

SOCIAL AND ENVIRONMENTAL IMPACT OF **THE COMMUNITY RANGERS PROGRAM IN ACEH**

NOVEMBER 2015

LAURA PALER · CYRUS SAMII
MATTHEW LISIECKI · ADRIAN MOREL



Acknowledgements and Disclaimer

Financial and other material support for the Community Rangers Program (CRP) Impact Evaluation came from the World Bank Consolidating Peaceful Development in Aceh Trust Fund, the World Bank Office in Indonesia, and World Bank Development Economics-Operations and Strategy/ Development Impact Evaluation Initiative (DIME).

Laura Paler (Department of Political Science, University of Pittsburgh), Cyrus Samii (Department of Political Science, New York University), Matthew Lisiecki (consulting analyst for the project) and Adrian Morel (Social Development Program, World Bank, Indonesia) prepared this report. Larry Chavis (Kenan Flagler School of Business, University of North Carolina) was part of the team that, along with Paler and Samii, designed and led the implementation of the evaluation since its inception in 2010 through endline data collection in 2013. Paler and Samii developed the analysis plan, which was circulated publicly in 2013-14 prior to receipt of the endline data in 2014. Paler, Samii, and Lisiecki carried out the data analysis and drafting of this report in 2014.

Suci Landon served admirably as the CRP Impact Evaluation Field Coordinator. We received field support from the World Bank staff in the Banda Aceh office, including Muslahuddin Daud and Didit Setiawan. Erin Lin (Department of Politics, Princeton University) worked as field coordinator during the pilot phase of the impact evaluation. Ryan Knox (Lawrence Berkeley National Laboratory) developed the satellite forest imagery for use in our analysis.

The evaluation was carried out in close cooperation with Fauna and Flora International (FFI), the lead implementing organization for the CRP. We are grateful to the FFI team, led by Matthew Linkie, for working with us through every stage of the evaluation. Baseline and endline surveys were conducted by JRI Research, Indonesia, under the direction of Rita Maria. Endline environmental assessments were carried out by Perkumpulan Rincong under the direction of Helene Barnes.

We received helpful feedback on the evaluation design and analysis plan from Peter Aronow, Radu Ban, Grant Gordon, Macartan Humphreys, Arianna Legovini, Jacob Shapiro, Johannes Urplainen, and seminar participants at the DIME Development Impact Evaluation in Fragile States workshop (Dubai, 2010), Columbia University Seminar on the Study of Development Strategies (New York, 2011), Columbia University Workshop on Field Experiments in Environment and Energy (New York, 2013), and Experiments in Governance and Politics at University of California, Berkeley (2014). We received excellent comments on the report from Tim Brown, Pablo Cuevas, and Audrey Sacks.

The findings and interpretations in this report are entirely those of the authors. They do not necessarily reflect the views of any of the above-named organizations, affiliated entities, or other individuals.

SOCIAL AND ENVIRONMENTAL IMPACT OF
**THE COMMUNITY RANGERS
PROGRAM IN ACEH**

NOVEMBER 2015

LAURA PALER · CYRUS SAMII
MATTHEW LISIECKI · ADRIAN MOREL

TABLE OF CONTENTS

GLOSSARY	iv
EXECUTIVE SUMMARY	vi
1.INTRODUCTION	1
2.THE CONTEXT	3
Reconstruction Assistance and the CRP	4
3.METHODOLOGY	7
3.1 Evaluation questions	7
3.2 Treatment assignment	8
Ranger Randomization	8
3.3 Sampling and data sources	8
3.4 Outcome variables	9
3.5 Estimating effects	12
3.6 Background characteristics	12
3.7 Attrition in the ranger candidate sample	12
4.CRP IMPLEMENTATION	15
4.1 Reported exposure to the CRP	15
4.2 Experience with the CRP program	16
5.OUTCOMES AND IMPACT ESTIMATES	19
5.1 Social Outcomes	19
5.1.1 Summary Statistics	19
5.1.2 Impact Estimates	23
5.1.3 Summary of Results for Economic and Social Outcomes	28
5.2 Environmental Outcomes	28
5.2.1 Summary Statistics	28
5.2.2 Impact Estimates	34
5.2.3 Summary of Environmental Results	39
6.DISCUSSION AND CONCLUSION	41
REFERENCES	44

LIST OF TABLES

Table 1. Social outcome themes, indices, and data sources	10
Table 2. Environmental outcome themes, indices, and data sources	11
Table 3. Descriptive statistics for social outcomes - Youth	20
Table 4. Impact estimates on social indices - Youth	24
Table 5. Impact estimates on economic variables - Youth	24
Table 6. Impact estimates on relationship variables - Youth	25
Table 7. Impact estimates on esteem variables - Youth	25
Table 8. Impact estimates on acceptance variables - Youth	26
Table 9. Impact estimates on bad behavior variables - Youth	26
Table 10. Descriptive statistics for environmental outcomes - village heads	30
Table 11. Descriptive statistics for environmental outcomes - environmental assessments	31
Table 12. Descriptive statistics for environmental outcomes - household heads	33
Table 13. Impact estimates on environmental indices - village heads and environmental assessments	34
Table 14. Impact estimates on environmental variables - Village heads	36
Table 15. Impact estimates on environmental variables - Environmental assessments	37

ANNEXES

All annexes can be accessed online via the following link: <http://dx.doi.org/10.7910/DVN/SEG008>

GLOSSARY

AFEP	Aceh Forest and Environment Project
Bappenas	National Development Planning Agency
BPKEK	Badan Pengelola Kawasan Ekosistem Leuser
BRA	Aceh Peace-Reintegration Board
CPDA	Consolidating Peaceful Development in Aceh
CRP	Community Rangers Program
FFI	Fauna and Flora International
GAM	Gerakan Aceh Merdeka
GoA	Government of Aceh
GoI	Government of Indonesia
MDF	Multi Donor Fund
MSR	Multi-Stakeholder Review
REDD+	Reduction Emissions from Deforestation and Forest Degradation
UNFCCC	United Nations Framework Convention on Climate Change



EXECUTIVE SUMMARY



The Pela Beungga Rangers, in Tangse, Pidie, helped neighboring communities when the Tangse valley was flooded in 2011. Over 200 families had to abandon their houses. Floods are a consequence of deforestation.

This report presents the results of a randomized evaluation of the impact of the Community Rangers Program (CRP), a community-based forest protection program implemented in Aceh, Indonesia, in 2011-14. Fauna and Flora International (FFI) implemented the CRP with funding from the Consolidating Peaceful Development in Aceh (CPDA) Trust Fund of the World Bank. The evaluation was undertaken by a team of independent researchers based at universities in the United States.

The CRP was implemented in the context of alarming deforestation in Aceh following the end in 2005 of nearly 30 years of civil conflict. The design of the program was sensitive to two realities. First, the rapid economic growth and development enabled by the end of the conflict was increasingly straining efforts to protect and maintain the environment, resulting in widespread illegal logging and deforestation. Second, much of the illegal logging in Aceh was perpetrated by former combatants and at-risk youths who found themselves with few skills and economic opportunities following the resolution of hostilities.

The CRP therefore had two primary and complementary objectives: (1) to improve the economic and social integration¹ of at-risk youths in Aceh by creating an alternative to illegal logging, and (2) to enhance environmental awareness and protection at the community level in Aceh. It aimed to achieve these goals through a set of reinforcing activities in which it identified at-risk youths, trained them to work as forest rangers, and tasked them with undertaking activities designed to promote environmental protection, as well as the youths' standing and integration within their communities. These activities included forest patrols, community outreach,

and the management of new, environmentally sustainable livelihood projects. The livelihood projects were meant to serve as a form of in-kind compensation to rangers, as well as a method for demonstrating to host communities that there are alternative, profitable modes of agriculture that have a less damaging environmental footprint than traditional modes.

To evaluate whether the CRP achieved these goals, the program was accompanied by a rigorous randomized evaluation with a multi-level design that sought to estimate the causal effects of the CRP on both environmental and social outcomes. To assess the effects on environmental outcomes, 14 of 28 forest-edge communities in the Ulu Masen forest area in Aceh were randomly selected to participate in the CRP. To assess the effects of serving as rangers on the social integration of at-risk youths, from a larger pool of 452 eligible candidates within the 14 CRP 'treatment' communities, 280 such youths were randomly selected to serve as rangers and 172 were assigned to a control group. Additional observational analysis and data collected in the non-CRP treatment Leuser National Park addresses potential spillover concerns. The evaluation employs data from individual, household, and village-head surveys, as well as ground-sourced environmental assessments, to measure the effects of the CRP.

The results show that the CRP succeeded in improving economic outcomes for rangers on a number of dimensions. The economic outcomes of interest included both objective measures of wellbeing (income and household poverty), as well as more subjective measures associated with perceptions of economic status and economic conditions. Overall, the program had positive and significant effects on all subjective measures of economic welfare. We find, for instance, that the CRP caused an 18 percentage point increase in the share claiming that their income is higher than that of others their age, and a 50 percentage point increase in the share stating that they are living comfortably on their current income. We also find strong positive effects of the CRP on life satisfaction, which could reflect a better economic situation. These findings are consistent with the somewhat weaker result that the CRP increased total income for rangers, although little evidence of improvements was found in other poverty indicators. Importantly, these positive economic findings coincide with an 8 percentage point *reduction* in the share self-reporting that they had engaged in illegal logging activity in the previous year. This suggests that the CRP had the desired effect on several of the economic outcomes of interest.

¹ In the context of this report "social integration" or "social inclusion" refer to the acceptance of participants in their community and their constructive engagement in the community's social life.

The effect of the CRP on other social outcomes, such as social integration and acceptance, is weaker, which is not surprising given that the data suggest that these areas were not necessarily a problem for these youths to begin with. We find that the CRP caused a positive and significant increase in participation in community groups, driven by greater participation particularly in farmers' and women's associations. There is also weak evidence that the CRP made rangers feel more respected relative to others their age and reduced fighting with family members, although the economic and social benefits of the program were notably limited to the participant youths and are not necessarily reflected in the views of other community members towards this group. Generally speaking, however, we observe little effect of the CRP on social outcomes, such as family and peer relations, self-esteem, and community acceptance. This is consistent with the fact that the data indicate that at-risk youths in Aceh are not necessarily confronting a lack of social integration within their communities—on the whole, data from youth, household, and village head surveys all indicate a relatively high level of acceptance.

With regard to environmental outcomes, the effect of the CRP is mixed. Among the main environmental objectives of the CRP were to reduce harmful forest usage and increase awareness of the benefits of environmental conservation. The results indicate that the CRP had a positive effect among household and village heads on attitudes towards the potential benefits from forest use and REDD+ projects,² but had little impact on actual behavioral change directly related to forest usage; we find very weak evidence for reductions in logging and poaching at the village and household levels.

Critically, however, there is strong evidence across three separate data sources that the CRP unexpectedly *increased* mining activity. This increase plausibly concerned only small mining operations, the impact of which pales in comparison with that of larger and more environmentally damaging logging or mining operations in the region. This points to a potential unintended spillover effect of the CRP: by discouraging illegal logging and poaching, the program might have channeled people into other environmentally harmful activities that were not explicitly monitored by the CRP. Alternatively, it could be the case that rangers discovered new opportunities for mining during patrols. This finding highlights the importance of thinking more holistically about how individuals substitute their forest-based activity with other potential sources of income generation, especially in the case that these alternate economic activities are equally or even more environmentally damaging than ongoing forest activities.

Overall however, we find that the CRP was well designed when it came to creating a program that generated benefits for participant youths. The results from the impact assessment, which provides valuable information for policymakers, development partners, development organizations, and academics, suggests that there is indeed scope for programs such as the CRP to improve economic outlook and present alternatives to illegal logging, although some modifications to the program concept would seem to be necessary to extend the benefits beyond the immediate youth participants themselves.

Going forward, our findings suggest ways that follow-on programs could do more to promote conservation-minded development more broadly. First, such programs should be more holistic in the way that conservation goals are pursued, as gains from the CRP in reducing illegal logging and poaching were offset by the increase in mining. Program designers need to anticipate how individuals may substitute their forest-based activity with other potential sources of income generation and whether the pursuit of forest conservation objectives may generate opportunities for other activities that are environmentally undesirable. Second, to increase the impact on environmental conservation behaviors, future interventions should consider generating benefits that extend to communities more broadly. In designing a program with community-wide benefits, one would have to be careful to ensure that incentives were meaningful when dispersed community-wide. Such benefits may also have to be made conditional on would-be beneficiaries' conversion to more conservation-friendly practices to actually affect behavior. Under such arrangements, enforcement mechanisms would also be important.

A revised version of the CRP could have rangers play a role similar to agricultural extension agents who facilitate transition to new, environmentally friendly techniques. This kind of effect was hoped for with the CRP, but with no plan in place to make it happen there was almost no transfer of knowledge or practices from rangers to the communities. Generally speaking, further programming should seek broader direct participation from community members in sustainable livelihood activities and broader engagement with community members in promoting the value of environmental conservation.

² REDD+ refers to "reducing emissions from deforestation and forest degradation in developing countries, and the role of conservation, sustainable management of forests, and enhancement of forest carbon stocks in developing countries". It is a mechanism that has been under negotiation by the United Nations Framework Convention on Climate Change (UNFCCC) since 2005, with the objective of mitigating climate change through reducing net emissions of greenhouse gases through enhanced forest management in developing countries.

1

INTRODUCTION

INTRODUCTION



Rangers use pengajian (Quranic study) to discuss conservation issues with local youths. Here, the head of the Keumala Rangers in Pidie.

This report presents the results of a randomized field experiment designed to evaluate the effects on forest conservation and social integration of the Community Rangers Program (CRP), a community-based forest protection program in Aceh, Indonesia. The CRP was implemented in the Ulu Masen forest area in Aceh, Indonesia in the period 2011-14. Fauna and Flora International (FFI) implemented the program with funding provided by the World Bank in Indonesia through the Consolidating Peaceful Development in Aceh (CPDA) Trust Fund (TF) of the World Bank.

The CRP had two primary goals: (1) to improve the social integration of at-risk youths, and (2) to strengthen environmental protection at the community-level. These objectives are related in that, following the 2005 resolution of a nearly 30-year separatist conflict in Aceh, there were numerous young 15- to 25-year-old former combatants who lacked the skills and experience to obtain employment in the wake of the conflict. Many of

these youths instead turned to illegal logging to generate income. The CRP sought to identify these at-risk youths, train them to work as forest rangers, and enable them to undertake activities within their communities that would support broader environmental conservation goals, such as forest conservation and sustainable agriculture. A central prediction in the logic of the program anticipated that the provision of services to communities would translate into social integration benefits for rangers and enhanced social cohesion at a collective level.

To assess effects on environmental outcomes, 14 of 28 forest-edge village clusters in the Ulu Masen forest area in Aceh were randomly selected to participate in the CRP. Outcomes were assessed in four villages per cluster using household surveys, village head surveys, satellite data measuring actual deforestation rates, and ground-sourced environmental assessments. To assess effects on the socioeconomic situation of at-risk youths, 258 youths were randomly selected as participants from a larger pool of 388 eligible candidates within the 14 treatment communities. This implied a treatment group of 258 youths and a control group of 130 youths. The study surveyed youths in treatment and control communities, as well as households, and village heads, to measure the effects of serving as a Ranger on economic welfare and social acceptance. Additional observational data collected in 56 matched villages in the Leuser National Park addressed potential spillover concerns.

While the complexity of the CRP program makes it difficult to identify the causal effect of any particular intervention component, analysis of the reduced form treatment effects nonetheless provides valuable information to policymakers, development partners, development organizations, and academics on the political economy of forest protection, especially in developing and post-conflict contexts.

2

THE CONTEXT

THE CONTEXT

The Indonesian province of Aceh has undergone a dramatic and positive transformation since the devastating earthquake and tsunami of December 26, 2004. The signing of the Memorandum of Understanding (MoU) between the Government of Indonesia (GoI) and the Free Aceh Movement (*Gerakan Aceh Merdeka*, or GAM) in Helsinki on August 15, 2005, brought peace to the province after a 29-year-long separatist conflict that resulted in some 30,000 deaths and the displacement of over 400,000 people (MSR, 2010).³ The end of violence and the resulting improvement of the economy, successful elections and increased provincial and district fiscal revenues all bode well for the future of the province. Cementing peace and economic growth, however, is a long-term process. International experience shows that post-conflict societies face immense challenges and the ongoing risk of relapse into violence.

Aceh's economy sustained severe damage from the combined impacts of the conflict and the tsunami. The financial costs of the tsunami alone were estimated at US\$4.1 billion in damage to productive infrastructure and economic losses (Bappenas, 2005). The economic cost of the conflict was estimated at US\$10.7 billion, with the productive sector in rural areas, agriculture and small enterprise bearing the brunt of damage and losses (MSR, 2010). The conflict also deterred local and international investment outside of the oil and gas sector, and depleted human capital as skilled and educated workers sought safety and employment opportunities outside the province (World Bank, 2009). In the period 2000-05, Aceh was the only province in the country in which poverty rates continued to rise (World Bank, 2008).

The return to peace and the massive inflow of reconstruction assistance in the wake of the tsunami led to enormous social and economic improvements. Massive investments in infrastructure, health, and education services produced a construction boom, the effects of which have directly or indirectly benefitted large swathes of the population. By 2006, poverty figures

in Aceh had returned to pre-tsunami levels, and the economy continued to grow through early 2009. The boost in economic growth contributed to the easing of the economic reintegration of former combatants and conflict-affected groups by presenting them with employment opportunities. In 2008, 85 percent of ex-combatants enjoyed full-time employment (MSR, 2010).

