the suitability of the location to the type. To avoid conflict, technical facilitators often follow the will of the community. And so the project often fails;
- **Road Hardening** was not done, especially with the opening of new roads. Lack of funding and lack of adequate tools is often blamed for the lack of the road hardening process, even though both technical facilitators and laborers are aware of how essential the process is. The consequences of budgeting for the process would be a shorter road or increase in costs. The researchers encountered cases involving roads that were not hardened: an example is found in Utikini 2 village, where the road was built in a swamp. The residents used sandstone to construct the body of the road without building a sturdy foundation first. The road is being 'reclaimed' by the swamp and is barely used;



A road in Majaran, Salawati, Sorong

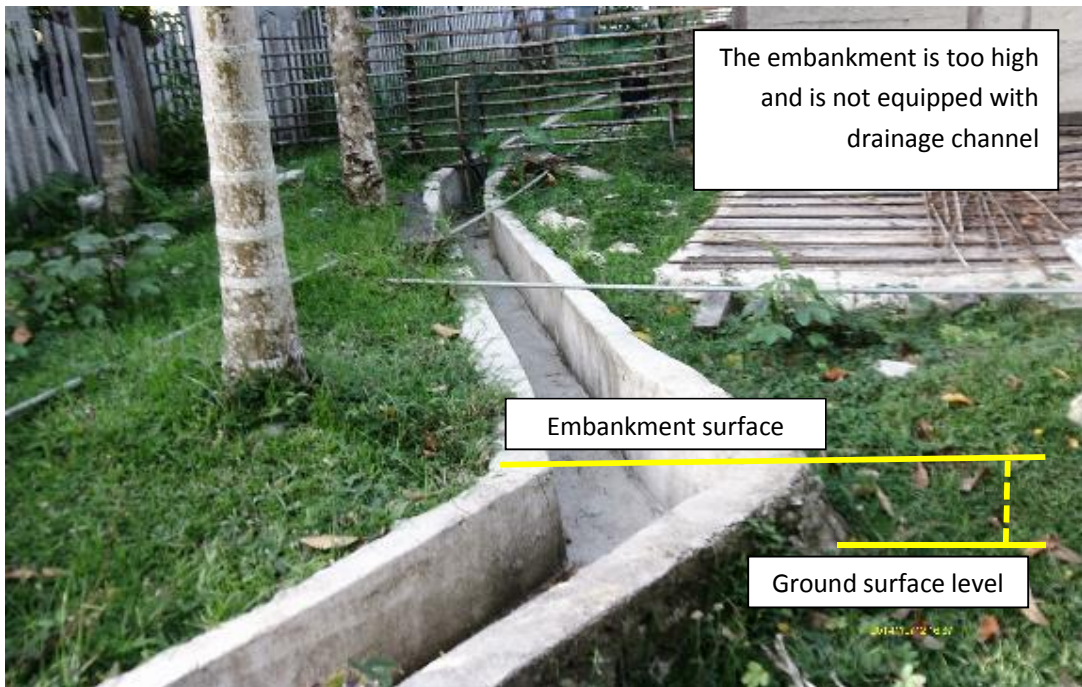
A road in Utikini 2, Kuala Kencana, Mimika

Figure 5 Unpaved road infrastructure.

- **Drainage systems** are an essential part of road construction. The lack of drainage systems in road construction is often found in mountain roads. The inconsistent water flow and pooling will rapidly degrade the road, and erosion on recently constructed roads is already obvious.

The study has also discovered drainage systems with embankments higher than the surface level of the road. This actually lends to greater pooling on the roads;

- **Septic tanks too close to clean water sources.** Public toilets are usually equipped with a supply of clean water, and a few have more than adequate supplies. According to Indonesian National Standard (SNI) 03-2916-1992, which provides specifications on wells and clean water sources, the horizontal distance from the well to the ground water flow or a source of contamination (septic tank) must be greater than 11 metres, while the distance from a wells to a communal living space must be more than 50 metres. The researchers discovered numerous PNPM-constructed public toilets where the distance to a well is between 4-6 metres. This will have a significant impact on the quality of clean water. Facilitators warn that the water cannot be used as drinking water or for food preparation, but whether they are listened to is another matter. This would not have been an issue if standards were abided;



Embankment in Kokas, Kokas, Fak Fak

Figure 6 Drainage system with embankment higher than ground surface level.



Latrine, Wara, Pisugi, Jayawijaya

Figure 7 Water well built too close to a septic tank.

- **Costly Material.** In inaccessible regions like Tolikara and rural Jayawijaya, construction work has to minimize materials that are not sourced locally, such as factory-made materials like cement, plywood, and steel reinforcement. Technical facilitators and their village counterparts almost always replace or modify designs to match the availability of materials in the area- rocks and

wood. Some of the locally sourced materials are of good quality, such as ironwood, which has the benefit of becoming stronger through use. Even though locally sourced materials have become an alternative to factory-made materials, facilitators need to be aware of how some substitutions can affect infrastructure quality. The study has discovered use of cracked and crooked wood that will affect the ability of column blocks to support weight, for example. The lack of experience found in many laborers is accompanied by a lack of knowledge on the appropriateness of the best substitute material, and this could be a factor in lower infrastructure quality.

3.4 Factors Affecting Infrastructure Quality

The quality of BEIII technical facilitators and their support system including the strategies employed by faskab (technical district facilitators) and overall infrastructure planning system, from the infrastructure planning and preliminary survey through to the design and budgeting phase, are more than adequate to produce infrastructure with good or sufficient quality.

For infrastructure quality to be either better or worse than good or sufficient, other factors are at play, and can generally be categorized as:

- The ability of technical facilitators to identify issues, and their ability to then facilitate and negotiate with the local community to solve these issues in the infrastructure implementation phase;
- The quality of TPKK and skilled laborers in the village;
- Accessibility;
- Community social dynamics.

These factors are discussed below.

3.4.1 Quality of Technical Facilitators

A. Facilitator Quality in the Infrastructure Planning Phase

In the planning phase, the researchers found no significant difference between BEIII and regular technical facilitators. Five out of 7 BEIII technical facilitators were able to carry out a standard planning process to produce designs and budgets that are of similar quality to regular technical facilitators: from the preliminary survey (measurement, filling in survey form and documentation), ToS (Take of Sheet) production, and budgeting, up to the design of most of the infrastructure units (especially buildings, bridges, drainage and public toilets).

Similarities in design and budget quality were not mainly attributed to technical facilitator capacity; the availability of support inside the PNPM system, and the ability to easily access information on lessons learnt from previous experience whenever a technical facilitator faces a problem, are big factors. And BEIII technical facilitators do face difficulties at the preliminary stages: compared to their counterparts with engineering degrees, they struggle with the ToS and design more frequently. However, as the above mentioned 5 BEIII technical facilitators actively sought support and help, especially from their technical *faskab*, regular technical facilitators or BEIII specialists, they were able to solve the problems they faced. The facilitators are also adept at using previous designs, ToS,

budgets and reports as training materials for their work. Successful BEIII facilitators also seek advice from other sources: ex-colleagues working in construction industry, TPKK, skilled and experienced laborers, and family members who are considered as experienced in the construction industry, as illustrated by the story below:

Box 1: BEIII technical facilitators with above average abilities

"There is a certain level of satisfaction working for PNPB, the community we work with is grateful and thankful for our help."

The BEIII technical facilitator from Sentani sub-district was an accounting student. When she was accepted into the BEIII program, she took a leave of absence from her studies. She is dedicated to her job and is highly respected as a result. She doesn't hesitate to seek advice other facilitators, counterparts and supervisors. After initial difficulties, she completes designs and budgets on her own, and now other BEIII graduates come to her for help. Just as she benefitted from the advice of others, she always shares her knowledge on, for example, calculating the volume of work to the TPKK, so that in the future, the workload of facilitators will be reduced, while the capability of TPKK will increase. Another female facilitator has 75% of her infrastructure units graded as excellent, good or sufficient, even though she has no technical background. She struggled with initial designs from existing suggestions, and initially relied on the advice of a family member in the construction industry; soon she was able to do the designs of bridges and other infrastructure on her own.