However, as of 2009, Aceh's economy remained fragile, and the sustainability of economic gains was far from secure. Poverty levels remained far above the national average. The construction sector was stagnant or contracting, and the same was true of the agriculture sector, both of which were shedding jobs. Workers formerly employed in these sectors were exiting the work force rather than finding employment in other sectors (World Bank/Bank Indonesia, 2008; MSR, 2010).

The result was a potentially dangerous demographic and economic situation. International experience shows that unmet economic expectations of improved welfare can lead to increased crime and violence, especially if shared by youths, broadly defined as those aged 15-25 (Urdal, 2004). The risk of violence rises in particular when these grievances are shared by youths with a strong collective identity, such as a common ethnicity or shared experiences of combat during conflict (Urdal, 2004). In 2009, 50 percent of Aceh's population was under the age of 25,⁴ and there was a large cohort of former combatants aged 15-25 who lacked skills, education, and work experience, yet possessed high expectations of access to high-paying jobs in the wake of the conflict.⁵ Meanwhile, while initially high levels of employment among male ex-combatants provided stability in the near term, most had taken on unskilled and semi-skilled jobs at the cost of opportunities to upgrade their skills and education. The resulting situation was a potentially explosive combination of economic stagnation coupled with economic and political grievances shared by youths with strong collective identities.

³ The Multi-Stakeholder Review (MSR) of Post-conflict Programming in Aceh was undertaken by the Aceh Peace-Reintegration Board (BRA), the National Development Planning Agency (Bappenas), AusAID, DFID, the Embassy of the Kingdom of the Netherlands, UNDP, the USAID-SERASI Program and the World Bank between May 2008 and December 2009 with IOM contributing in the initial phase. Four years on from the Helsinki MoU, it provides a framework for future policies and programs to consolidate peace and development in Aceh. The MSR employs a comprehensive framework to identify post-conflict needs and issues in Aceh and ways to most effectively respond to them. It considers issues relating to livelihoods and the economy, politics, security and social cohesion, and governance and institutions. This allows for a consideration of the policies and programs that can build the foundations for sustainable peace and development in post-conflict Aceh. The MSR final report was published and disseminated in July 2010.

⁴ 2004 SUSENAS general population data.

⁵ A 2006 World Bank survey of former combatants found that nearly 30 percent of an estimated 15,000 former combatants were aged 15-25.

At the same time, slowing economic growth also had the potential to impact Aceh's efforts at conservation. Up until the resolution of hostilities in 2005, decades of violent conflict shielded the province of Aceh from the intense economic growth pressures felt elsewhere in Indonesia. This left some of the largest, most intact, and most biodiversity-rich old growth forest systems in the world virtually untouched. Aceh's two main forest ecosystems, Ulu Masen and Leuser, cover almost 3 million hectares, an area equivalent to that of the Netherlands (Kasia et al. 2011). Although reliable data are hard to come by, there is strong anecdotal evidence that in the wake of peace, the newly freed-up access to Aceh's forests resulted in widespread illegal logging by ex-combatants and unemployed/underemployed youths. The deforestation rate was estimated at 18,400 hectares per year in the period 2005-09 (Aceh Green), adding to Indonesia's overall alarming rates of deforestation, the scale of which ranks the country just behind the United States and China as country-contributors to the accumulation of greenhouse gases in the atmosphere (Burgess et al, 2012).

Given that these ex-combatants and unemployed/underemployed youths engaged in illegal logging as a low-risk activity that generated income, it may be posited that a slowdown in the economy and related job losses would accelerate the rate of illegal logging. Thus, the absence of sustainable employment opportunities also presented a risk to Aceh's efforts at protecting its natural resources.

With these issues in mind, the Community Rangers Program (CRP) was established in 2011 by arrangement by between the Aceh governor's office, the World Bank's CPDA program, Fauna and Flora International, and an academic research team based in the United States. The CRP was designed to support Aceh's goal to create sustainable employment opportunities for at-risk youths, while also trying to address environmental and conservation concerns. It was developed as a randomized field experiment to evaluate the potential for an integrated conservation, development, and reconstruction program during the administration of the first post-MOU Aceh governor, Irwandi Yusuf (2006-12). Yusuf famously had an intense interest in environmental conservation and sought to integrate conservation goals with post-conflict reconstruction and development goals. In 2008, Yusuf established the "Aceh Green" strategy for environmentally sensitive economic development and reconstruction based on a valuation of the intact forests, and strove for a balance between development and reconstruction priorities and programs that made use of intact forests (e.g., carbon credit sales, eco-tourism, or sustainable agriculture). The World Bank and FFI developed the

CRP with the broader Aceh Green strategy in mind and garnered support from the governor's office on this basis.⁶

The CRP was designed to motivate local communities to contribute to forest conservation by providing local employment in the forestry sector (namely, forest ranger jobs for local youths), instruction on sustainable agricultural practices, protection against forest-based hazards such as elephant raids on crops, and sensitization on the importance of forest conservation. Moreover, by providing environment-related employment opportunities for at-risk youths and former combatants, the CRP sought to contribute to post-conflict social reconstruction. It was expected that the CRP would promote social integration and social stability for at-risk youths by supporting an occupation that would remove them from illegal logging and that would allow them to make contributions to their communities.

Importantly, the CRP was conducted in the context of growing interest in development interventions designed to improve at-risk youths' economic wellbeing and job prospects, particularly in post-conflict environments beyond Aceh. For instance, Blattman and Annan (2014) find that providing 'high-risk' former combatants with skills training and capital improved employment and social integration in Liberia. An important ongoing debate in this literature is over the importance of material versus non-material incentives, such as status, peers, or norms, in encouraging individuals to desist from illegal activity.⁷ The CRP is in a potentially interesting position to contribute to this debate as, while it included some material incentives in the form of (largely delayed) livelihood benefits, it primarily emphasized the role of non-material incentives such as community status and acceptance.

Methodological details of the CRP study are provided below.

Reconstruction Assistance and the CRP

The Community Rangers Program was implemented in Aceh in the context of several previous programs focused on environmental conservation and post-conflict reconstruction. By the end of 2007, post-tsunami rehabilitation and reconstruction commitments in Aceh had totaled US\$7.8 billion, exceeding the estimated amount of funds needed to rebuild the province to pre-tsunami levels, at US\$6.2 billion (Masyrafah and McKeon, 2008). However, Masyrafah and McKeon (2008) found that the environmental sector had not received sufficient funding to cover needs, with an allocation gap estimated at over US\$100 million in 2008.

⁶ Aceh Green and the CRP faced new pressures for fast-paced development and the constraints of government budgets following the 2012 elections, which brought in a new governor, Zaini Abdullah, who did not explicitly endorse the previous administration's approach to conservation. During the years of program implementation in 2013-14, there were concerns that environmental protection might be deprioritized, as evidenced by plans to construct a new road through UluMasen and the Leuser reserve. The government also faced substantial pressure from vested interests keen to accelerate development through deforestation in Aceh.

⁷ For studies on the importance of socialization and non-material incentives, see also Heckman and Kautz, 2013; and Blattman et al., 2014.

Within the environmental sector, a number of local government initiatives were undertaken in the aftermath of the tsunami, with a view to safeguarding local forests. These initiatives included: (i) a logging moratorium introduced in June 2007 to halt conventional commercial logging; (ii) TIPERESKA - A Government of Aceh (GoA) review and re-design of the forestry sector and forest estate in Aceh; (iii) Aceh Green - Governor Irwandi Yusuf's flagship strategy for environmentally sensitive and sustainable economic development in Aceh, described above; (iv) the establishment of a new conservation body (*Badan Pengelola Kawasan Ekosistem Leuser*, or BPKEL) to manage the Leuser ecosystem; and (v) the introduction and ongoing development of sustainable carbon trade revenue mechanisms (through the REDD platform), with a view to securing long-term funding for Aceh to maintain forests and environmental services.

In addition, a major environmental program called the Aceh Forest and Environment Project (AFEP) was undertaken by the international community. Funded via a US\$17.5 million grant from the World Bank-managed Multi-Donor Fund for Aceh and Nias (MDF), AFEP ran from 2006 to 2010. The program aimed to mitigate the adverse environmental effects of the high demand in timber supply resulting from the reconstruction effort. AFEP financed a broad range of activities, including governance interventions (accommodation of environmental and conservation concerns into development planning and spatial plans, support for the preparation of Aceh's REDD carbon market plan - see above), strengthening the institutional capacity of the Ministry of Forestry for forest protection and management, awareness-raising campaigns and forest monitoring. Under AFEP, 10 community-monitoring teams were established across the Ulu Masen and Leuser forests to carry out surveys and conduct patrols and community outreach. Two NGOs, Fauna and Flora International (FFI) and the Leuser International Foundation, were responsible for implementation, in Ulu Masen and Leuser, respectively. Initially, the community monitoring teams established by FFI in two districts of the Ulu Masen area trained and employed just 46 rangers.

To a large extent, the CPDA-funded CRP project, which ran from 2011 to 2014 at a cost of US\$2.6 million, can be regarded as a scale-up of these initial AFEP activities. Fourteen teams were established across six districts under the supervision of senior rangers trained under the AFEP program. There were, however, notable differences in approach. The AFEP community monitoring teams targeted recruitment of former forest crime offenders, whereas the CPDA CRP targeted at-risk youths, defined as unemployed youths under the age of 35, many of whom

were former GAM combatants. Furthermore, the CRP was a multi-faceted intervention designed to achieve goals of institutionalizing support for conservation and promoting social integration by changing community attitudes and behavior in favor of forest conservation. The program also aimed to improve the social integration of at-risk youths who were hired to serve as forest rangers in their communities. Unlike AFEP, the main intended beneficiaries of the CRP were both average households within CRP communities and individuals who would serve as rangers.

Specifically, the main components of the CRP were:

- **Training at-risk youths:** Those individuals selected to serve as forest rangers received skills training on environmental protection, mitigation of human-wildlife conflict, and enhanced agro-forestry and business development.
- **Patrols:** Rangers undertook routine forest monitoring patrols and filed reports on forest offenses to district-level contacts within the police or Ministry of Forestry who had the mandate to make official investigations and take action.⁸
- **Livelihood sub-grant projects:** In each treatment *mukim* (a traditional geographic unit of administration), rangers established one livelihood project that was most relevant to the local geographical area, capacity and markets with an initial grant of US\$23,000.⁹ This program was intended to provide primary material compensation to rangers, aside from per diem received for conducting patrols. Rangers also used the project sites to train community members to undertake more sustainable agriculture. The program aimed to train about 1,200-2,000 community members in enhanced agro-forestry techniques and joint participation in agro-businesses.
- **Safeguard community agricultural livelihoods:** Rangers provided essential support to forest-edge communities to reduce their economic losses due to wildlife conflicts. These most commonly included crop raids by elephants and tiger attacks on livestock. Rangers were on call to immediately respond to local requests to mitigate human-animal conflict.
- **Community outreach and awareness:** Community rangers led outreach and awareness raising campaigns on environmental issues, such as the relationship between intact watershed forests, water quality, and human health. Outreach campaigns also addressed religious issues, such as the teachings of Islam on the environment. FFI supported the rangers in developing the environmental outreach modules, trained the rangers in these modules and their delivery, and where appropriate, worked with cultural leaders and religious leaders.

⁸In 2009, FFI found that 86 of 190 cases reported by community partners in their programming resulted in government law enforcement action.

⁹Livelihood initiatives included establishment of model farms focused on the following themes: poultry farming, soya and legume farming, goat rearing and breeding, fruit tree nurseries, and corn and rice farming.

3

METHODOLOGY

METHODOLOGY



Illegal gold mining operation in Pidie

3.1 Evaluation questions

The scope of this report is to evaluate the impact of the CRP as administered in the Ulu Masen area in the period 2011-13, including impacts on both environmental and social outcomes. The evaluation was especially geared towards evaluating how the CRP, as a decentralized program that provides bottom-up incentives and local capacities for forest conservation, impacted environmental and social outcomes.

It should be noted that the analysis below provides only a partial picture of the dynamics of environmental change and development in Aceh. In addition, our analysis explicitly does not take into consideration the possible effects of other programs, whether prior to the CRP or operating alongside the CRP, although the experimental design and our data suggest that such other programs were just as relevant in both control and treated areas. Thus, our analysis still captures the impact of the CRP, but it does so against the backdrop of whatever activities had taken place prior to the CRP or that were occurring simultaneously.¹⁰

Concerning environmental outcomes, the impact evaluation addresses the question, *to what extent does a community-centered program like the CRP institutionalize local support and capacity for conservation, especially in the face of strong countervailing pressures for immediate resource utilization?* More specifically,

- Do CRP communities express different attitudes towards, and support for, conservation goals than non-CRP communities? For instance, do CRP communities exhibit more support for policy proposals that protect the environment even in the face of pressure for rapid development?
- Do CRP communities engage in less environmentally destructive behavior, or otherwise engage in more environmental protection activities, than non-CRP communities?
- Are instances of illegal logging and human-wildlife conflict lower in CRP communities than non-CRP communities?

Concerning economic and social outcomes, the impact evaluation addresses the question, *to what extent does involving at-risk youths in forest conservation activities within their communities promote social integration of the very socio-economic demographic that often engages in illegal logging?* More specifically,

- Does CRP have a positive impact on the economic welfare of youths serving as forest rangers? For instance, does CRP improve welfare in both objective terms (income, indicators of household poverty) and subjective terms (perceptions of economic well-being and status)?
- Does CRP have a positive effect on the self-esteem and social integration of youths serving as forest rangers? In particular does the CRP increase social 'rootedness' (marriage, children), improve family and peer relations, strengthen participation in community organizations, and increase self-esteem and perceptions of being accepted by the community?
- Does CRP promote trust and respect between rangers and their communities?

¹⁰ To some extent, prior exposure to other development projects addressing similar issues might make it harder for us to detect effects from the CRP as communities could already have been socialized on the messages of environmental protection and social integration, leaving little room for substantial value-add from CRP.

3.2 Treatment assignment

Ranger Randomization

To identify causal effects of the CRP on both conservation and social outcomes, the project design includes multiple levels of randomization and matched comparison. Treatments were assigned in 2011 at two levels. The first level had 14 of 28 *mukim* assigned through block randomization to host program activities. A *mukim* is a traditional geographic unit of administration in Aceh consisting of a few villages. These 28 *mukim* were all forest-edge communities on the edge of the Ulu Masen forest system in northern Aceh. They were selected by the implementing partner, FFI, on the basis of their being strategically well-located sites for observing and potentially interfering with illegal forest activities (namely, logging, poaching, or mining) in Ulu Masen. Prior to randomization, the 28 *mukim* were stratified into three blocks on the basis of ex ante perceived risk of illegal forest activities in the forest area adjacent to each *mukim*. These risks were assessed with data on illegal forest activities that FFI had collected over the preceding two years. The proportion of *mukim* assigned to treatment in each block was variable, and so block-specific assignment probabilities are taken into account in the analysis.

Within the 14 treatment *mukim*, rangers were assigned randomly to treatment and control groups after their eligibility for participation was determined. Eligibility was determined through a multi-stage process. First, FFI met with community representatives to draw up a long list of candidate community rangers, from which a short list would then be constructed. Interested participants had to provide their age, a permit letter, a health certificate, their employment situation, and an ID card to be considered for the long list. Those candidates who met the administrative criteria were then short-listed. FFI staff conducted 10-15 minute interviews with short-listed candidates to ascertain their interest in becoming a ranger. Following the interview, all short-listed candidates completed the self-administered baseline survey, which provides pre-treatment data at the individual level. Finally, after the survey, random selection occurred among all eligible candidates present.

The original goal was for FFI to shortlist 40 candidate rangers per *mukim*, of which 20 would be randomly assigned to treatment and the other 20 to control; in reality, the pool of candidate rangers was sometimes smaller due to a lack of eligible applicants. A restricted randomization procedure was applied that sought to randomly assign 20 candidates per *mukim* to the treatment group with the remainder going to the control

group, in a way that evened out the distribution of selected rangers across all villages within a *mukim*. This was deemed important for political reasons: village members would likely view imbalances across villages in those selected as rangers, even if incidental, as unfair. This in turn could threaten *mukim* and village leaders' willingness to support the program. The restricted randomization implies that individuals' probabilities of treatment assignment vary across villages; these village-specific assignment probabilities are taken into account in the analysis.

The final pool of candidate rangers included 452 youths, of which 278 were randomly assigned to the treatment group and 174 to the control group. We discuss possible spillover effects and our strategy to study them in Annex 7.¹¹

3.3 Sampling and data sources

As we assigned program-level treatment to each *mukim*, which are clusters of villages, the experimental design takes the form of a cluster-randomized experiment for village-level effects. Given the resources available for our sampling strategy, we decided to sample on average four villages per *mukim*. However, as a random sampling approach would have introduced an element of sampling variability, we limited ourselves to a homogeneous subset of villages selected through a propensity score model. Although this strategy limits external validity, we reasoned that it would increase the power to detect an effect for a well-defined subpopulation. We report details on the sampling procedure we followed for villages in Annex 1.¹²

To study village-level effects, we gathered the following types of data:

1. Survey interviews with village heads on demographic, economic, environmental, and social conditions in the villages.
2. Environmental assessment data on environmental conditions collected through informant interviews and direct observation by an environmental assessment team.

We sampled households at random from lists of households enumerated within the selected villages, gathering household level data on demographic, economic, environmental and social conditions and attitudes. Because the number of households varies across villages, the sampling probabilities vary as well; we account for this in the analysis.

The youth data for this analysis come from baseline and endline surveys conducted with treatment and control rangers. The baseline survey was self-administered and was completed by all candidate rangers prior to randomization.

¹¹ All annexes can be accessed online via the following link: <http://dx.doi.org/10.7910/DVN/SEG008>.

¹² All annexes can be accessed online via the following link: <http://dx.doi.org/10.7910/DVN/SEG008>.