In the planning stage (survey, design and budget), technical facilitators struggle the most with road infrastructure, especially the opening of new road and the clean water sourcing for infrastructure like public toilets and water wells. With road infrastructure, especially new road opening, difficulties arise because new road openings aren't systematically included in the initial residential training, and when they seek advice from the technical *faskab*, they are often ignored. Technical facilitators could often only measure, document and fill in the survey form, without being able to identify ground conditions in order to decide whether extra work, such as additional soil, is required. For public toilets and water wells, the survey work done by technical facilitators revolves around measurements, with no emphasis on the availability of clean water sources; facilitators often just take the community's word that such a source is available, without verification and negotiation. The researchers also discovered that there are technical facilitators who have not completed designs, because of their lack of experience and capacity. Technical facilitators have been rotated to minimize the problems caused by this lack of capacity whilst the weaker engineers receive additional mentoring.

B. Technical Facilitator Quality in the Implementation Phase (Supervision)

Most designs and budgets are of adequate quality. But in the implementation stage, struggles occur. One of the major influencing factors in the highly critical implementation phase is the capability of technical facilitators in their supervisory work. Local labor and the TPKK face issues that technical facilitators aren't present to help resolve. In the implementation stage, most technical facilitators (57% of BEIII, and 67% of regular) only minimally supervise. They visit mainly for reporting purposes, or only when there is a problem flagged by the TPKK.

For minor problems in implementation (cement mixing, polishing/finishing of works, surface levelness/incline), both regular and BEIII technical facilitators are generally able to solve problems on their own. However, in the event of serious problems such as TPKK/ *tukang* deviating from the approved design; conflict between village actors; or complications relating to initial decisions (technical facilitators were unable to revise the initial plan), both BEIII and regular facilitator found it difficult to resolve problems. The supporting system, such as social and technical *faskab*, were not helpful either.



Figure 8 Concrete staircase, Ifar Besar, Sentani.

Box 2: Problems and Solutions for a technical facilitator in Sentani

The community in Ifar Besar, Sentani, requested a concrete staircase ascending a hillside in their area: the facilitator tailored its design to fit the terrain for safe and comfortable use. She then left it to the TPKK, who organized local labor for the construction. When the facilitator returned to spot check, she found that the design was altered by the TPKK: the gradient of the stairs was now too steep- enough to be a safety issue for users. She requested for the TPKK and laborers to abide the original design, and tough negotiations occurred: the TPKK and laborers were all older and more experienced than her. She sought support from her supervisors and the head of the village, and carefully and repetitively explaining the safety issues resulting from the gradient. The TPKK ultimately reverted to the original design, albeit with the beginning section of the stairs still steep.

3.4.2 Quality of Supporting Actors: TPKK and *Tukang*

TPKK and *tukang* make the difference in whether a project is very good or very poor. This study found that 90% of TPKKs were good quality: were able to select experienced *tukang*, were able manage *tukang* to build infrastructures according to the approved RAB and design, and were able to identify potential problems during infrastructure building. This is because the chosen TPKK were local community members who had knowledge of building construction, and previous experience with PNPM (as the program began in 2007, there are a high number of experienced TPKK). Of the 20 infrastructure units categorized as Very Good and 33 categorized as Good, around 75% and 76%, respectively, were found in villages with experienced TPKK. There were a handful of cases where the chosen TPKK were incompetent and were only chosen due to their influence in the village. Some of these failures have not been re-elected. A small number of extremely poor-quality TPKK had dire impacts upon construction. One TPKK changed a design to suit his own fund calculations, without consulting technical facilitators. Another TPKK in Timika changed a bridge design: due to a lack of supervision from a weak facilitator, the bridge was constructed, and it failed.

TPKK usually handpick local *tukang* experienced in construction for buildings, bridges and latrines. For simpler construction likeroads, drainages and talud (retaining wall), work is delegated to the wider community and coordinated by a *tukang* selected by the TPKK. Experienced *tukang* were able

to give inputs to TPCKs. Some *tukang* are able to identify if a design is flawed or not suitable to field conditions. For example, the *tukang* in Matawolot gave inputs to TPCK and technical facilitators in order to increase the width of the culverts, because the design given by the technical facilitators was insufficient to accommodate the high water flow during the rainy season.

3.4.3 Accessibility

The easier the access, the better the chance for infrastructure to be of very good, good, or moderately good quality. This study confirms the correlation between quality and accessibility, attributable to two factors:

- a. Locations with better accessibility have better availability of experienced TPCK and *tukang* candidates. In locations with lower accessibility, there were few experienced TPCK and *tukang*, resulting in lower quality human resources. Often in inaccessible locations, *tukang* from outside would be employed, or the community would propose infrastructure types that would not require special skills, such as road building (it's unfortunate that road pioneering is considered to be a low-skilled project, when the opposite is true if the road is to last beyond a rainy season). This is also the case with materials;
- b. Due to the limited number of experienced *tukang* and TPCK, technical facilitator roles are all the more crucial. Technical facilitators were expected to assist the community in building the chosen infrastructure. However, this was not an easy task, as technical facilitators were faced with time constraints: the implementation stage, from the initial first phase of fund disbursement to the reporting of fund utilization after the second disbursement, was less than 1.5 months. This in combination with low accessibility limited the technical facilitator's role in supervising implementation.

3.4.4 Community Social Dynamics

Existing conflicts in communities, and the desire of PNPM staff to avoid possible conflicts with communities, impacts infrastructure quality, as does the penalty levied upon villages during the next annual budgeting.

An example of the impact of these dynamics is again found in failed latrines and wells. Fragmented communities demanded latrines and wells in exclusive areas that would ensure that neighbors they were in conflict with would not use them; neighboring clusters demanded the same. Conflict was the determining factor in unit location, not water, and there was not enough water to supply these units. As a compromise, often units were built in churches or at the village office, but these also lacked convenient water sources and were eventually abandoned after they became filthy. This failure has much to do with the planning stage undertaken by social facilitators.

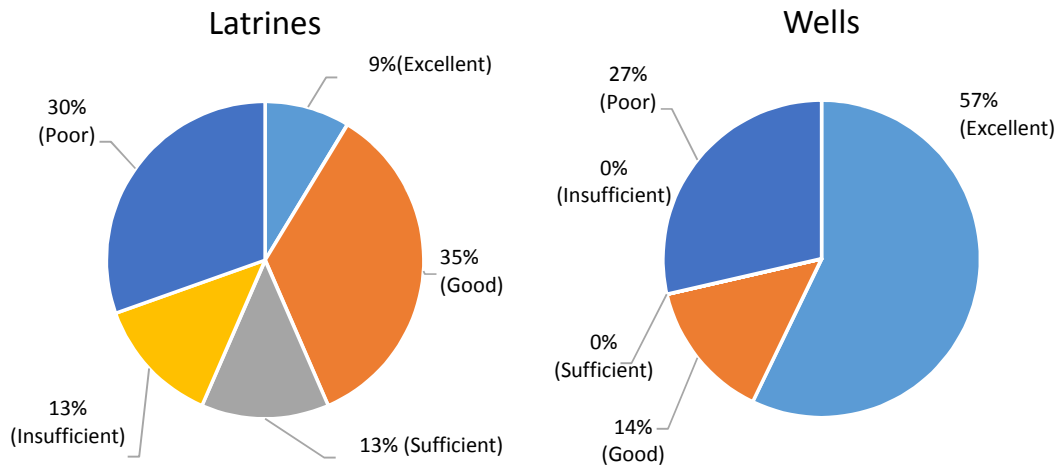


Figure 9 Quality of latrine and well infrastructure (percentage).