In the mountains of Mane, raids by wild elephants are common and represent a threat to the livelihoods of local communities. Local rangers use tamed elephants to drive the wild ones away.

3.4 Outcome variables

The impact evaluation studies a variety of social and environmental outcome variables. These are classified according to themes. Table 1 and Table 2 list each of the themes for social and environmental outcomes, respectively. The tables also display corresponding sets of indices for each theme, data sources, the number of raw variables feeding into each index, and the direction of the hypothesized effects for each index.

The indices used to measure outcome variables are sometimes constructed out of collections of raw variables from the surveys, environmental assessments, or satellite data. The number of raw variables feeding into each index is shown in Table 1 and Table 2 as well. To construct an index from multiple raw variables, we use inverse covariance weighted averages of the standardized raw variables. This method is explained in Anderson (2008), and provides a way to guard against multiple testing problems when working with sets of variables while also increasing the power of index-specific hypothesis tests.¹³ In the results section below, we show estimates of treatment effects for these indices. To provide more nuance, we also show estimates on the component raw variables.

As Table 1 shows, social outcomes are divided into themes of the youths' economic outcomes; rootedness in the community, family, and friends; future outlook, self-esteem and the youths' perceptions of their acceptance in the community; bad behavior; and then community perceptions of the youths' integration into the community. These capture various dimensions of "social integration," both from the vantage point of the youths themselves and their community members. For each of the themes, the various indices explore different facets, including both subjective and objective indicators, and indicators relating to different facets of social life.

Table 2 shows environmental outcomes that are divided along the themes of environmental impact of development and human settlement; forest crimes; human wildlife conflict; and institutional capacities for conservation. These themes then involve various indices constructed from the village head surveys, household surveys, environmental assessments, and satellite data. The indices capture outcomes related to environmental conditions prevailing in and around the villages, as well as community member attitudes towards conservation outcomes.

¹³ Prior to constructing indices from multiple raw variables, we analyzed correlation matrices containing the component raw variables to ensure that each index was reasonable in terms of the component raw variables being positively correlated with each other. In some cases we transformed variables or excluded some that had originally been proposed for inclusion if they fared poorly in this analysis.

Table 1. Social outcome themes, indices, and data sources

Theme	Index	Data source	# of variables	Direction of hypothesized effect
Youth economic outcomes	Objective economic welfare	Youth surveys	5	+
	Subjective economic welfare	Youth surveys	4	+
	Human capital	Youth surveys	2	+
Roots in the community, family, and friends	Roots in the community	Youth surveys	3	+
	Good relations with family	Youth surveys	3	+
	Positive peer characteristics	Youth surveys	6	+
	Negative peer characteristics	Youth surveys	4	-
Future outlook and self-esteem	Life satisfaction	Youth surveys	4	+
	Positive self-esteem	Youth surveys	6	+
	Negative self-esteem	Youth surveys	3	-
Acceptance in the community	Participation in communal activities	Youth surveys	10	+
	Positive community relations	Youth surveys	4	+
	Negative community relations	Youth surveys	4	-
Bad behavior	Logging	Youth surveys	3	-
	Fighting	Youth surveys	2	-
	Conflict with police	Youth surveys	3	-
	Tensions in community	Youth surveys	2	-
Integration	Community acceptance of youth	Village head surveys	2	+
		Household head surveys	2	+
	Negative community feelings towards youth	Village head surveys	4	-
		Household head surveys	4	-
	Ability of youth to lead a decent life	Village head surveys	1	+
		Household head surveys	1	+
	Youth crime	Village head surveys	2	-
	Perceived tension with youth	Village head surveys	4	-
Household head surveys		4	-	

Table 2. Environmental outcome themes, indices, and data sources

Theme	Index	Data source	# of variables	Direction of hypothesized effect	
Environmental impact of development/human settlement	Infrastructure/roads constructed without pre-construction EIA	Env. assessment	2	-	
	Area converted from forest to farmland/plantation (via burning/hot spots, cutting, etc.)	Env. assessment	3	-	
		Satellite	1	-	
	Composting, picking up trash and otherwise reducing everyday environmental degradation	Env. assessment	1	+	
Forest crimes	Frequency of illegal logging events	Village head surveys	3	-	
		Env. assessment	8	-	
		Household head surveys	3	-	
		Satellite	1	-	
	Frequency of illegal mining events	Village head surveys	2	-	
		Env. assessment	6	-	
		Household head surveys	1	-	
	Frequency of illegal poaching events (tiger traps, etc.)	Village head surveys	1	-	
		Env. assessment	3	-	
	Community awareness of forest crimes, ability and willingness to discuss them	Village head surveys	1	+	
		Household head surveys	14	+	
	Human-wildlife conflict	Frequency and destructiveness of animal attacks	Village head surveys	1	-
			Env. assessment	2	-
			Household head surveys	2	-
Institutional capacity for conservation	Institutions for conservation activities/events and participation in such institutions.	Village head surveys	3	+	
		Household head surveys	7	+	
	Confidence in capacity to stop illegal logging	Village head surveys	2	+	
		Household head surveys	2	+	
	Confidence in capacity to stop illegal poaching	Village head surveys	2	+	
		Household head surveys	2	+	
	Existence of ongoing resource disputes	Village head surveys	1	-	
		Household head surveys	1	-	
	Perceptions that other community members have pro-conservation attitudes	Village head surveys	4	+	
		Household head surveys	4	+	
	Pro-conservation attitudes when asked about themselves	Village head surveys	11	+	
		Household head surveys	11	+	
	Community belief that they will benefit from REDD	Village head surveys	1	+	
		Household head surveys	1	+	
	Community belief that they will benefit from conversion activities	Village head surveys	1	+	
		Household head surveys	1	+	
	Ability to protect from animal attacks	Household head surveys	1	+	
Knowledge of environmental regulation	Household head surveys	2	+		

3.5 Estimating effects

Details on the statistical methods used to estimate and test for the significance of effects are presented in Annex 8,¹⁴ which is a technical appendix. In summary, we estimated effects using linear regressions, presenting estimates without control variables and, as a robustness check, estimates that control for baseline variables that were found to be out of balance across treatment and control groups. Such covariates are identified in our analyses of baseline data as set forth in the sections below. The regressions also account for the fact that treated communities and youths were selected on the basis of a block-stratified design and that all households in a community were assigned together to a common treatment condition. Spillover analysis (Annex 7)¹⁵ was run using data from non-randomized control youths in non-CRP *mukim* and communities located in the Leuser area. The statistical models for the spillover analysis were based on the same core specification as models used to estimate effects with the randomized-experimental data. Section 10 describes attrition over time in our ranger sample, which we accounted for using the weighting method to account. In addition, the survey data occasionally exhibited missing values for variables (never exceeding 5 percent, however). To deal with such missing values, we used regression-based imputation.

3.6 Background characteristics

Annex 2¹⁶ presents and discusses detailed descriptive statistics on the villages included in the study, the youths who were part of the ranger candidate recruitment pool, and the non-experimental controls from the non-CRP *mukim* in the Ulu Masen area. The data show that agriculture predominated among household livelihoods, with rice being the main crop. On average, the villages contained around 130-150 households, with about half of the villages being multi-ethnic. The treatment, control, and Leuser communities are balanced on these variables. Many households hosted migrant workers, a factor that is important when evaluating occupational options for youths who might participate in the ranger program. This variable is somewhat out of balance across the treatment conditions, and the analysis below checks robustness of our results to control for this variable.

With respect to forest and environmental conditions, the villages tend mostly to be located inland, along rivers, and on moderately hilly terrain. The groups appear to be balanced on factors such as terrain, the presence of

rivers, and the incidence of slash and burn practices and floods. However, the type of forestland (conservation vs. production forest) differs across the treatment conditions, so this is another factor for which we control in the analysis below.

For the ranger candidates, the mean age was 27.29 (about 10 percent) were women.¹⁷ 21 percent were engaged or married, and between a half and two-thirds had at least a high school education. Most of the candidates (83 percent) were underemployed, suggesting a scarcity of attractive economic opportunities in the region. As for conflict exposure, 90 percent of candidates reported being affected by the conflict in some way, for instance having private property damaged or being displaced. As for illegal logging, 12 percent of candidates admitted cutting trees illegally, while about half of them expressed support for the need of villagers to log in order to earn income. We control for imbalances in these variables across treatment and control groups in the analysis below.

3.7 Attrition in the ranger candidate sample

Unsurprisingly, our ranger candidate sample suffered some attrition over the duration of the program. Attrition here means that candidate rangers in both the treatment and control groups who completed the baseline survey did not participate in endline data collection. Overall, attrition was on the order of 7 percent in the treatment group (20 of 278) and 25.3 percent in the control group (45 of 174). On average, attrition was about 14 percent (65 of 452). Extensive effort was made to locate missing treatment and control rangers, including consulting with village leaders and family members who were most likely to know their whereabouts. Table 19 in Annex 3¹⁸ presents results from a logistic regression using data from the baseline survey to identify the determinants of attrition. The results show that candidates were substantially less likely to go missing if they were assigned to the treatment group and if they had at least a high school education. They were significantly more likely to go missing if they had a history of exposure to illegal logging (they had previously been asked to cut and/or transport trees for illegal loggers). Since attrition, particularly differential attrition in treatment and control groups, has the potential to bias estimates of treatment effects, we therefore account for it by weighting observations by the inverse of their predicted probability of being observed. The predicted probabilities are generated from the logistic regression reported in Table 19.

¹⁴ All annexes can be accessed online via the following link: <http://dx.doi.org/10.7910/DVN/SEG008>.

¹⁵ All annexes can be accessed online via the following link: <http://dx.doi.org/10.7910/DVN/SEG008>.

¹⁶ All annexes can be accessed online via the following link: <http://dx.doi.org/10.7910/DVN/SEG008>.

¹⁷ Women were welcome to apply to become rangers. However, social and moral norms often prevented them from doing so. Acehese rural communities typically disapprove of unmarried women mixing with men, especially when this happens out of sight of the community (forest patrols etc).

¹⁸ All annexes can be accessed online via the following link: <http://dx.doi.org/10.7910/DVN/SEG008>.



Small-scale gold mining operation in Pidie.

4

CRP IMPLEMENTATION

CRP IMPLEMENTATION



Monitoring illegal logging with the Sungai Mas Rangers.

In this section, we discuss the implementation of the CRP. First, we assess whether people in non-CRP localities had exposure to the program, which allows us to discuss possible spillover effects. Second, we examine attitudes towards the program within treated localities and among youths selected to become rangers. Supporting this is a brief summary of the results of analysis of implementation, while a more detailed discussion with tables and figures can be found in Annex 4.¹⁹

4.1 Reported exposure to the CRP

We have used data from three sources, namely village head, household head and youth surveys, to investigate: (1) the extent to which CRP activities were actually observed in treated communities; and (2) the extent to which they were confined to CRP locations or whether they spill over into neighboring areas. We compare data from various indicators to ascertain differences between the treatment group and the two non-CRP control groups (consisting of *mukim* in Ulu Masen and Leuser) for household heads and village heads. In general, we find that the program was highly visible in treated communities and that spillovers were very limited, although the survey data suggest that spillovers may have occurred to a limited degree among village elites.

For example, in a survey of household heads, answers to the CRP awareness questions differed sharply between the treatment group and the control group. Household heads in CRP villages were far more likely to have heard of the CRP, while household heads in non-CRP villages in Ulu Masen were only slightly more likely to have heard of the CRP than their counterparts in Leuser. In other words, there was a little spillover in knowledge of the CRP program in control villages in Ulu Masen compared with pure control villages in Leuser. The question on seeing CRP patrols shows similar differences between villages in different treatment conditions.

¹⁹All annexes can be accessed online via the following link: <http://dx.doi.org/10.7910/DVN/SEG008>.

Evidence of spillovers among village heads was only slightly stronger. When asked whether they had heard of the CRP, the vast majority of treated area village heads had heard of it and had witnessed CRP ranger patrols. None of the non-Leuser village heads, as expected, had heard of it at all, while about a quarter of non-CRP Ulu Masen village heads had heard of it a little. Similarly, no village head in Leuser reported seeing rangers on patrol, while about 20 percent of non-CRP Ulu Masen village heads did. These data suggest that, among village elites, spillovers may have occurred, but to a limited degree, supporting the conclusion that if spillovers did occur, these were likely to be limited to village-level elites.

Data from the youth survey turned up similar conclusions, with sharp contrasts in awareness between the CRP and non-CRP *mukim*. More than 50 percent of control youths in ranger *mukim* were aware of the rangers, whereas the vast majority of non-control youths in control *mukim* in Ulu Masen or Leuser *mukim* had not heard of them at all. Similarly, almost all control rangers had seen the treatment rangers at work, whereas almost none of the youths in the control or Leuser *mukim* had been exposed to rangers. This supports the conclusion that spillovers were limited across communities.

4.2 Experience with the CRP program

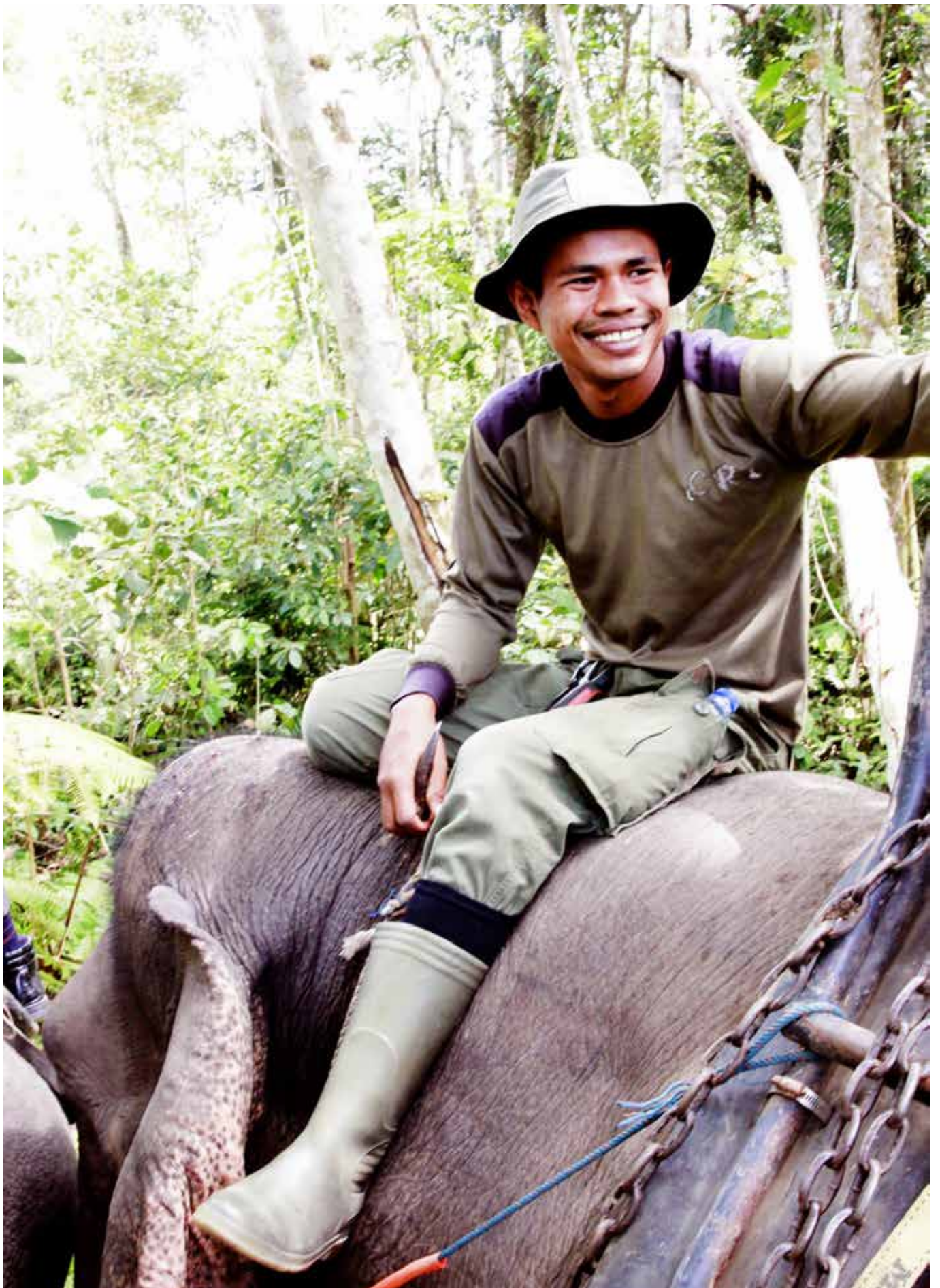
Various indicators from the youth survey were used to understand “what it meant” to be a ranger rather than a non-ranger youth, and to ascertain if ranger activities differed from normal youth activities. Some social activities had high rates of participation for both ranger and non-ranger youths, for instance participation in meetings with village and *mukim* heads, working on livelihood projects, and helping to resolve conflicts of different sorts. However, for each activity, being a ranger had a significant positive effect on whether or not a youth participated in an activity. The effect was particularly strong for community outreach, assisting with natural disasters, and participating in Quran readings. Indeed, an analysis of reported ranger conservation and promotion activities suggests that such activities tended to consist of meetings with *mukim* and village leaders, forest patrols, community outreach, village cleanups, and Quran readings. Besides these conservation-promotion activities, the rangers ran sustainable livelihood demonstration projects in their home *mukim*. Examples of activities in such projects include land preparation, food garden preparation, the purchase and care for new livestock, nursery construction, seedling purchase and development, and veterinary care. With respect to village heads and household heads, the ranger activities reported by interviewed village and household heads tend to be consistent with what rangers reported themselves.