Latrine (2013) in Sawesuma, Unurum Guay, Jayapura

Bridge(2012) in Gabage, Kondaga, Tolikara

Figure 10 Examples of infrastructure where quality was affected by social dynamics.

The study found 3 cases where conflicts resulted in poor and very poor infrastructure quality.

Conflict over land ownership and use often affects infrastructure, especially in opening new roads. Land in Papua is communally held by clans and extended families: there is no 'unclaimed' space, and use of land for projects requires extended negotiations and often compensation for the party holding the land. But limited funds and the lack of a compensation structure for land has become the biggest challenge for communities and technical facilitators. Many community members will willingly

give up a portion of their land if they consider the project to be a public good with a tangible benefit. But often, community members refuse. As construction might begin before negotiations are complete, this often results in half-completed and abandoned projects. For instance, a planned concrete road project in Sorong was terminated when it was half-complete because the son of the landowner demanded compensation, despite the fact that his father already approved the construction.

Political conflict impacts projects as well. In Tolikara, for example, electoral conflict killed dozens in 2012, and the conflict continues between two factions, the Bogoga (affiliated with Golkar) and the Wanui (affiliated with Partai Demokrat). This conflict has repercussions down to the grassroots, although little violence occurs now, and much of what did occur was concentrated in Karubaga. Public infrastructure was destroyed in the previous violence, including a PNPM-RESPEK bridge that was the only transport connection Ganage had with Karubaga. The bridge was hastily rebuilt by villagers with planks of loose wood, posing a danger to users.

Conflicts involving TPKK also occur, with some failed projects resulting in the expulsion of TPKK from their communities.

Social dynamics complicating projects are the norm in much of Papua: but violence and project failure are not as common. Social and technical facilitators must continuously pay attention to effective socialization in order to obtain widespread support for the program that crosses the social boundaries of conflict. Support from *Faskab* and government officials (at the village, sub-district and district level) can also assist in overcoming such conflicts, but some- like Tolikara, as well as Puncak- are not manageable, and pose an unacceptable risk to the program.

3.5 Strategies to Build Infrastructure in Sub-Districts without Technical Facilitators

Infrastructure built in sub-districts where there are no technical facilitators have surprisingly positive grades: the study shows that 20 infrastructure units out of 24 built with no technical facilitation were rated by the researchers to be excellent, good, or moderately good- 83%. This success is attributable to *Faskab* strategy to plan projects according to the limitations imposed by such absence:

- Firstly, social facilitators actively argue against infrastructure planning that will be beyond the scope of the project to provide. They encourage fund reallocations for scholarships, foodstuffs, educational materials for schools, and so on. If the community still proposes infrastructure, the *Faskab* assesses the readiness of social facilitators and village actors, based on an evaluation of previous work. Unfortunately, the social facilitators often take on technical roles, such as conducting surveys, field supervision, and technical report writing. Meanwhile, villagers actors become directly involved in the building process, including villagers with construction experience. There are cases where a complete lack of skills and competence do not dissuade villagers from choosing infrastructure: when this occurs, the *Faskab* might argue for cancellation by announcing that funding from the next annual budget will be cancelled in the event of project failure or incompleteness;

- *Faskab* may involve technical facilitators from other sub-districts, especially those with more experience and who have completed assigned tasks, to assist a sub-district with no technical facilitator. Their main task would be to assist with design and budget planning based on the surveys conducted by the social facilitator;
- *Faskab* have also taken over technical facilitator duties in making design and budget plans. For instance, the Jayawijaya *Faskab* has done design and supervision in select remote sub-districts. This is not an uncommon practice. This work is especially difficult in Tolikara, which has a low number of technical facilitators (FTs) and due to pemekaran, there are now 36 sub-districts. *Faskab* are reportedly expected to perform examinations on at least 500 infrastructures within one-fiscal year;
- *Faskab* allocate FTs to areas that are less accessible and concentrate FT-vacant sub-districts closer to the district capitals where the *Faskab* works. This allows for their increased supervision of non-FT areas to work more smoothly due to the ease of access. The chances of project success are also increased when the sub-district is closer to the district capital, because of the presence of more skilled *tukang*, more experienced TPKK, and the ability to bring in outside labor from the district capital.

3.6 Operations, Maintenance and Utilization

3.6.1 Operations and Maintenance (O&M)

The study found that most infrastructure did not have clear O&M plans or procedures, and that projects had no special caretakers. Roughly 18% of studied units had systematic O&M, and 44% of the infrastructure had unsystematic O&M. 38% had no form of O&M.

The types of infrastructure with systematic O&M had assigned caretakers from the beginning: for Posyandu and meeting halls, for example. Posyandu had midwives or nurses as their main caretakers, and meeting halls would be taken care of by village officials. All the maintenance would be delegated to those mentioned, ranging from sanitation to routine minor repairs.

Infrastructure with unsystematic O&M were public: roads, latrines, and water catchments (PAH/PMA). After construction, infrastructure is 'handed over' to the community, with a kepala dusun acting as a coordinator who organizes O&M on an ad-hoc basis.

Infrastructure with no O&M occurred in infrastructure with heavy public use but no assigned caretakers, such as public latrines. These were deteriorated and unusable.

3.6.2 Utilization

This study categorizes utilization into 5 categories: (1) Inclusive, daily, (2) Inclusive, not daily (3) Exclusive, daily, (4) Exclusive, not daily (5) No utilization. Exclusive infrastructure refers to infrastructure utilized only by a small portion of the community, such as a particular family/kin group or the population of a limited residential area. Inclusive infrastructure refers to infrastructure utilized by the general public, and not limited to a certain group. These categories are further divided into daily and non-daily use, based on frequency of utilization.

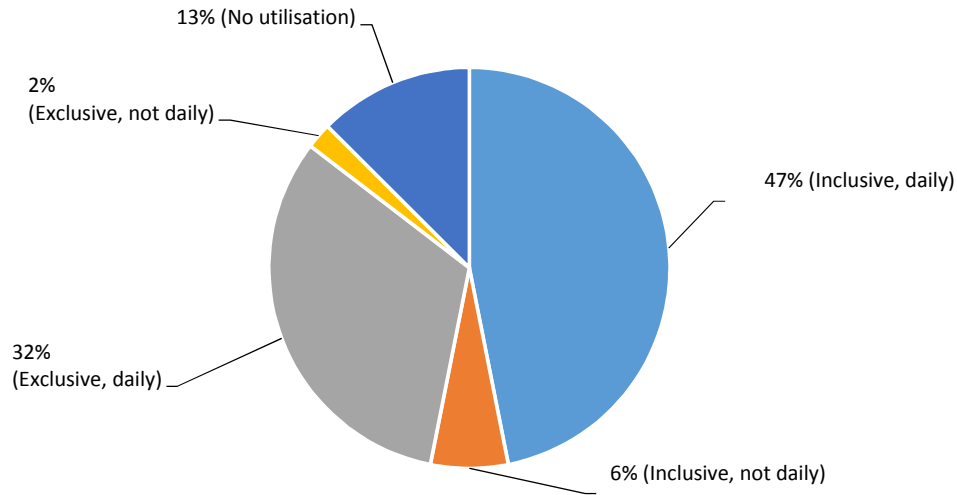


Figure 11 Utilization in 6 districts.

Ideal utilization would be inclusive and routine, such as the case of the PMA in Tiri village, where a water catchment tank stores spring water. The PMA is close to residential areas, enabling community members to obtain water from it as needed, unlimited by time or amount of water.



Village hall in Walelagama, Jayawijaya



Latrine in Kama, Wesaput, Jayawijaya

Figure 12: Examples of infrastructure utilized by the community.

Infrastructure with exclusive utilization were more often found in water projects such as PAH, wells and PMA: often these projects are located in locations which makes it impossible for community members outside of a certain group/family from accessing/utilising the infrastructure. Exclusive utilization was more often found in highlands regions like Jayawijaya.

12% of the studied infrastructure was unused, usually because of damage or because the project was never completed.