Data from the survey also help us understand how rangers understood the material benefits offered by the livelihood

program. A majority (58 percent) of rangers indicated that their livelihood programs had started to generate some income. For those who reported that the activities had not yet started generating income, nearly 79 percent expected that it would take at least another two years to start receiving income from the project. Evidence on expected material benefits suggests that most rangers saw the livelihood program as something that might deliver a one-time benefit (e.g., from the rearing and then sale of livestock) rather than something that would provide a long-term source of income, as only a few of them expected benefits to extend to the second post-program year. Rangers also expressed an intention to divide income from the livelihood equally among them, but that they tended not to view such income as meant to be shared with the broader community. This is consistent with the idea that the rangers took the livelihood programs to be primarily a method of compensation owed to them in return for their service to the CRP.

Overall, rangers reported generally high morale: a majority of them indicated that leaders were interested in what they thought, that disagreements on tasks among rangers were rare, that they felt proud of their team, and that their team was effective. Ranger youths tended to see the new skills (37 percent) or income (30 percent) as the most important benefits coming from their participation in the program. Among costs of being a ranger, tensions with loggers and poachers were the most important for the greatest share of those who responded, suggesting that the program indeed targeted youths with a high potential to interact with illegal logging and poaching networks. Rangers also expressed overwhelming support for the program, with 95 percent of them indicating that they would continue ranger work if such an opportunity was offered.

In terms of benefits to the larger population from these livelihood projects, the data suggest that efforts to bring people from across the *mukim* to participate in livelihood projects were limited, a fact confirmed by the very low levels of participation in livelihood projects reported by households. The data show that households tended to have minimal exposure to the livelihood projects, likely due to the fact that projects tended to be located at a single location in the *mukim*, whereas this survey samples households in villages throughout the *mukim*. However, in the village heads’ estimation, benefits from the livelihood projects were not limited only to the rangers. One possible explanation for the discrepancy between household and village head survey data is that the household survey data may be underestimating the extent to which villagers benefitted from the livelihood projects. Indeed, activities associated with the livelihood projects, such as vaccinating animals and conducting livelihood training, reached members of the community beyond those who ran the projects or received income as a result. Nonetheless, it appears that the majority of livelihood program benefits were concentrated among the rangers themselves.



In the mountains of Mane, Rangers use tamed elephants to patrol the forest

5

OUTCOMES AND IMPACT ESTIMATES

OUTCOMES AND IMPACT ESTIMATES



Female rangers in Pidie.

The following sections report estimated impacts of the program on social and environmental outcomes. We begin by presenting summary statistics for the outcomes of interest and then follow with the impact estimates. The presentation of results follows the listing of outcomes in Table 1 and Table 2—that is, we first present results with respect to social and economic outcomes before turning to environmental outcomes.

5.1 Social Outcomes

We begin with economic and social impacts, namely impacts on a youth's economic outcomes; roots in the community; relations with family and friends, future outlook and self-esteem; acceptance by the community; engagement in risky or illegal behavior; and other facets of integration into the community.

5.1.1 Summary Statistics

The summary statistics on social outcomes provide a backdrop against which we can interpret impact estimates. For the most part, youths' relations with their communities appear to be quite positive. Economic circumstances were seen as limited both by youths themselves and by their community members, but youths tended to express optimism for the future.

5.1.1.1 Youth survey

Table 3 shows summary statistics for the outcome variables measured in the post-CRP implementation youth surveys (which includes responses from both rangers and non-rangers). With regard to economic circumstances, there are mixed indicators on the poverty level of ranger candidates. About half of respondents do not have access to water from a protected source or cook with gas or electricity (as opposed to wood or coal), which suggests a substantial share of relatively poor participants, although the high rates of high quality floor and wall materials mean that few respondents are from extremely poor households.

Table 3. Descriptive statistics for social outcomes - Youth

	Mean	Std. Dev.	Minimum	Maximum	Count
PANEL A: ECONOMIC OUTCOMES					
A1: Econ objective					
Total income (logged)	16.68	0.89	12.43	19.42	387
Water from a protected source	0.50	0.50	0	1	387
Floor made of high quality materials	0.94	0.25	0	1	387
Walls made of high quality materials	0.69	0.46	0	1	387
Cook with gas/electricity	0.51	0.50	0	1	387
A2: Econ subjective					
Income higher than other people my age	2.03	0.55	1	3	387
Living comfortably at present income	2.47	0.71	1	3	387
Economic condition now better than 2 years ago	2.65	0.57	1	3	387
Economic condition in two years better than now	1.80	0.70	1	3	387
A3: Human capital					
Numeracy (based on math quiz)	2.64	1.18	0	4	387
Highest level of education completed	2.57	0.72	0	4	387
PANEL B: ROOTED + NETWORKS					
B1: Rooted					
Married	0.33	0.47	0	1	387
Children	0.39	0.86	0	4	387
Head of household	0.27	0.45	0	1	387
B2: Family relations					
Family relations close	3.90	0.31	2	4	387
Rarely argue with family	3.35	0.85	1	4	387
Family concerned about you	3.92	0.34	1	4	387
B3: Peers1					
Peers are interested in school	0.70	0.46	0	1	387
Peers participate in community meetings	0.91	0.28	0	1	387
Peers go to mosque regularly	0.85	0.36	0	1	387
Peers work hard	0.90	0.30	0	1	387
Peers earn income	0.82	0.39	0	1	387
Trust peers	0.82	0.38	0	1	387
B4: Peers2					
Peers do not drink	0.96	0.19	0	1	387
Peers are not ex-combatants	0.71	0.45	0	1	387
Peers do not fight	0.94	0.23	0	1	387
Peers are not loggers	0.88	0.33	0	1	387
PANEL C: OUTLOOK/ESTEEM					
C1: Life satisfaction					
Life satisfaction now (10 step ladder)	5.02	1.64	1	10	387
Life satisfaction two years ago (10 step ladder)	4.13	1.68	1	10	387
Life satisfaction in one year (10 step ladder)	6.40	1.65	1	10	387
Life satisfaction in five years (10 step ladder)	7.81	1.73	1	10	387
C2: Esteem1					
Satisfied with yourself	3.29	0.67	1	4	387
Enjoy convincing others of your opinion	2.88	0.69	1	4	387
Like to assume responsibility	3.20	0.70	1	4	387
Usually successful and everything I do	2.71	0.75	1	4	387
Often give advice to others	3.09	0.55	1	4	387
Look for ways to resolve conflict	2.96	0.66	1	4	387

	Mean	Std. Dev.	Minimum	Maximum	Count
C3: Esteem 2					
Disagree that everything you try fails	3.03	0.76	1	4	387
Disagree that you are a good person but doing nothing	3.10	0.70	1	4	387
Disagree that you do not have much to be proud of	2.95	0.83	1	4	387
PANEL D: ACCEPTANCE					
D1: Participation					
Contribute labor/money to gotong royong	0.66	0.47	0	1	387
Attend village meetings	0.95	0.22	0	1	387
Spoke at village meetings	0.67	0.47	0	1	387
Participate in farmers group	1.85	0.95	0	3	387
Participate in credit/finance group	1.55	0.92	0	3	387
Participate in community dev group	1.20	1.16	0	3	387
Participate in women's group	1.06	0.78	0	3	387
Participate in youth group	2.46	0.85	0	3	387
Participate in livelihood benefits group	1.02	1.04	0	3	387
Participate in forest users group	0.68	1.02	0	3	387
D2: Accept 1					
Respect relative to others your age	0.30	0.46	0	1	387
Tried to resolve conflict in village	0.47	0.50	0	1	387
People in the village treat me with respect	3.22	0.91	1	4	387
People in the village accept me	3.81	0.55	1	4	387
D3: Accept 2					
People in the village do not fear me	3.91	0.40	1	4	387
People in the village are not suspicious of me	3.79	0.54	1	4	387
People in the village are not frustrated with me	3.93	0.35	1	4	387
People in the village are not jealous of me	3.70	0.69	1	4	387
PANEL E: ILLEGAL ACTIVITY					
E1: Community tensions					
Tensions between young and old	1.16	0.44	1	3	387
Tensions between youth and police	1.13	0.42	1	3	387
E2: Logging					
Asked to log in past year	0.10	0.29	0	1	387
Logged in past year	0.05	0.23	0	1	387
Believe its ok to log	1.71	1.00	1	4	387
E3: Community disputes					
Disputes with anyone in village	0.02	0.15	0	1	387
Physical fighting	0.02	0.14	0	1	387
E4: Police encounters					
Harrassed by the police	0.06	0.24	0	1	387
Arrested by the police	0.02	0.12	0	1	387
Accused of a crime	0.04	0.21	0	1	387

Subjective economic measures show that ranger candidates tend to believe they are earning a living similar to that of their peers (corresponding to an index value of 2). Perceptions of whether they are living comfortably are concentrated between perceptions of “coping” and “finding it difficult” (index values of 2 and 3); few say they are living “comfortably” or “finding it very difficult” (index values of 1 and 4, respectively). Respondents tend to think that economic conditions are either the same or worse than two years ago (index values of 2 and 3, respectively) but that they will be either the same or better two years hence (index values of 1 and 2, respectively). As for human capital, numeracy skills are quite variable, with the average suggesting relatively low levels (index values of 2 and 3 corresponding to providing wrong responses or being unable to respond to the questions) and levels of education concentrated on junior high/vocational or senior high school.

As for measures of social “rootedness,” we see strong expression of rootedness and support among peers. About a third of respondents are married, with few children reported (less than one on average), and about a quarter are heads of households. Respondents tend to report that their relationship with their immediate family is either “close” or “very close” (index values of 3 and 4, respectively) and they also report that their families “rarely” or “never” worry about them or argue with them (index values of 3 and 4, respectively). Respondents tend to rate their close peers (specifically, we had them refer to “their five closest friends”) highly in terms of social engagement, with an overwhelming majority indicating that their friends take interest in activities ranging from school to working hard; similarly, respondents tended to rate peers highly in terms of trust and also to indicate that peers abstained from activities such as drinking or fighting, tended not to be ex-combatants, and tended not to be involved in logging. At the same time, it is worth noting that only 88 percent of respondents professed to having peers uninvolved in logging (implying an expressed rate of 12 percent participation in logging), a percentage that stands out as relatively low compared with percentages not involved in drinking or fighting (96 percent and 94 percent, respectively).

With respect to outlook and self-esteem, respondents indicate weakly positive self-esteem but a generally hopeful outlook. Respondents tend to express ambivalence about their current and past life satisfaction

in their “life satisfaction ladder” scores, but these scores are substantially higher when projecting into the future. Self-esteem scores show a concentration of responses around weakly positive values (index value of 3 in an index from 1 to 4 going from negative self-evaluation to positive, respectively).

In terms of participation and acceptance in community activities, we find reasonably healthy participation in community activities and positive perceptions by youths of how they are viewed by their community members. About two-thirds of respondents contribute to community work projects (*gotong royong*), nearly all respondents attend community meetings, and about two-thirds indicate that they speak in these meetings. Respondents tend mostly to “sometimes” participate in various community groups (index value of 2, compared with 1 for “never” and 3 for “often”), and rates of participation in youth groups are substantially higher. By contrast, forest user group participation is low, and only about 30 percent indicate that they receive as much respect as others their age, with about half of respondents indicate that they have helped to resolve a conflict. Nonetheless, index values associated with community treatment and perceptions of youths are generally very positive (indices are scaled from 1 to 4, with 4 being the most positive).

Finally, with respect to tensions and illegal activities, respondents suggest little experience with adversarial relations or engagement in illicit activities. Respondents report very low levels of tension between youth and older community members or the police (indices are scaled from 1 to 3 with 1 indicating little to no tension). About 10 percent of respondents indicate having been asked to log in the past year and about half admit to having logged. Responses to a question of whether respondents thought it was ever acceptable to illegally log were quite variable, but the average value suggests weak support for the idea that illegal logging is never acceptable as opposed to being acceptable sometimes (average of 1.71 on a scale ranging from 1 to 4, with 1 indicating “never acceptable” and 4 indicating “sometimes acceptable”). Very small numbers of respondents indicate being involved in community disputes or police encounters.

5.1.1.2 Village head survey

Table 21 in Annex 5²⁰ shows summary statistics for the social outcome from the village head interviews. Generally, Aceh’s village heads do not consider the younger

²⁰ All annexes can be accessed online via the following link: <http://dx.doi.org/10.7910/DVN/SEG008>.

members of their community to be socially apart from the rest of the village. The high mean values of the indices for respect and acceptance for youths (means of 2.62 and 2.98 on a scale of 1-4) suggest that village heads do not feel that younger village members are looked down upon. This is corroborated by low mean values on measures of fear of (mean = 1.88), frustration with (mean = 1.7), and jealousy of (mean = 1.34) the young (scaled from 1 to 3, with 3 indicating more negative feelings), although we do see some indication that village heads harbored "suspicion" towards the youth (mean = 2.16). Overall corroborating what was revealed in the youth surveys, village heads report low levels of crimes committed by youths and little tension between village youths and the village establishment (defined as older citizens and the police). When asked about the ability for village youths to lead a "decent life," the village heads surveyed averaged a mean response of 2.48 (on a scale of 1-4). That value is not as enthusiastic as the variables measuring social integration, but could certainly be worse.

5.1.1.3 Household head survey

Finally, Table 22 in Annex 5²¹ presents summary statistics for social outcome variables from the household head surveys. Similar to the village heads, household heads consider young people to be both respected (mean = 2.75) and accepted (mean = 3.11) in their communities. Household heads also agree with village heads that negative feelings towards the young tend to be low. They further report low crime statistics for young people, and do not observe much tension between youths and the village establishment.

However, the household heads surveyed are more pessimistic when asked whether young people have the ability to lead a decent life in their village. They were asked to report on how common the inability to lead a decent life is, with 1 indicating that it is very common and 4 meaning not common at all. On this scale, the household heads averaged a response of 1.77. While the village head response indicated that youth were potentially struggling to lead a decent life, the household heads confirmed that possibility.

5.1.2 Impact Estimates

In this section and in Annex 5²² we display impact estimates on social outcomes from youths, village heads, and household surveys. For each survey, we first present estimates for indices that correspond to the outcome

themes described in Table 3. The indices were constructed using precision- and covariance-weighted averages of sets of survey items (the weighting method is described in the methodology section above). The impact estimates on the outcome indices are calculated in terms of standard deviations of the outcome variable. We then display impact estimates for each of the component variables that were used to create the indices, in order to unpack whatever findings emerge from the impacts on the indices. The impacts on the indices should be used as the primary guide for assessing impacts, while the effects on the component variables are meant to provide extra nuance.

Generally, we find strong evidence from the youth survey that the program was beneficial with respect to the economic conditions of participating youths and their roles in their communities. These benefits were not so apparent from the vantage point of village heads, however. From the results of the survey with household heads, we find evidence that the program improved the social position of youths, but it also seemed to cause some pessimism about the potential for youths to lead a decent life in their home villages and about whether youths are respected or accepted in their home villages. These results are largely consistent with the findings from Section 11, which indicated a program whose benefits were very much concentrated among the rangers themselves as opposed to being felt more broadly in the host communities.

5.1.2.1 Youth survey

Table 4 to Table 9 present results from the youth survey. The results suggest a program that was beneficial to participant youths. Table 4, which presents the top-level results for indices in the five main outcome categories, shows that being a ranger substantially increased perceived economic welfare, life satisfaction, community participation, and certain forms of acceptance (those related to respect and being active in resolving conflicts in the village). Being a ranger also substantially decreased participation in illegal logging activities, at least as reported by the youths themselves. The impacts on objectively measured economic welfare and family relations are more modest but in the desired direction. No evidence was found of effects on social rootedness, peer networks, self-esteem, tension with other villagers, or police encounters. We do find an unexpected negative effect on human capital, perhaps indicative of rangers taking time away from educational courses to focus on their work.

²¹ All annexes can be accessed online via the following link: <http://dx.doi.org/10.7910/DVN/SEG008>.

²² All annexes can be accessed online via the following link: <http://dx.doi.org/10.7910/DVN/SEG008>.

Table 4. Impact estimates on social indices - Youth

		Model 1 (no controls)			Model 2 (all controls)			Desired Direction
		T.E.	s.e.	p-value	T.E.	s.e.	p-value	
Panel A: Economic outcomes								
(1)	Econ objective	0.15	(0.11)	0.156	0.19*	(0.11)	0.090	+
(2)	Econ subjective	0.76***	(0.09)	0.000	0.76***	(0.10)	0.000	+
(3)	Human capital	-0.22*	(0.11)	0.058	-0.10	(0.09)	0.273	+
Panel B: Rooted + Family + Friends								
(4)	Rooted	0.03	(0.09)	0.745	0.03	(0.08)	0.726	+
(5)	Family relations	0.17	(0.11)	0.144	0.21*	(0.12)	0.085	+
(6)	Peers 1	0.05	(0.12)	0.647	0.14	(0.12)	0.268	+
(7)	Peers 2	0.10	(0.11)	0.367	0.05	(0.10)	0.630	+
Panel C: Outlook/esteem								
(8)	Life satisfaction	0.25**	(0.12)	0.031	0.32***	(0.12)	0.010	+
(9)	Esteem 1	0.05	(0.11)	0.651	0.07	(0.10)	0.504	+
(10)	Esteem 2	0.10	(0.11)	0.386	0.12	(0.11)	0.302	+
Panel D: Acceptance								
(11)	Participation	0.32***	(0.09)	0.001	0.33***	(0.10)	0.002	+
(12)	Accept 1	0.17*	(0.10)	0.084	0.19*	(0.10)	0.076	+
(13)	Accept 2	-0.07	(0.12)	0.583	0.00	(0.12)	0.989	+
Panel E: Bad Behavior								
(14)	Tensions in village	-0.13	(0.14)	0.363	-0.12	(0.15)	0.436	-
(15)	Fighting in village	0.05	(0.12)	0.698	-0.04	(0.14)	0.784	-
(16)	Logging	-0.34***	(0.11)	0.003	-0.40***	(0.11)	0.000	-
(17)	Police	-0.07	(0.12)	0.577	-0.18	(0.12)	0.149	-

* p<.10, ** p<.05, *** p<.01

Table 5. Impact estimates on economic variables - Youth

		Model 1 (no controls)				Model 2 (controls)			Desired Direction
		Mean in controls	Treatment Effect	s.e.	p-value	Treatment Effect	s.e.	p-value	
Panel A: Econ objective									
	Total income (logged)	16.54	0.19**	(0.10)	0.048	0.18*	(0.11)	0.097	+
	Water from a protected source	0.5	0	(0.06)	0.956	0.02	(0.05)	0.664	+
	Floor made of high quality materials	0.91	0.03	(0.02)	0.194	0.02	(0.02)	0.341	+
	Walls made of high quality materials	0.7	-0.01	(0.05)	0.846	0.01	(0.06)	0.923	+
	Cook with gas/electricity	0.51	0.03	(0.05)	0.624	0.06	(0.06)	0.246	+
Panel B: Econ subjective									
	Income higher than other people my age	1.91	0.18***	(0.06)	0.003	0.16***	(0.06)	0.006	+
	Living comfortably at present income	2.09	0.50***	(0.08)	0.000	0.47***	(0.08)	0.000	+
	Economic condition now better than 2 yrs ago	2.53	0.19***	(0.07)	0.005	0.20***	(0.06)	0.003	+
	Economic condition in two years better than now	1.54	0.38***	(0.06)	0.000	0.41***	(0.07)	0.000	+
Panel C: Human capital									
	Highest level of education completed	2.69	-0.16**	(0.07)	0.031	-0.09	(0.06)	0.186	+
	Numeracy (based on math quiz)	2.71	-0.12	(0.13)	0.351	-0.03	(0.12)	0.800	+

* p<.10, ** p<.05, *** p<.01

Table 6. Impact estimates on relationship variables - Youth

	Model 1 (no controls)				Model 2 (controls)			Desired Direction
	Mean in controls	Treatment Effect	s.e.	p-value	Treatment Effect	s.e.	p-value	
Panel A: Rooted								
Married	0.28	0.04	(0.04)	0.351	0.04	(0.04)	0.337	+
Children	0.40	-0.01	(0.08)	0.865	-0.02	(0.07)	0.793	+
Head of household	0.25	0.01	(0.04)	0.770	0.01	(0.04)	0.697	+
Panel B: Family relations								
Family relations close	3.90	-0.01	(0.03)	0.711	0.00	(0.03)	0.980	+
Family concerned about you	3.88	0.05	(0.05)	0.282	0.08	(0.05)	0.114	+
Rarely argue with family	3.22	0.16*	(0.09)	0.090	0.13*	(0.08)	0.099	+
Panel C: Peers1								
Peers are interested in school	0.69	0.04	(0.05)	0.389	0.06	(0.05)	0.183	+
Peers participate in community meetings	0.91	0.01	(0.03)	0.658	0.02	(0.03)	0.520	+
Peers go to mosque regularly	0.85	-0.01	(0.04)	0.785	0.01	(0.05)	0.751	+
Peers work hard	0.87	0.02	(0.03)	0.635	0.04	(0.03)	0.240	+
Peers earn income	0.83	-0.03	(0.05)	0.454	-0.03	(0.04)	0.463	+
Trust peers	0.81	0.01	(0.04)	0.787	0.01	(0.04)	0.764	+
Panel D: Peers2								
Peers do not drink	0.97	0	(0.02)	0.901	-0.02	(0.02)	0.186	+
Peers are not ex-combatants	0.79	-0.08*	(0.05)	0.094	-0.07	(0.04)	0.119	+
Peers do not fight	0.90	0.05	(0.03)	0.107	0.06*	(0.03)	0.099	+
Peers are not loggers	0.83	0.06	(0.04)	0.139	0.05	(0.04)	0.230	+

* p<.10, ** p<.05, *** p<.01

Table 7. Impact estimates on esteem variables - Youth

	Model 1 (no controls)				Model 2 (controls)			Desired Direction
	Mean in controls	Treatment Effect	s.e.	p-value	Treatment Effect	s.e.	p-value	
Panel A: Life satisfaction								
Life satisfaction now (10 step ladder)	4.67	0.50***	(0.17)	0.003	0.60***	(0.18)	0.001	+
Life satisfaction two years ago (10 step ladder)	4.22	-0.03	(0.17)	0.852	0.00	(0.18)	0.979	+
Life satisfaction in one year (10 step ladder)	6.05	0.50***	(0.18)	0.008	0.59***	(0.20)	0.003	+
Life satisfaction in five years (10 step ladder)	7.45	0.56***	(0.20)	0.008	0.67***	(0.21)	0.002	+
Panel B: Esteem1								
Satisfied with yourself	3.24	0.06	(0.09)	0.526	0.04	(0.09)	0.638	+
Enjoy convincing others of your opinion	2.91	-0.07	(0.09)	0.432	-0.05	(0.08)	0.524	+
Like to assume responsibility	3.31	-0.12	(0.08)	0.162	-0.09	(0.08)	0.288	+
Usually successful and everything I do	2.62	0.15**	(0.07)	0.038	0.17**	(0.07)	0.018	+
Often give advice to others	3.10	-0.03	(0.06)	0.655	-0.01	(0.06)	0.833	+
Look for ways to resolve conflict	2.92	0.04	(0.07)	0.545	0.04	(0.08)	0.610	+
Panel C: Esteem 2								
Disagree that everything you try fails	2.96	0.13	(0.10)	0.188	0.12	(0.09)	0.214	+
Disagree that you are a good person but doing nothing	3.07	0.06	(0.09)	0.464	0.09	(0.08)	0.276	+
Disagree that you do not have much to be proud of	2.97	-0.03	(0.09)	0.770	-0.02	(0.10)	0.846	+

* p<.10, ** p<.05, *** p<.01

Table 8. Impact estimates on acceptance variables - Youth

	Model 1 (no controls)				Model 2 (controls)			Desired Direction
	Mean in controls	Treatment Effect	s.e.	p-value	Treatment Effect	s.e.	p-value	
Panel A: Participation								
Contribute labor/money to gotong royong	0.63	0.02	(0.06)	0.688	0.02	(0.06)	0.693	+
Attend village meetings	0.92	0.02	(0.03)	0.357	0.04	(0.03)	0.227	+
Spoke at village meetings	0.65	0.01	(0.06)	0.832	0.02	(0.07)	0.719	+
Participate in farmers group	1.63	0.24***	(0.08)	0.004	0.23**	(0.10)	0.025	+
Participate in credit/finance group	1.48	0.09	(0.11)	0.411	0.12	(0.11)	0.295	+
Participate in community dev group	1.05	0.14	(0.09)	0.105	0.14	(0.09)	0.140	+
Participate in women's group	0.87	0.26***	(0.07)	0.001	0.24***	(0.07)	0.002	+
Participate in youth group	2.37	0.09	(0.11)	0.433	0.08	(0.11)	0.507	+
Participate in livelihoods benefits group	0.91	0.11	(0.11)	0.319	0.12	(0.12)	0.323	+
Participate in forest users group	0.59	0.02	(0.08)	0.780	0.06	(0.09)	0.536	+
Panel B: Accept 1								
Respect relative to others your age	0.22	0.11*	(0.06)	0.058	0.10*	(0.05)	0.064	+
Tried to resolve conflict in village	0.43	0.04	(0.06)	0.449	0.05	(0.06)	0.408	+
People in the village treat me with respect	3.1	0.17	(0.11)	0.131	0.19	(0.12)	0.119	+
People in the village accept me	3.82	-0.02	(0.06)	0.737	-0.01	(0.06)	0.935	+
Panel C: Accept 2								
People in the village do not fear me	3.91	0	(0.04)	0.962	0.02	(0.05)	0.691	+
People in the village are not suspicious of me	3.82	-0.06	(0.08)	0.465	-0.02	(0.08)	0.814	+
People in the village are not frustrated with me	3.93	0.01	(0.04)	0.841	0.02	(0.04)	0.575	+
People in the village are not jealous of me	3.73	-0.06	(0.08)	0.501	-0.06	(0.08)	0.491	+

* p<.10, ** p<.05, *** p<.01

Table 9. Impact estimates on bad behavior variables - Youth

	Model 1 (no controls)				Model 2 (controls)			Desired Direction
	Mean in controls	Treatment Effect	s.e.	p-value	Treatment Effect	s.e.	p-value	
Panel A: Tensions in village								
Tensions between young and old	1.17	-0.02	(0.06)	0.764	-0.01	(0.07)	0.835	-
Tensions between youth and police	1.18	-0.07	(0.05)	0.217	-0.06	(0.06)	0.283	-
Panel B: Fighting in village								
Disputes with anyone in village	0.02	0.01	(0.02)	0.515	0	(0.02)	0.973	-
Physical fighting	0.02	0	(0.02)	0.969	-0.01	(0.02)	0.637	-
Panel C: Logging								
Asked to log in past year	0.13	-0.04	(0.04)	0.372	-0.04	(0.04)	0.376	-
Logged in past year	0.1	-0.08**	(0.03)	0.015	-0.08**	(0.03)	0.015	-
Believe its ok to log	1.82	-0.19*	(0.10)	0.053	-0.27**	(0.10)	0.011	-
Panel D: Encounters with police								
Harrassed by the police	0.07	-0.02	(0.03)	0.349	-0.04	(0.02)	0.134	-
Arrested by the police	0.02	-0.01	(0.01)	0.415	-0.02	(0.01)	0.113	-
Accused of a crime	0.05	0.01	(0.03)	0.836	-0.01	(0.03)	0.719	-

* p<.10, ** p<.05, *** p<.01

Table 5 to Table 9 unpack these top-level findings by showing the results for individual component measures of the indices. Table 5 presents results for economic outcomes, including objective measures, subjective measures, and measures of human capital. While there is some evidence that being a ranger increased total income, there is no evidence of a treatment effect for other objective measures of economic welfare (Panel A). There is, however, clear evidence of a treatment effect on subjective measures of economic welfare (Panel B). Being a ranger increased perceptions among the treatment group that they are doing better relative to others their age when it comes to earning a decent living. The treatment group was also more likely to report that they are living comfortably at present income, to feel their economic condition now is better than it was two years ago, and to feel their economic condition two years in the future would be better. The unexpected negative human capital effect is driven by a negative effect on reported levels of education completed. Again, this presumably indicates that rangers were less likely to complete courses because they were occupied by their participation in the ranger program as opposed to their counterparts who were free to complete courses (Panel C).

The findings on economic welfare are consistent with FFI project data on livelihood projects and their prospects for financial returns, namely that gains in economic welfare were made. Overall, nine teams were focused on livestock, four teams on agriculture, and one team on both. According to an FFI report, of the 14 teams, nine of them reported a profit by 2014. Moreover, four of the teams had invested in rubber or *jabon*, which would require over six years to mature but which stands to bring in substantial profit.²³ For instance, a 20 hectare plot of *jabon* cultivation (as is the case for the Gunong Palang ranger team in Pidie Jaya) is anticipated to be worth US\$400,000 in six years. Given that rangers also received skills training specifically related to livelihood benefits management, there is reason to believe that these economic gains can be sustained into the future.

Table 6 presents results for effects on family and social networks. Overall, there is little evidence that being a ranger improved 'rootedness', meaning whether the ranger got married, had children, or became the head of household (Panel A). Nor was there much evidence of a treatment effect on family relations (Panel B) or on quality of peer networks (Panels C and D).

Table 7 presents results for self-esteem and personal outlook. There is clear evidence that being a ranger improved perceptions of life satisfaction as measured on a 10-point scale. In particular, there is a positive treatment effect on perceptions of life satisfaction now as well as expectations of life satisfaction one and five years from

now. Reassuringly, there is no evidence of a treatment effect on life satisfaction *two years ago*. Since this was prior to treatment, we would expect perceptions of life satisfaction to be the same in treatment and control groups, just as the data indicate. This should increase confidence in the measures.

In Table 8 we present measures for community participation and acceptance. Given the assumption behind the CRP that youths were marginalized in their communities, increasing participation in community organizations was viewed as an important social outcome in its own right. We investigate whether the CRP increased participation in seven different types of community organizations that could plausibly have been affected, including farmers groups, community development groups, women's groups, and youth groups. Interestingly, we see that the positive effects of the treatment on community participation are primarily driven by participation in farmers groups and women's groups. There is little evidence of a treatment effect for other measures of community acceptance.

Finally we look at the effect of the ranger treatment on risky and/or illegal behavior as presented in Table 9. While there is little evidence of a treatment effect on village tensions, disputes, or police encounters, we see that the program caused an 8 percentage point reduction in the share reporting that they had participated in illegal logging activities in the previous year.²⁴ The treatment also reduced the extent to which subjects agreed that it was acceptable to earn a living through logging.

5.1.2.2 Village head survey

Table 23 and Table 24 in Annex 5²⁵ present impact estimates from the village head surveys. Table 23 presents the top-level results for the five main categories by index. The results show that the ranger program did not have a statistically significant impact on any of the five indices based on village heads' perceptions, although effects do move in the desired direction for most of the indices (acceptance of youth went up, while negative attitudes towards youth and tension went down). Table 24 shows the results for individual component measures of each index. Panel A shows the component variables of the acceptance index, neither of which was significantly affected by the program. Panel B shows the variables of the negative index. Although the impact on the overall index is not statistically significant, the program did impact two components with fear of young people decreasing and jealousy of the young increasing, effects that canceled each other out in the overall index. Panel C shows an insignificant impact on young people's ability to lead a decent life in CRP villages, and Panel D shows a similarly insignificant impact on crime indicators. Panel E provides suggestive evidence that the CRP program reduced the level of tension between young and old village members.

²³ Jabon (anthocephaluscadamba) is a fast-growing hardwood tree from which growers harvest wood and extract oils.

²⁴ This is a more modest reduction in illegal logging than that reported in FFI's completion report, which finds that whereas 46 rangers admitted to engaging in illegal logging prior to becoming rangers, only three continued to log after becoming a ranger. The FFI report is based on looking at change among treatment rangers over time and does not take into account the control group. Taken together, the findings support the conclusion that there was a general decline in (self-reported) logging found in the impact evaluation.

²⁵ All annexes can be accessed online via the following link: <http://dx.doi.org/10.7910/DVN/SEG008>.

5.1.2.3 Household head survey

Table 25 and Table 26 in Annex 5²⁶ display impact estimates from the household head survey. Table 25 shows the top-level impacts on indices for the acceptance of youths, negative feelings towards youths, the ability of youths to lead a decent life, and tension involving youths. The most robust impact was a decrease in the perception that young people can lead a decent life, which runs contrary to what was desired. One possible explanation for this is that the CRP made community members more aware of the challenges confronting youths in Aceh today, and it is this awareness that is being detected by this measure. There are also apparent decreases in indices measuring acceptance, which appear in Table 25 and are more puzzling to explain. As can be seen in Table 26, which shows the component variables of the acceptance index, the statistically significant and unexpected decrease in acceptance was driven equally by both components (Index A). Yet, some of the outcomes run in the predicted direction. Specifically, the CRP caused the predicted reduction in negative attitudes towards youths, which Table 26 reveals was predominantly driven by a decline in the share of people reporting that they were afraid of young people (Index B), a finding that coincides with that reported in the village head survey. Among the four variables of the tension index, all of are statistically insignificant or indicate small impacts (all 4 variables had very little variance, as shown in presentation of summary statistics above).

5.1.3 Summary of Results for Economic and Social Outcomes

All in all, the findings suggest a number of ways in which participation in the CRP had a positive effect on social outcomes for ranger youths. Importantly, the CRP was motivated in part by a concern that at-risk youths were not well-integrated into their communities and therefore at risk of being drawn into increasingly dangerous activities. The summary statistics for the main social outcomes suggest this is not generally the case. The young are relatively optimistic about their economic futures, enjoy good relations with family and friends, have ties to their communities, and feel accepted. This is not a one-sided perception; both the village head and household surveys indicate that youths are indeed relatively accepted in their communities. Thus, the fact that the study finds little evidence that serving as a ranger increased rootedness in one's community, self-esteem, or perceptions of acceptance should not be a cause for concern given that the data reveal that these were not significant problems to begin with.

In contrast, we find that the CRP had a positive effect on several important economic and social outcomes. Specifically, participation in the CRP caused significantly higher levels of income, subjective economic wellbeing, life satisfaction, and participation in farmers and women's groups for rangers (*vis-à-vis* controls). The fact that the findings on subjective wellbeing are so strong could reflect not only the modest increases in current income caused by the program but also the anticipated future benefits from the livelihood program. This is consistent with the potentially large future gains that project data suggest will come from many of the livelihood projects. Being a ranger also significantly reduced individual self-reported engagement in illegal logging activities and diminished the belief that logging is acceptable under some circumstances.

It should also be highlighted that the positive effects of the CRP program primarily stemmed from changes in how rangers perceived themselves and their communities, while the effect on village heads or members of other households in the community was more mixed. Interestingly, the results from both the village and household surveys indicate that the CRP succeeded in making community members less fearful of young people. On the other hand, the CRP also increased the perception that young people would struggle to have a decent life in their communities. However, in the case that the CRP helped to socialize community members on the challenges confronting youth in Aceh today, then this could reflect a heightened awareness of the struggle for a decent life rather than an actual change in objective conditions.