3.7 Social and Environmental Safeguards

3.7.1 Environmental Safeguards

Around 13% of infrastructure had potential environmental pollution issues:

- Flooding, caused by blocked culverts, as well as drainage levels which were higher than the surrounding land surface, where water cannot flow into drainage channels;
- Land pollution, such as improper waste disposal from latrines;
- Water pollution, especially from placement of septic tanks close to wells;
- Logging, especially in highland areas which infrastructure is characterized by use of wood. Logging activity is increasing and the landscape is slowly being configured through unsustainable logging practices, especially in the Baliem.

3.7.2 Social Safeguards

Technical facilitators prioritize the clarification of land ownership status due to previous experiences where conflict arises from contested land being used. After the community agrees to give up a portion of their land, technical facilitators fill out consent forms to be signed by the village head, witnessed by TPKK and the community.

Out of all studied infrastructure, land-related issues were only found in the opening of new roads. Not all community members were willing to voluntarily give up a portion of their land for such infrastructure. Technical facilitators and TPKK frequently conducted negotiations with community members who objected to the project or who demanded compensation for their land (compensation is not allowed under PNPM-RESPEK). Community members have been convinced to donate land after protracted negotiations, but such outreach is not always successful.

This study also found that one village had prepared a system regarding land ownership status. The head of village together with traditional leaders made a deal that whichever of their community members were affected by the development program, he or she must voluntarily give up the land. The whole community with no exception must respect this agreement. When there were still community members who did not approve of the agreement, they would have to speak directly with traditional leaders and head of village.

4. CONCLUSIONS AND RECOMMENDATIONS

4.1 Conclusion

This study found that 74% of surveyed PNPM-RESPEK infrastructure projects are other excellent quality (21%), good quality (34%), or sufficient quality (19%). The remaining 26% were of poor or insufficient quality. Failures occurred for many reasons, including: lack of detail in initial surveys; design not suitable to the location; minimum distances between various components of infrastructure did not fulfill the SNI; the price of materials; availability of water sources; accessibility; lack of supervision and facilitation quality of FTs; lack of local human resources including TPKK and *tukang*; disputed land; and conflict.

The study shows that there is no marked difference in the quality of infrastructure between sub-district assisted by BEIII technical facilitators, regular technical facilitators, or no technical facilitators. In almost all conditions, the proportion of infrastructure with acceptable quality (Sufficient, Good, and Excellent) was higher than those of unacceptable quality (Insufficient and Poor). In sub-district with BEIII technical facilitators, there was a higher proportion of infrastructure rated excellent quality when compared to sub-districts with regular technical facilitators. And sub-districts with no technical facilitators were still able to produce infrastructure of acceptable quality.

Although BEIII technical facilitators still encountered difficulties, especially in ToS and design drawings, the planning system for infrastructure under PNPM-RESPEK was efficient, and the support structure in place for BEIII graduates helped them produce designs and budget plans of comparable quality to regular technical facilitators; this was assessed through design drawing/ template archives, and expenditure reporting. With supervision from technical *faskab*, and in the absence of extreme factors affecting the implementation of infrastructure such as violent conflict, or the severely poor quality of TPKK and *tukang*, BEIII technical facilitators performed to the same standards as regular technical facilitators.

BEIII technical facilitators were aware of their relative inexperience and this led them to proactively seek guidance and assistance from technical *faskab*, colleagues, and friends. BEIII technical facilitators, particularly those with PNPM background (former village facilitators or TPKK) were more active in seeking consultations on designs and budget plans with technical *faskab* as well as experienced TPKK or skilled *tukang*.

BEIII facilitation still requires special attention, especially at the supervision of implementation stage where many issues arise, including local conflicts and/ or changes to the design made by TPKK or *tukang*. At this stage, regular supervision and continued facilitation must occur so that problems are fixed as they occur. The quality of facilitation at these stages needs to be emphasized during specialized trainings.