5.2 Environmental Outcomes

5.2.1 Summary Statistics

Table 10 to Table 12 show summary statistics for environmental outcomes from the village head survey, village environmental assessments, and household surveys. Variables are grouped according to the outcome indices with which they are associated (see Table 2). Generally speaking, we find evidence that illegal forest activities occur with some regularity, albeit in a minority of villages. Proper awareness of conservation-related regulations appears low both among village heads and household heads. Village and household heads express moderate confidence in government authorities' ability to combat illegal forest use activities. Among village and household heads, there was considerable skepticism or lack of awareness about how conservation activities would benefit the village versus other, more immediately profitable, uses of forestland. This comes despite the fact that village heads and household heads proclaim to value conservation in the abstract.

²⁶ All annexes can be accessed online via the following link: <http://dx.doi.org/10.7910/DVN/SEG008>.

11.2.1.1 Village head survey

Table 10 shows descriptive statistics for village-level outcome variables from the village head surveys. When asked whether logging/mining was taking place in the village, village heads' responses indicate that each was happening in about one of every five villages (logging in 19 percent of villages and mining in 23 percent). It is important to remember that these villages—both treatment and control—were selected for being particularly high-risk for illegal forest activities; even so, such activities were not present in the majority of villages. There were also very few instances of illegal poaching (Index C).

The Index D variable shows that village heads were on average able to answer correctly only about half the time when asked to provide information about the types of surrounding forest (protected/production/community) or poaching regulations in effect around their villages, an outcome suggesting that the village heads were simply guessing. Thus the data suggest that village heads do not have real knowledge and awareness of formal conservation regulations. This could be understood in both negative and positive terms: negative because it means that regulations are not effectively communicated to the people they affect, but also positive because it means that people who are engaging in illegal activities may not be purposely ignoring the law, but rather may not know what the law is.

Index E shows that about 30 percent of communities had experienced some kind of animal attack (e.g., elephant crop raiding, which is the most common form, or much more rarely, tiger attacks).

The Index F variables show that few villages have a forest users group (only 20 percent), and that meetings to discuss forest use are infrequent. Land use decisions seem to be happening at the level of the village elite rather than at the community level. Crop rotation is practiced by about a quarter of households. The Index G and H variables show on average modest levels of confidence in the government's ability to stop illegal logging or poaching (the outcome is an index that ranges from 1 to 4, with 1 meaning no confidence and 4 meaning highly confident; mean values for these variables fall between 2 and 3); similar results are obtained for confidence in the government's ability to protect the village from animal attacks (Index J). Active land disputes are rare according to the village heads, with an average of less than one active dispute per village (Index I).

The Index K variables assess opinions on conservation. Village heads were asked a set of four questions twice, with instructions to report their own opinion on the

tradeoffs between conservation and economic growth (the last four questions in Index L), as well as the opinion of others in their village (the questions in Index K). The questions had village heads weigh the value of forest conservation against other more immediately economically profitable uses of forestland. The outcome for each question is a scale from 1 to 4 with 1 meaning "not important at all" and 4 meaning "very important." For all of these questions, the responses when asked for their own opinion are more conservation-friendly than responses when asked for the opinions of others, which is what one would expect if respondents were trying to present themselves in a positive light but were presumably more objective when considering the opinions of others. Therefore, when it comes to these four variables in the impact effect section, we will consider the impact of the CRP on other villagers' opinions as more indicative of the true impact. For these variables, the average village head's response on his/her own opinions suggests moderate to strong support for conservation, where responses on other villagers' opinions suggests only moderate support. Also in Index J, the village heads were asked to name any activity that could be done with forestland. We were generous in coding their responses, choosing to count the entire response as conservation-friendly if they mentioned anything related to promoting conservation (even if that mention came after a suggestion that forestland should be cleared to make way for farmland). Even with this generous coding, only 8 percent of village heads mentioned conservation as a potential activity for forests. This indicates that that conservation does not naturally spring to the minds of survey respondents when they think about the forest as a resource.

Responses to these and other questions in Index J show that the village heads surveyed are neither ardent environmentalists nor strong believers in conversion. They recognize the importance of conservation in the abstract (as evidenced by the high mean response when asked about the importance of conservation locally and for the world), and do not want large-scale conversion happening in their village (shown by their disagreement that their village's forestland should be cleared for farmland). At the same time, their responses when asked to consider possible productive uses for forestland show that conservation is not at the forefront of their thinking on an everyday basis.

The Index M and N variables ask about benefits of REDD+ (which was explained) and other conservation programs. Responses suggest that perceptions that villages will benefit are not very high (mean values of 2.94 and 2.88, respectively, on a scale where 1 means the program *will benefit* the village and 4 means it will have *no benefit*).

Table 10. Descriptive statistics for environmental outcomes - village heads

	Mean	Std. Dev.	Minimum	Maximum	Count
Index A: Logging					
Did loggers hire here in last 12 months?	0.19	0.39	0	1	110
Percent of households that logged in last 12 months	3.14	7.62	0	50	110
Percent of households with chainsaws	3.10	4.76	0	34.4	110
Index B: Mining					
Have people found gold near the village?	0.23	0.42	0	1	110
Percent of households that mined near the village	4.08	11.55	0	60	110
Index C: Poaching					
Does illegal poaching happen here?	0.03	0.16	0	1	110
Index D: Community Awareness of Conservation					
Knowledge of protected forests/animals	0.53	0.20	0	1	110
Index E: Animal Attacks					
Have animal attacks happened here?	0.30	0.46	0	1	110
Index F: Conservation Institutions					
Does the village have a forest users group?	0.20	0.40	0	1	110
Frequency of meetings to discuss forest use	0.70	0.86	0	4	110
Percent of households that practice crop rotation	23.72	31.60	0	100	110
Index G: Confidence in Stopping Logging					
Confidence in gov't ability to prevent logging	2.44	0.90	1	4	110
Confidence in gov't will to prevent logging	2.25	0.83	1	4	110
Index H: Confidence in Stopping Poaching					
Confidence in gov't will to prevent poaching	2.27	0.74	1	4	110
Confidence in gov't ability to prevent poaching	2.15	0.75	1	4	110
Index I: Disputes					
Number of disputed land plots	0.51	1.74	0	10	110
Index J: Security from Animal Attacks					
Lack of confidence in gov't ability to protect from attacks	2.26	0.88	1	4	110
Index K: Other Villagers' Opinions on Conservation					
Others agree that conservation is more important than growth	2.75	1.23	1	4	110
Others agree that it is never okay to log	2.84	1.11	1	4	110
Others agree that gov't should control land use	3.26	0.86	1	4	110
Others agree that gov't should prevent logging for profit	2.95	1.00	1	4	110
Index L: Village Head's Opinions on Conservation					
Importance of conservation to the world	3.98	0.13	3	4	110
Importance of conservation to the local area	3.97	0.21	2	4	110
Advocate nonviolent methods of controlling animal problems	0.14	0.72	-1	1	110
Believe that conservation is a good use of local forest land	0.08	0.28	0	1	110
Lack of reliance on forest products	1.24	0.52	1	3	110
Disagree with proposals to use forest for economic growth	3.28	0.91	1	4	110
Desire to involve local land in such proposals	3.56	0.67	1	4	110
Agree that conservation is more important than economic growth	2.91	1.28	1	4	110
Agree that it is never ok to log	3.09	1.10	1	4	110
Agree that gov't should control land use	3.48	0.84	1	4	110
Agree that gov't should prevent logging for profit	3.23	1.05	1	4	110
Index M: Benefits from REDD					
Belief that REDD+ projects will not benefit village	2.94	0.69	1	4	110
Index N: Benefits from Conservation					
Believe that forest use projects will not benefit household	2.88	0.99	1	4	110

11.2.1.2 Village environmental assessments

The summary statistics for the interview and observational data collected in the environmental assessments are displayed in Table 11. The results mostly agree with those from the village head surveys. Each variable reports or observes information related to the environment for each village. As with the village head survey data, the environmental assessment shows that logging activities are present in these villages without dominating village life. Not every village has a sawmill (an average of 0.38 sawmills reported and 0.42 sawmills observed in each village), and the number of chainsaws per village is in the low single digits. Mining is at an even smaller scale, having only been observed in 21 percent of villages.

Data on animal attacks are also in line with similar variables from the village head survey. In the village head survey,

animal attacks were reported in 30 percent of villages. In the environmental assessment, evidence of animal attacks was observed in 29 percent of villages. First, this shows that animal attacks happen, but are not a daily occurrence. Second, this corroboration verifies the accuracy of environmental data reported in the village head survey.

In Index F, we learn that each village saw about 10 hectares of forestland converted to other uses in the past 3 years. Of those 10 hectares, 14 percent were converted without permission from the relevant authorities (or ~0.5 ha per village per year). This supports our notion that illegal logging is happening, but does not dominate local life.

Finally, this dataset shows that observable rubbish is low in the villages that participated in the program. On a scale of 0 to 2, the mean level of trash in the village is 0.58.

Table 11. Descriptive statistics for environmental outcomes - environmental assessments

	Mean	Std. Dev.	Minimum	Maximum	Count
Index A: Logging					
Reported # of sawmills	0.38	0.67	0	3	110
Reported # of chainsaws	2.99	3.64	0	21.67	110
Reported # of people involved in logging	5.44	8.39	0	48	110
Observed # of sawmills	0.42	0.73	0	4	110
Observed # of chainsaws	0.95	1.42	0	6	110
Observed timber in village	1.72	4.52	0	27	110
Observed logging sites in village	0.15	0.40	0	2	110
Incidents of timber transport	0.29	0.75	0	4	110
Index B: Mining					
Reported # of people mining	0.08	0.27	0	2.5	110
Reported # of mining machines	0.01	0.05	0	0.42	110
Reported instances of mining	0.25	0.60	0	4	110
Observed # of grinding machines	0.01	0.06	0	0.58	110
Observed # of metal excavations	0.18	0.47	0	3	110
Observed instances of mining	0.21	0.41	0	1	110
Index C: Poaching					
Reported index of poaching in village	0.04	0.09	0	0.47	110
Reported index of poaching outside village	0.07	0.14	0	1.03	110
Reported index of hunting frequency	0.08	0.10	0	0.54	110
Index D: Animal					
Reported index of animal attacks	0.10	0.11	0	0.61	110
Observed evidence of animal attacks	0.29	0.46	0	1	110
Index E: Non-Authorized Clearing					
Reported infrastructure/road development	0.12	0.70	0	5	110
Observed infrastructure/road development	0.16	0.85	0	5.6	110
Index F: Conversion					
Reported amount of land converted (ha)	9.48	21.52	0	150	110
Proportion of land converted w/o permission	0.14	0.34	0	1	110
Observed forest conversion (ha)	9.67	22.64	0	150	110
Index G: Garbage					
Trash observed (highest possible score: 2)	0.58	0.43	0	1.67	110

5.2.1.3 Household head survey

Table 12 shows descriptive statistics for environmental variables from the household head survey. Note that the indices and component variables closely match those from the village head survey. Some questions focus on the village level while others, when appropriate, focus on behaviors and beliefs at the household level.

Similar to the village heads, the household heads agree that logging and mining are present around 20 percent of the time. Household heads further report that 15 percent of households had a member who was hired by loggers, and that 18 percent of households had a member find gold.

For the Index C variables, we asked a series of questions regarding the types of forest near the village. Responses were coded as 1 if they were correct (i.e., the respondent said that the forest type was nearby when it was, or said that it was not nearby when it was not), and 0 if incorrect. Except for the community forest variable, household heads had at best a 50/50 chance of answering correctly, which corroborates the data from Index D of Table 10. The responses suggest that there is significant room for increased education and awareness regarding forests in Aceh. In the same index, we also measured the non-response rates for questions about participation in logging and mining, under the assumption that high non-response rates could tell us about the prevalence of those behaviors in the region. Of the respondents, 55 percent did not answer the questions about the daily rates for logging, which means that either they did not know the answer, or did know and were unwilling to say so.

The Index D variables indicate that 20 percent of households experienced elephant crop raiding or other elephant-related attacks in the 12 months leading up to survey implementation, while only a tiny percentage (less than 1 percent) experienced tiger attacks.

The Index E variables were in line with those from the village head survey, demonstrating modest rates of forest user group attendance (22 percent) or knowledge of village meetings convened to discuss forest related issues (20 percent of households). About 15 percent of household heads reported attending such meetings, while only 10 percent spoke at such meetings.

The results for Index F and G variables resemble what we saw in the village heads' survey, averaging only moderate confidence in government institutions' ability to stop logging, poaching, or animal attacks (Index E, F, and H variables). Less than 1 percent of households indicated that they were involved in an active land dispute (Index H).

The Index J and K variables ask about opinions toward conservation. When asked about the importance of conservation in the abstract ("importance of conservation to the world" or "to the local area") household heads indicate strong support. However, conservation involves tradeoffs and so it is important to evaluate perceptions relative to these tradeoffs. Similar to the village head survey, the household heads were asked the same set of four questions twice, with one set of questions asking respondents on what others thought about the balance between economic growth and conservation (Index J) and the other set asking for the respondents' own opinions (in Index K). Unlike the village heads, the household heads' responses were more consistent between themselves and others. Both sets of household head answers were similar to the village heads' answers when asked about others, suggesting that either the village heads were inflating their own attitudes towards conservation for the sake of the survey, or that village heads as a group are more conservation-minded than the majority of their constituents. Overall, household heads tended to report moderate support for forest conservation over other more immediately economically profitable uses of forestland.

The Index K variables also included a question about whether conservation would be a good use for forestland. The question was coded with a 1 to indicate a conservation-friendly answer, 0 indicating a neutral answer, and -1 indicating an answer involving the cutting or degradation of forests. The household heads' average answer of -0.48 shows that conservation is not something that automatically comes to mind when considering what to do with forestland in Aceh. A question about whether non-violent methods should be used to control animal populations showed a little more respect for conservation concerns (this was coded using the same -1, 0, 1 coding).

Finally, the Index M and N variables line up with the village head survey in showing that respondents are skeptical that the benefits from REDD+ and other conservation programs will actually make a difference in their daily lives.

Table 12. Descriptive statistics for environmental outcomes - household heads

	Mean	Std. Dev.	Minimum	Maximum	Count
Index A: Logging					
Did loggers hire from HH in last 12 months?	0.15	0.35	0	1	1120
Number of chainsaws in household	0.11	0.33	0	2	1120
Logging as income-generating activity	0.01	0.11	0	1	1120
Index B: Mining					
HH member has found gold near the village	0.18	0.38	0	1	1120
Index C: Community Awareness of Conservation					
Knows that there is protected forest nearby	0.53	0.50	0	1	1120
Knows that there is conservation forest nearby	0.08	0.27	0	1	1120
Knows that there is production forest nearby	0.14	0.35	0	1	1120
Knows that there is state-owned forest nearby	0.52	0.50	0	1	1120
Knows that there is community forest nearby	0.91	0.28	0	1	1120
Knows not to hunt certain animals	0.82	0.38	0	1	1120
Knows which animals not to hunt	0.80	0.40	0	1	1120
Is logging a problem here?	0.04	0.20	0	1	1120
Is land clearing a problem here?	0.04	0.20	0	1	1120
Is water affected by mining/roads/construction?	0.04	0.20	0	1	1120
Non-response: logging hires in HH	0.08	0.26	0	1	1120
Non-response rate: daily payment for logging	0.55	0.50	0	1	1120
Non-response rate: daily payment for log transport	0.55	0.50	0	1	1120
Non-response rate: HH member finding gold	0.03	0.17	0	1	1120
Index D: Animal Attacks					
Elephant raid in last 12 months?	0.20	0.40	0	1	1120
Tiger attack HH members in last 12 months?	0.01	0.10	0	1	1120
Index E: Conservation Institutions					
Attend forest user grup meetings	0.22	0.41	0	1	1120
Village had meetings to discuss forest land use	0.20	0.40	0	1	1120
Attended meetings to discuss forest land use	0.15	0.36	0	1	1120
Spoke at meetings to discuss forest land use	0.10	0.30	0	1	1120
HH participation in gotong royong	0.79	1.11	0	4	1120
HH cleanup of forest/river in last 12 months	0.32	0.47	0	1	1120
HH practices crop rotation	0.20	0.40	0	1	1120
Index F: Confidence in Stopping Logging					
Confidence in gov't ability to prevent logging	2.39	0.89	1	4	1120
Confidence in gov't will to prevent logging	2.26	0.84	1	4	1120
Index G: Confidence in Stopping Poaching					
Confidence in gov't will to prevent poaching	2.24	0.80	1	4	1120
Confidence in gov't ability to prevent poaching	2.22	0.87	1	4	1120
Index H: Disputes					
Engaged in land dispute	0.01	0.11	0	1	1120
Index I: Security from Animal Attacks					
Lack of confidence in gov't ability to protect from attacks	2.16	0.91	0	4	1120
Index J: Other Villagers' Opinions on Conservation					
Others agree that conservation is more important than growth	2.68	1.29	1	4	1120
Others agree that it is never okay to log	2.81	1.13	1	4	1120
Others agree that gov't should control land use	3.00	1.03	1	4	1120
Others agree that gov't should prevent logging for profit	2.80	1.10	1	4	1120
Index K: Household Head's Opinions on Conservation					
Advocate nonviolent methods of controlling animal problems	0.19	0.44	-1	1	1120
Importance of conservation to the world	3.93	0.36	1	4	1120
Importance of conservation to the local area	3.86	0.45	1	4	1120
Agree that conservation is more important than growth	2.63	1.28	1	4	1120
Agree that it is never ok to log	2.97	1.12	1	4	1120
Agree that gov't should control land use	3.26	1.02	1	4	1120
Agree that gov't should prevent logging for profit	3.10	1.09	1	4	1120
Believe that conservation is a good use of local forest land	-0.48	0.81	-1	1	1120
Lack of reliance on forest products	3.62	0.66	1	4	1120
Disagree with proposals to use forest for economic growth	3.52	0.85	1	4	1120
Desire to involve local land in such proposals	3.70	0.57	1	4	1120
Index L: Knowledge of Environmental Regulation					
Did you learn anything about forest regulation during CRP?	0.07	0.25	0	1	1120
Has heard of REDD+ program	0.09	0.29	0	1	1120
Index M: Benefits from REDD					
Belief that REDD+ projects will not benefit village	2.98	0.92	1	4	1120
Index N: Benefits from Conservation					
Believe that forest use projects will not benefit household	3.16	0.98	1	4	1120

Table 13. Impact estimates on environmental indices - village heads and environmental assessments

		Model 1 (no controls)			Model 2 (all controls)			Desired Direction
		T.E.	s.e.	p-value	T.E.	s.e.	p-value	
Panel A: Village head survey - Environmental outcomes								
1	Logging	-0.32	(0.20)	0.131	-0.2	(0.19)	0.294	-
2	Mining	0.54**	(0.25)	0.036	0.49*	(0.25)	0.066	-
3	Poaching	-0.09	(0.19)	0.623	0	(0.16)	0.999	-
4	Community Awareness of Conservation	-0.15	(0.20)	0.448	-0.24	(0.19)	0.213	+
5	Animal Attacks	-0.12	(0.32)	0.705	-0.21	(0.25)	0.409	-
6	Conservation Institutions	-0.33*	(0.18)	0.071	-0.44***	(0.14)	0.004	+
7	Confidence in Stopping Logging	0.06	(0.25)	0.813	0.27	(0.25)	0.290	+
8	Confidence in Stopping Poaching	-0.07	(0.17)	0.702	-0.09	(0.16)	0.568	+
9	Disputes	0.02	(0.22)	0.941	0.02	(0.24)	0.936	-
10	Security from Animal Attacks	-0.09	(0.25)	0.723	-0.12	(0.25)	0.647	+
11	Other Villagers' Opinions on Conservation	-0.27*	(0.14)	0.065	-0.43***	(0.14)	0.006	+
12	Village Heads' Own Opinions on Conservation	-0.16	(0.17)	0.352	-0.23	(0.18)	0.222	+
13	Benefits from REDD	-0.12	(0.23)	0.609	0.16	(0.21)	0.465	-
14	Benefits from Conservation	-0.50***	(0.17)	0.006	-0.47**	(0.22)	0.040	-
Panel B: Environmental assessment outcomes								
1	Logging	-0.11	(0.18)	0.543	-0.01	(0.19)	0.943	-
2	Mining	0.47**	(0.20)	0.024	0.46*	(0.26)	0.096	-
3	Poaching	-0.28*	(0.15)	0.072	-0.08	(0.14)	0.593	-
4	Animal Attacks	-0.17	(0.22)	0.442	-0.16	(0.21)	0.458	-
5	Forest Conversion	-0.09	(0.22)	0.672	0.07	(0.22)	0.760	-

* p<.10, ** p<.05, *** p<.01

5.2.2 Impact Estimates

5.2.2.1 Village head survey and village environmental assessments

Table 13 to Table 15 show the impact estimates for environmental indices and variables in the village head survey and environmental assessment dataset. In Panel A of Table 13, we provide the treatment effect of the CRP on each environmental index from the village head survey, as well as the desired direction of the effect based on how the component variables were coded. Panel B contains the same information for indices in the environmental assessment dataset.

Both the village head survey and environmental assessments suggest a decrease in logging and poaching activities, as desired, but these effects are often statistically insignificant. By contrast, we do see significant negative effects in the indices for illegal mining, but the apparent increase in mining runs contrary to the desired effect. It is remarkable that the estimates are nearly identical across the both the village head survey and the environmental assessments. The CRP also seems to have generated a decrease in the indices of conservation institutions and

opinions on the value of conservation, each of which runs contrary to the desired impact. At the same time, we see a beneficial impact on perceptions of whether villages will benefit *should conservation activities be initiated* (Panel A, Index 14; recall that higher values indicate more skeptical attitudes). This suggests that the CRP successfully showed village heads in Aceh that conservation programs could have tangible livelihood benefits for their villages, even if this did not translate into more support for conservation more broadly.

Table 14 and Table 15 break down the indices and present the impact estimates for each variable within the indices. Table 14 contains the treatment effects for the village head survey, and Table 15 displays the same information for the environmental assessment dataset.

Though none of the coefficients were statistically significant for variables in the logging index, the treatment effect was negative (the desired direction) for all three variables. This, along with the drop in logging shown in the youth survey, suggests that the CRP did contribute to a modest reduction in logging activities.



The Pela Beungga Rangers set up motion-activated cameras to monitor tigers

However, there is little doubt that the CRP did contribute to more mining. The control means for the mining variables indicate that 13 percent of control group villages hosted mining activity and that about 2 percent of household engaged in such activity. We estimate a 22 percentage point effect on the rate at which villages host mining activities, meaning that mining activities occurred in about 35 percent of CRP villages.

The negative coefficient on the index for conservation institutions was also driven by each component variable, particularly the ones measuring whether the village has a forest user group and the percentage of households practicing crop rotation. Regarding the forest user group, it is possible that CRP villages felt that the introduction of CRP patrols to their villages meant that a forest user group would be superfluous and therefore tended not to use it in order to focus their energies on areas not covered by the CRP. However, there is no similar explanation for the decrease in crop rotation.

Index K shows that the significant effect on the index for other villagers' attitudes regarding conservation and economic growth is driven by substantial effects on three of the four variables. According to these variables, the CRP is associated with a decrease in the belief that it is never acceptable to engage in logging, a decrease in agreeing that government should control forestland use, and a decrease in agreeing that the government should prevent logging for profit. In interpreting these results, it may be worth reflecting on whether it is realistic or even desirable to persuade people that it is never acceptable to log. It is possible that the CRP demonstrated to individuals that there were ways to sustainably and responsibly extract

forest resources. Moreover, it may be that communities were endowed with a sense that they could take on such management responsibilities themselves. Under this interpretation, the findings for the Index K variables are not so disheartening.²⁷

In the index measuring the village heads' own opinions, the results were mixed. As mentioned above, the CRP was associated with a decrease in the belief that logging is never an acceptable activity. It is also associated with a slight decrease in the perceived importance of conservation for land near the village (though, the importance of conservation for the world in general was not affected). However, the CRP was associated with an increased level of suggesting conservation as a good use of forestland. The control mean for that variable is 0, which means that any mention of conservation in response to this question occurred in CRP villages.

In the environmental assessment dataset (Table 15), we see a similar increase in mining activities in CRP villages. Four of the variables in the index saw substantial increases due to the ranger program, including the reported number of people engaged in mining activities, the reported instances of mining, the observed number of metal excavations, and the observed instances of other mining activity. That people did not try to hide their involvement in mining when the observers conducting the assessment were in the villages suggests that mining is not considered a bad activity. If, in the implementation of the CRP, all efforts focused on discouraging logging at the expense of mining, then that could help to explain the troubling increase in mining in CRP villages.

²⁷We thank Tim Brown for this point.

Table 14. Impact estimates on environmental variables - Village heads

	Model 1 (no controls)				Model 2 (controls)			Desired Direction
	Mean in controls	Treatment Effect	s.e.	p-value	Treatment Effect	s.e.	p-value	
Index A: Logging								
Did loggers hire here in last 12 months?	0.25	-0.12	(0.08)	0.150	-0.11	(0.07)	0.110	-
Percent of households that logged in last 12 months	3.95	-1.06	(1.41)	0.460	-0.19	(1.70)	0.911	-
Percent of households with chainsaws	3.77	-1.3	(1.12)	0.258	-0.64	(1.10)	0.566	-
Index B: Mining								
Have people found gold near the village?	0.13	0.22**	(0.09)	0.026	0.21**	(0.10)	0.039	-
Percent of households that mined near the village	1.86	5.10*	(2.94)	0.096	4.02	(2.87)	0.174	-
Index C: Poaching								
Does illegal poaching happen here?	0.03	-0.02	(0.03)	0.623	0	(0.03)	0.999	-
Index D: Community Awareness of Conservation								
Knowledge of protected forests/animals	0.54	-0.03	(0.04)	0.448	-0.05	(0.04)	0.213	+
Index E: Animal Attacks								
Have animal attacks happened here?	0.32	-0.05	(0.13)	0.705	-0.09	(0.11)	0.409	-
Index F: Conservation Institutions								
Does the village have a forest users group?	0.2	-0.02	(0.07)	0.819	-0.11*	(0.06)	0.062	+
Frequency of meetings to discuss forest use	0.84	-0.28	(0.19)	0.163	-0.16	(0.13)	0.215	+
Percent of households that practice crop rotation	28.85	-7.79	(5.41)	0.162	-10.41*	(5.36)	0.064	+
Index G: Confidence in Stopping Logging								
Confidence in gov't ability to prevent logging	2.38	0.14	(0.23)	0.529	0.31	(0.21)	0.150	+
Confidence in gov't will to prevent logging	2.3	-0.05	(0.18)	0.772	0.08	(0.18)	0.650	+
Index H: Confidence in Stopping Poaching								
Confidence in gov't will to prevent poaching	2.34	-0.12	(0.13)	0.369	-0.14	(0.12)	0.245	+
Confidence in gov't ability to prevent poaching	2.14	0.03	(0.12)	0.798	0.02	(0.12)	0.862	+
Index I: Disputes								
Number of disputed land plots	0.54	0.03	(0.36)	0.941	0.03	(0.39)	0.936	-
Index J: Security from Animal Attacks								
Lack of confidence in gov't ability to protect from attacks	2.32	-0.08	(0.21)	0.723	-0.1	(0.21)	0.647	+
Index K: Other Villagers' Opinions on Conservation								
Others agree that conservation is more important than growth	2.81	-0.14	(0.32)	0.662	-0.15	(0.27)	0.593	+
Others agree that it is never okay to log	2.95	-0.31	(0.21)	0.157	-0.42**	(0.19)	0.039	+
Others agree that gov't should control land use	3.35	-0.2	(0.23)	0.391	-0.35*	(0.20)	0.082	+
Others agree that gov't should prevent logging for profit	2.98	-0.12	(0.12)	0.353	-0.28*	(0.15)	0.063	+
Index L: Village Head's Opinions on Conservation								
Importance of conservation to the world	4	-0.05	(0.04)	0.286	-0.08	(0.05)	0.148	+
Importance of conservation to the local area	4	-0.05	(0.03)	0.150	-0.06*	(0.04)	0.083	+
Advocate nonviolent methods of controlling animal problems	0.03	0.21	(0.16)	0.218	0.24	(0.16)	0.137	+
Believe that conservation is a good use of local forest land	0	0.15**	(0.06)	0.027	0.19***	(0.07)	0.010	+
Lack of reliance on forest products	1.22	0.02	(0.09)	0.829	0.08	(0.10)	0.397	+
Disagree with proposals to use forest for economic growth	3.41	-0.21	(0.19)	0.276	-0.11	(0.14)	0.449	+
Desire to involve local land in such proposals	3.6	-0.06	(0.17)	0.734	0.01	(0.12)	0.948	+
Agree that conservation is more important than growth	2.92	-0.03	(0.34)	0.923	-0.04	(0.26)	0.881	+
Agree that it is never ok to log	3.23	-0.35*	(0.21)	0.100	-0.49**	(0.23)	0.045	+
Agree that gov't should control land use	3.49	-0.06	(0.20)	0.756	-0.22	(0.20)	0.292	+
Agree that gov't should prevent logging for profit	3.15	0.08	(0.18)	0.675	-0.11	(0.24)	0.655	+
Index M: Benefits from REDD								
Belief that REDD+ projects will not benefit village	3	-0.09	(0.17)	0.609	0.12	(0.15)	0.465	-
Index N: Benefits from Conservation								
Believe that forest use projects will not benefit household	3.12	-0.45***	(0.15)	0.006	-0.42**	(0.20)	0.040	-

* p<.10, ** p<.05, *** p<.01

Table 15. Impact estimates on environmental variables - Environmental assessments

	Model 1 (no controls)				Model 2 (controls)			Desired Direction
	Mean in controls	Treatment Effect	s.e.	p-value	Treatment Effect	s.e.	p-value	
Index A: Logging								
Reported # of sawmills	0.39	-0.04	(0.12)	0.726	0.08	(0.09)	0.357	-
Reported # of chainsaws	2.95	0.27	(1.00)	0.790	0.63	(0.99)	0.532	-
Reported # of people involved in logging	4.83	1.55	(2.45)	0.533	2.21	(2.14)	0.312	-
Observed # of sawmills	0.41	0.01	(0.12)	0.912	0.14	(0.10)	0.173	-
Observed # of chainsaws	1.12	-0.24	(0.35)	0.499	-0.26	(0.34)	0.453	-
Observed timber in village	1.82	0.15	(1.08)	0.890	0.2	(1.00)	0.844	-
Observed logging sites in village	0.16	-0.01	(0.09)	0.925	-0.04	(0.08)	0.587	-
Incidents of timber transport	0.38	-0.12	(0.20)	0.544	-0.05	(0.17)	0.791	-
Index B: Mining								
Reported # of people mining	0.02	0.13*	(0.07)	0.074	0.17	(0.10)	0.107	-
Reported # of mining machines	0	0.02	(0.01)	0.124	0.02	(0.01)	0.233	-
Reported instances of mining	0.14	0.24*	(0.12)	0.062	0.21	(0.13)	0.121	-
Observed # of grinding machines	0	0.02	(0.01)	0.206	0.02	(0.02)	0.250	-
Observed # of metal excavations	0.07	0.24**	(0.09)	0.017	0.19**	(0.08)	0.033	-
Observed instances of mining	0.11	0.22**	(0.10)	0.044	0.16	(0.11)	0.158	-
Index C: Poaching								
Reported index of poaching in village	0.04	-0.02	(0.02)	0.351	0	(0.01)	0.908	-
Reported index of poaching outside village	0.1	-0.05**	(0.02)	0.040	-0.03	(0.02)	0.224	-
Reported index of hunting frequency	0.09	-0.03	(0.02)	0.142	0	(0.02)	0.971	-
Index D: Animal								
Reported index of animal attacks	0.11	-0.02	(0.02)	0.447	-0.01	(0.03)	0.680	-
Observed evidence of animal attacks	0.32	-0.05	(0.13)	0.694	-0.06	(0.13)	0.625	-
Index E: Non-Authorized								
Reported infrastructure/road development	0.06	0.11	(0.12)	0.356	0.13	(0.12)	0.296	-
Observed infrastructure/road development	0.13	0.05	(0.14)	0.718	0.07	(0.14)	0.615	-
Index F: Conversion								
Reported amount of land converted (ha)	11.36	-4.51	(4.27)	0.301	-0.53	(4.26)	0.902	-
Proportion of land converted w/o permission	0.11	0.03	(0.07)	0.674	0.06	(0.08)	0.438	-
Observed forest conversion (ha)	11.3	-4.49	(4.30)	0.307	-0.87	(4.46)	0.848	-
Index G: Garbage								
Trash observed (highest possible score: 2)	0.6	-0.05	(0.06)	0.356	-0.13*	(0.07)	0.063	-

* p<.10, ** p<.05, *** p<.01

5.2.2.2 Household head survey

Table 27 and Table 28 in Annex 6²⁸ provide impact estimates on environmental data from the household head survey. Table 27 contains the effect of the CRP on each index, as well as the desired direction of that impact. As with the village head survey, the results are mixed. Again, we see evidence of a moderate decrease in logging activities as a result of the CRP. This corroborates the decrease shown in the youth survey and is consistent with, although somewhat more encouraging than, the weaker effects measured in the village survey and environmental assessment.

As with the environmental assessment and village heads, however, the household head survey reveals a statistically significant increase in mining as a result of the CRP. The coefficient is in the same range (about 0.5) as the coefficients on the mining indices in those other datasets. Both of these facts support the undesirable conclusion that the CRP is associated with an increase in mining activities.

Moving from the activity indices and into the indices measuring beliefs and opinions, results continue to be mixed. On the encouraging side of the ledger, the CRP was associated with a decrease in animal attacks (Index 4), as

²⁸ All annexes can be accessed online via the following link: <http://dx.doi.org/10.7910/DVN/SEG008>.

well as a decrease in skepticism that REDD+ or other conservation programs could result in tangible benefits for them (indices 14 and 15; note that index 15 operates in the opposite direction to 14). Also, there was a positive treatment effect on the index measuring knowledge of environmental issues, which suggests that the CRP did fill in some educational gaps related to forests and forest policy.

On the discouraging side, the CRP was associated with a decrease in confidence that the government could stop logging in Aceh (Index 7). In the village data, the same index saw a statistically insignificant but positive treatment effect, suggesting that there is a disconnect between village heads and the household heads on this point.

Table 28 in Annex 6²⁹ provides impact estimates for each of the component variables within the indices discussed above. For Index A variables, we see that the decrease in logging is driven primarily by a decrease in loggers hired from CRP households in the past 12 months.

As discussed above, the CRP was associated with an increase in mining activities. In the household survey, the mining index is composed of a single variable that measures whether or not a household member has found gold near the village. As with the village head survey and environmental assessment, the control mean was relatively low, suggesting that only 11 percent of households engaged in mining (the phrase “found gold near the village” was used to reduce the sense that the question was being asked in a manner that passed negative judgment on respondents responding in the affirmative).

In the village head survey, respondents record a significant impact from the CRP on attitudes towards local conservation, but not towards worldwide conservation. In the household data, the opposite is the case. In Index K, the CRP is associated with a decrease in the importance of worldwide conservation. This reinforces the notion, discussed in previous sections, that villagers in Aceh are not strongly committed either way to conservation or deforestation.