Although the study found that the majority of TPKK were of good quality, when they and *tukang* faced (or sometimes created) problems, facilitation from social and technical facilitators, with *Faskab* assistance, must occur: facilitation and problem-solving do not end with the start of

implementation. Community conflicts were more difficult to solve and the ability of facilitators to overcome these issues when they put projects in jeopardy was limited at best. And with their burden of work- facilitating project allocations from two funding streams every fiscal year, completing and reporting upon projects, travelling to distant compulsory meetings- they do not have time to take on additional tasks. Hopefully the upcoming village law block grants will learn from the lessons PNPM has to offer and create a new supportive structure for that project's facilitators.

4.2 Recommendations

BEIII produced skilled technical facilitators to fill a chronic human resources gap in Papua, and supported them with mentoring and training. These graduates are successes especially when paired to experienced TPKK and *tukang*.

4.2.1 Barefoot Technical Facilitators

The BEIII training program could be improved in effectiveness through the following proposed amendments: (1) Improving the quality of BE teachers/trainers and selecting those with substantive experience in PNPM, particularly in Papua; (2) involving regular technical facilitators who have proven teaching skills, in order for them to share their experiences with problems and solutions to the myriad problems graduates will face; (3) instituting a training curriculum which puts more emphasis on hands-on training/practice, using a good variety of templates and infrastructure types; (4) modules and trainings related to facilitation and effective communication as well as negotiation with village actors, especially TPKK. A more in-depth study is required to look into the effectiveness of the initial residential training modules. This recommendation emerged from interviews with various informants, including BEIII technical facilitators, technical *faskab* and technical specialists.

4.2.2 Technical

- Technical facilitators must ensure the presence of clean water sources for “wet” infrastructure, considering the depth of ground water surface, the distance to the water source, and the soil conditions. This is to prevent infrastructure from losing function due to the absence of clean water. Further, facilitators must discuss with TPKK and the community the most suitable place for such infrastructure, and not allow for projects to be built in areas where the project will ultimately fail. *Faskab* must also ensure the presence of clean water in building “wet” infrastructure. When there was infrastructure with survey data that did not include the presence of clean water, the *Faskab* must provide a special note of consideration and disallow the building of the proposed infrastructure until a clean water source can be guaranteed;
- The hardening of roads should be an important part in road construction, especially in opening new roads with soft ground surfaces. This process was often missed in the construction project as the cost of hardening is relatively expensive and requires heavy machinery. Facilitators must be able to explain to the community the importance of the hardening process. Road pioneering without this process should be disallowed;
- The study found drain channels with sidewalls higher than the ground surface, meaning that water cannot enter the drain channels and remains puddled. To avoid such occurrence, facilitators must ensure that drainage channels occur according to the design and local

conditions. In addition, facilitators must ensure that water can flow easily into the channels. Building special channels in the form of input pipes or special channels along the “dam” within determined distances can also mitigate this;

- Facilitators must ensure that the distance between septic tanks and wells meet SNI standards, to avoid well pollution. When the community decides a location, the *Faskab* can assist in explaining to the community about the minimum distance required between wells and septic tanks;
- The price of materials is a common problem in Papua, especially in the highlands. This often results in design modifications after the project has begun. For areas which have poor accessibility and expensive transport costs, local material should be prioritized in the design stage. Lastly, *Faskab* or specialists should create templates for infrastructure using wood.

BIBLIOGRAPHY

AKATIGA 2010, *“Marginalized Groups in PNPM”*, AKATIGA Foundation, Bandung.

AKATIGA 2012, *“Evaluation of PNPM RESPEK: Village Infrastructure and Institutional Capacity”*, AKATIGA Foundation, Bandung.

PNPM Mandiri Perdesaan 2009, *“Panduan Supervisi Efektif PNPM”*, PNPM Mandiri Perdesaan, Jakarta.

PSF 2012, *“Infrastruktur PNPM Mandiri Perdesaan: Laporan Evaluasi Teknis 2012”* (*“PNPM Mandiri Perdesaan Infrastructure: Technical Evaluation Report 2012”*), PNPM Support Facility (PSF), Jakarta.