5.2.2.3 Exploring the mining result

We consider two possibilities for why the apparently adverse mining effect may have occurred. The first possibility is a *substitution* story, whereby barriers that the CRP created to illegal logging employment may have caused individuals in the treated areas to shift to mining as a substitute for lost logging income. Such substitution does not appear to explain the entirety of the effect: as Table 28 in Annex 6³⁰ shows, there was a decline of about 6 percentage points in households engaged in logging, but an increase of about 20 percentage points in mining. Thus we also consider the second possibility

of an *opportunity* story, whereby the CRP may have created new mining opportunities by, for example, allowing rangers to identify new mining locations during their patrols. If the substitution story explains the result, then we would expect to see increases in mining in places where the most pronounced constraints were introduced on logging activities and where other compensating benefits, such as those from the livelihood program, were lowest. If the opportunity story explains the result, we would expect to see that the increases in mining took place in areas that are especially ripe for exploitation, for example in areas that are especially remote. The data provide some circumstantial evidence in favor of both of these possibilities and so neither can be ruled out.

We began exploring these possibilities by constructing a village-level mining intensity index that takes the average of the index values from the environmental assessments and village head surveys. As it happens the two indices are highly correlated (Pearson's $\rho=0.50$, $p < .001$), and so their average should provide a more reliable measure than either on its own. Figure 29 in Annex 6³¹ plots the values of the index for treated areas (panel 1) and control areas (panel 2). It also shows the locations of active mining locations whose GPS coordinates were collected as part of the environmental assessments. The maps indicate that the effect on mining appears to be driven by the high levels of mining intensity in CRP-treated communities located along the southeast quadrant of the Ulu Masen system. The communities with the most intense mining activities tend to be the CRP-treated communities located deepest in the forest. Remarkably, such a pattern is nowhere near as apparent when we examine the control communities. We do see concentrated mining in the southeast quadrant for the control communities, but the levels are not high as in the treated communities.

The picture that is provided by the mining intensity index is consistent with what we see in panel 3, which displays the GPS-located active mine sites (i.e., sites where processing or extraction equipment was seen to be in use) recorded as part of the environmental assessments. Panel 3 also plots road density data (the orange-brown pixels), and from that we see that the southeast quadrant is marked by relatively low road density relative to other areas. Thus, the picture that emerges from these maps is that the mining effect was driven by relatively high levels of mining intensity in CRP-treated communities that are deep in the forest and relatively remote. This is consistent with the opportunity story, albeit highly circumstantial.

In examining evidence for the substitution story, we note first that the qualitative report submitted by our environmental assessment team mentions that:

[t]he extent of logging taking place is considered to have reduced and this appears to be largely true due to a) the distance to the forest with economically valuable trees is

²⁹ All annexes can be accessed online via the following link: <http://dx.doi.org/10.7910/DVN/SEG008>.

³⁰ All annexes can be accessed online via the following link: <http://dx.doi.org/10.7910/DVN/SEG008>.

³¹ All annexes can be accessed online via the following link: <http://dx.doi.org/10.7910/DVN/SEG008>.

very far so operational costs are high, b) loggers often do not receive payments owed to them c) loggers currently prefer to work on their farmland and cannot leave the farmland to work temporarily as a logger as this will result in pests eating the harvests and loss of perhaps a month's income, d) *loggers have converted to gold mining* [emphasis added]. (Perkumpulan Rincong, 2008).

It is point d) that is of interest here. To the extent that there was a general trend of switching from logging to mining in the region, then it is plausible that the CRP could have induced an acceleration of such processes in its program areas. But more direct evidence is necessary for this explanation to be compelling. For this, we turn to the survey results, examining whether we find correlations between mining activities on the one hand, and logging activities and perceptions of the material benefits of the program on the other. Table 29 in Annex 6³⁰ presents the results of this analysis. What we have done is to aggregate responses from the ranger and control youth surveys on logging activity, economic conditions, and the results of the livelihood activities. We also include indices on logging activity from the village head surveys and environmental assessments. If the substitution story is valid, we would expect to see that increases in the logging indices would be associated with decreases in mining intensity. Such an association is apparent when we examine youth survey (YH) responses to the question of whether they had participated in logging in the past year. However, we do not see an association with the indices from the village head survey or environmental assessments. Thus, we have only weak evidence on this basis.

The substitution story would also lead us to expect that lower mining intensity should be associated with better economic conditions. The evidence here, again, points weakly in this direction. Most of the coefficients in the analysis suggest a negative relationship if any, although these variables are not significant predictors of mining intensity. Finally, the substitution story would lead us to expect that lower mining intensity would be associated with more optimistic impressions from the livelihood programs. Here we see some unusual patterns. We find that where CRP participant youths are more likely to report having earned a return from their livelihood activities that mining intensity is *higher* (Panel B), but that this pattern is not evident among non-participant (control) youths. For the other indicators of expected income over time and overall satisfaction with the program, we see that the relationships tend to fall in the expected negative direction. Moreover, the values for *non-participant (control) youths* appear to be a relatively strong predictor of mining intensity (Panel C, $p < 0.10$ in a joint significance test), much more so than for the values of CRP-participant

youths. Thus, we find rather weak evidence of a substitution effect away from logging; this substitution effect appears to have been offset by compensating livelihood opportunities, but to the extent that it was, the effects were driven by the behavior of *non-participant youths*.

5.2.3 Summary of Environmental Results

The effect of the CRP on environmental outcomes is decidedly mixed, regardless of whether the data are drawn from village heads, environmental assessments, or household surveys. On one hand, there is comforting evidence from the village head survey that the CRP caused an increase in the belief that conversation is a good use of forestland. Similarly, it increased the belief among village heads and household heads that their communities could benefit from forest use projects. The CRP also increased the proportion of household heads that stated that REDD+ projects will benefit their villages.

On the other hand, there were a number of surprising and even adverse results. The first and foremost surprising result is that there is strong evidence from all three data sources that the CRP caused a significant *increase* in mining activity. Additional data analysis provides circumstantial evidence that this could be due either to a *substitution* effect—in the case that CRP reduced logging in treatment villages and shifted people into mining instead—or an *opportunities* effect, whereby CRP patrols revealed new locations for mining. Overall, this finding highlights the importance of thinking more rigorously about how individuals substitute their forest-based activity with other potential sources of income generation. To be successful, any conservation program will need to consider a more integrated approach, especially if those other economic activities are equally or even more environmentally damaging than ongoing forest activities.

Among the adverse results were findings from the village head survey that the CRP reduced agreement with the statement that 'it is never acceptable to log'. Similarly, for households it caused a decline in the proportion agreeing with the statement that conservation is important to the world. Both of those findings are hard to explain in the context of this study.

All in all, given the decidedly mixed nature of the environmental outcomes, it would be prudent to study more closely the economic and environmental effects that arise when individuals are displaced from illegal forest-based activities.

³⁰ All annexes can be accessed online via the following link: <http://dx.doi.org/10.7910/DVN/SEG008>.

6

DISCUSSION AND CONCLUSION

DISCUSSION AND CONCLUSION



Female community rangers in Pidie.

The Aceh context is one of tremendous conservation opportunities. Compared with the rest of the region, Aceh has experienced relatively low rates of deforestation in recent years, owing to the conflict as well as to both recent leaders' commitment to conservation and the excellent work of conservation organizations such as Fauna and Flora International (FFI), which had been involved in conservation activities in Aceh for years prior to their implementation of the CRP.

The Community Rangers Program (CRP) therefore aimed to achieve two important goals in the context of post-conflict Aceh: (1) to improve the economic and social situation of at-risk youths in Aceh to create an alternative to illegal logging, and (2) to enhance environmental awareness and protection at the community-level in Aceh.

The descriptive data on the program indicate that the CRP was reasonably well implemented. Youths were identified and trained to be rangers and undertook a number of activities within their communities, from regularly patrolling the forest to organizing livelihood benefit activities. On the whole, rangers reported that their experience was overwhelmingly positive.

Ninety-five percent of the rangers stated that they would be willing to continue their work if given the opportunity, stating among others that the one of the greatest benefits of participation in the ranger program were new skills. This is consistent with the fact that the CRP provided several avenues for skills acquisition. Rangers received 10 days of basic training focused on forest monitoring skills (navigation, search and rescue, forest crime monitoring, reporting and survival techniques). In addition, rangers received on-the-job training in relation to the implementation of the livelihood sub-grants, including preparation of business plans, accounting, and financial management basics. FFI linked livelihood projects with technical support from district governments and/or universities, bringing in experts to teach the rangers enhanced and environmentally friendly techniques tailored to the nature of the livelihood projects (although an anecdotal evidence points to a large variation in the level and quality of this type of technical support across teams, as it depended on the capacity and initiative of the project's district-level coordinators, level of support from local government, and availability of expertise).

Income from the livelihood activities was also cited by rangers as a key benefit, despite the fact that much of the income was not anticipated for another two years. This could therefore be viewed as a success in the program's design; the livelihood activities were intentionally set up in a way that rangers could, in principle, continue to receive benefits for their service beyond the end of project funding. The idea was that their rights to the livelihood project sites would be contingent on their being rangers, and this would not require continual injection of funds.

Participation in the CRP as a ranger thus achieved a number of positive economic effects. We find weak evidence that the CRP increased incomes for rangers and substantially stronger effects that it caused improvements in subjective wellbeing. These findings are particularly reassuring in that they occurred in conjunction with a significant (self-reported) decrease in illegal logging activities. The finding about subjective economic wellbeing is particularly interesting in light of the fact

that, as mentioned above, the majority of benefits from livelihood projects will not be realized for several more months, if not years. This indicates that the program brought perceived benefits to rangers, even in the absence of substantial immediate financial reward. Of those who cited downsides to being a ranger, tensions with loggers and poachers ranked the highest. This 'cost' of participation is telling in that it suggests that rangers were indeed doing their jobs.

In terms of social outcomes, the CRP had some effect but the overall impact was weaker in light of the fact that social integration and acceptance were not necessarily a problem for youths to begin with. In particular, we find that the CRP caused a positive and significant increase in participation in community groups, driven by greater participation particularly in farmers' and women's associations. There is also weak evidence that the CRP also made rangers feel more respected relative to others their age and reduced fighting with family members. Generally speaking, however, we observe little effect of the CRP on other social outcomes, such as peer relations, self-esteem, and community acceptance. This is likely because at-risk youths were already relatively accepted within their communities and were not suffering from a lack of self-esteem or community antipathy. All in all, this indicates that, while youths in Aceh might be suffering from a lack of opportunities to develop their skills and generate income, they are not—reassuringly—suffering from social exclusion.

Turning to the effects of the CRP on community-level outcomes, results are more mixed, with both behavioral and attitudinal impacts from the program. Rangers were visible in the activities that they undertook within their communities to promote environmental protection. Households reported that rangers often met with *mukim* and village leaders, cleaned up the village, and engaged in patrols. Comparatively, while 60 percent of households noted that rangers 'often' or 'sometimes' engaged in community outreach activities, another 30 percent said that they had never observed rangers undertaking such work. In addition, according to both the village and household head surveys, community members were rarely if ever involved in the livelihood benefit activities. This suggests that rangers might have had limited regular and sustained involvement with community members on environmental issues, which could account for the minimal effects of the CRP on attitudinal and behavioral change with respect to forest conservation.

However, the puzzle is why we see attitudinal change in the desired direction but not behavioral change, with a weak but desirable reduction in logging activities partially offset by mining results that ran contrary to the desired behavioral impact. To some extent the lack of pronounced, desirable behavioral change is not surprising. Bringing about such change requires substantial alteration of either

norms or incentives, whereas the CRP did not offer much in the way of incentives for community members who were not rangers. Where potential positive inducements were concerned, the benefits of livelihood programs were concentrated almost entirely among the rangers, while in terms of negative incentives, the rangers were not given formal sanctioning authority—indeed, such was never the intention of the CRP. The weak and not entirely desirable effects on community members' behavior could be indicative of the limits of a program that engaged communities primarily on normative terms with no substantial positive material incentives being established. In summary, on one hand the CRP had a positive effect among household and village heads on attitudes towards the potential benefits from forest use and REDD+ projects, and youths who participated in the ranger program were significantly less likely to engage in logging. On the other hand, the CRP had at best only a very modestly beneficial impact on other community members' forest usage behavior.

Critically, however, there is strong evidence from all three data sources that the CRP unexpectedly *increased* mining activity. While we observe a 6 percentage point reduction in the number of households engaged in logging, the data reveal a 20 percentage point increase in households engaged in mining. This points to a potential unintended spillover effect of the CRP: by discouraging illegal logging and poaching, the program might have channeled people into other environmentally harmful activities that were not explicitly monitored by the CRP. Alternatively, it could be the case that the CRP patrols located new mining sites and therefore increased opportunities for mining. Additional data analysis exploring the mining findings finds circumstantial evidence that both mechanisms could be at play.

Overall, the mining finding highlights the importance of thinking more holistically about how individuals substitute their forest-based activity with other potential sources of income generation. On one hand, the CRP likely only affected small mining operations, which are substantially less environmentally destructive than large-scale operations that involve heavy equipment and chemicals. On the other hand, in the aggregate, even small-scale mining can have environmental effects and these need to be taken into account when considering the net environmental consequences of the CRP program. This strongly points to the need for a more integrated approach that considers the potentially adverse effects of closing off income generating activities that impact the environment.

In summary, the CRP was well designed when it came to creating a program that generated benefits for participant youths. Despite some adverse effects, the CRP also achieved some success in terms of its limited



Salam Ranger!

environmental aims, as a community-level intervention that sought to deter youths from participating in logging and to build community interest in conservation. Indeed, given its limited aims, it would be unreasonable to see the CRP as an attempt to end illegal logging in Aceh; instead, the program could be more properly understood as an activity complementing other efforts to deal with logging more broadly.

In evaluating the program's success, it is also important to note that the program design implicitly acknowledged a willingness to put social outcomes ahead of environmental ones, given that a primary objective of the CRP was to improve the social integration of youths (who were assumed to be more marginalized community members) rather than focusing on making a significant environmental impact. We might imagine that, if environmental objectives were paramount, it would make sense to target older, established, and already influential members of the community to take on the role of rangers and community socialization. This suggests that future program designers who are primarily interested in environmental outcomes, or who are operating in environments in which social integration is not a concern, might consider targeting individuals with a different profile to take on the role of community socialization.

Going forward, our findings suggest ways in which such a program could be designed to promote conservation-minded development more broadly. First, such programs should be more holistic in the way conservation goals are pursued. Program designers need to anticipate how individuals may substitute their forest-based activity with other potential sources of income generation, for example mining increases offsetting the gains of the CRP in reducing illegal logging, and whether the pursuit of forest conservation objectives may, ironically, generate opportunities for other activities that are environmentally undesirable. Second, to increase the impact on environmental conservation behaviors, future interventions should consider generating benefits that extend to communities more broadly. A revised version of the CRP could have rangers play a role similar to agricultural extension agents who facilitate transition to new, environmentally friendly techniques. This kind of effect was hoped for with the CRP, but with no plan in place to make it happen, there was almost no transfer of knowledge or practices from the rangers to the communities more broadly. Generally speaking, further programming should seek broader direct community member participation in sustainable livelihood activities and broader engagement with community members on promoting the value of environmental conservation.

REFERENCES

- Anderson, M. 2008. "Multiple inference and gender differences in the effects of early intervention: A reevaluation of the Abecedarian, Perry Preschool and Early Training projects." *Journal of the American Statistical Association* 103 (484):1481-1495.
- Bappenas, 2005. *Indonesia: Preliminary Damage and Loss Assessment, The December 26, 2004 Natural Disaster*. Jakarta: Bappenas.
- Blattman, C., J. Annan. 2014. "Can Employment Reduce Lawlessness and Rebellion? A Field Experiment with High-risk Men in a Fragile State". Forthcoming in *American Political Science Review*.
- Blattman, C., J. Jamison and M. Sheridan. 2014. "Reducing youth poverty and violence: Experimental evidence from unconditional cash transfers and behavior change with high-risk men". Forthcoming in *American Economic Review*.
- Burgess, R., M. Hansen, B. Olken, P. Potapov, and S. Sieber. 2012. "The Political Economy of Deforestation in the Tropics." *Quarterly Journal of Economics* 127 (4): 1707-1754.
- Heckman J., T. Kautz. 2013. "Fostering and Measuring Skills: Interventions that Improve Character and Cognition" *NBER working paper*.
- Kasia, R., W. Azmi, M. Ismail, J. Dunlop, D. Kiswayadi, H. Halimatussa'diah, F. Tryshanie, H. Isha, N. Almasri, and M. Linkie. 2011. *Tackling Illegal Logging in Ulu Masen, Aceh: Strategy, Action, and Future Direction*. Banda Aceh: Fauna and Flora International.
- Masyrafah H., and J. McKeon. 2008. "Post-Tsunami Aid Effectiveness in Aceh" Proliferation and Coordination in Reconstruction." Wolfensohn Center for Development. Working Paper 6, November 2008. Brookings Global Economy and Development
- MSR. 2010, *Multi-Stakeholder Review of Post-conflict Programming in Aceh: Identifying the Foundations for Sustainable Peace and Development in Aceh*. Jakarta.
- Perkumpulan Rincong, 2013. *Final Report: Environmental Threat Analysis, Consolidating Peaceful Development in Aceh-Community Ranger Program*, November 30, 2013: 8. Banda Aceh.
- Urdal, H. 2004. *The Devil in the Demographics: The Effects of Youth Bulges on Domestic Armed Conflict, 1950-2000*. Conflict Prevention and Recovery Working Paper No. 14. Washington, DC: World Bank.
- World Bank. 2008. *Aceh Poverty Assessment: The Impact of the Conflict, the Tsunami, and Reconstruction on Poverty in Aceh*. Jakarta: World Bank.
- World Bank. 2009. "Aceh's Growth Diagnostic: Identifying the Binding Constraints to Growth in a Post-Conflict and Post-Disaster Environment". Mimeo.
- World Bank/Bank Indonesia. 2008. *Aceh Economic Update October 2008*. Jakarta: World Bank.



