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BUILDING ON A FOUNDATION STONE: THE LONG-TERM IMPACTS OF A LOCAL INFRASTRUCTURE AND GOVERNANCE PROGRAM IN CAMBODIA

Ariel BenYishay, Brad Parks, Rachel Trichler, Christian Baehr, Daniel Aboagye and Punwath Prum

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Foreword by the EBA

Post-conflict reconstruction, or simply construction, of systems of governance, democracy, social services, economic and other institutions poses huge burdens on affected societies. While at the heart of what official development cooperation shall do, supporting such processes is challenging. A recent EBA report provides an analysis of Sweden's support for this transition in Bosnia and Herzegovina (EBA 2018:10).

The present report, as well as EBA report 2019:03, concerns Cambodia. While the latter studies long-term democracy and human rights assistance, the focus in this report is on a specific programme for decentralization, local democracy and local economic development. The programme was initiated in 1996, when local democracy in Cambodia was very weak, with the aim to rebuild confidence in government institutions and improve economic welfare from the bottom-up. Supported by Sweden and other donors, the programme was scaled up and institutionalized and achieved nationwide coverage during the 2000s.

Nearly 25 years after the pilot, the EBA commissioned this impact evaluation to look at whether the programme contributed to economic development, poverty reduction and strengthened capacity at the local level. The evaluation finds that the programme generated significant socioeconomic benefits and increased economic development in areas reached.

The evaluation results suggest that Swedish development cooperation can achieve substantial and long-lasting impacts, even under challenging conditions. The evaluated programme demonstrates that development goals related to local democracy and poverty reduction also can be successfully combined. The evaluation itself finally illustrates that it is possible to assess long-term impact of development cooperation programs using a quantitative, cost-effective, methodology.

I hope this report will find an audience among those at the Ministry for Foreign Affairs and at Sida who are working with

Swedish development cooperation with Cambodia but also among the general public.

The authors' work has been conducted in dialogue with a reference group chaired by Arne Bigsten. The authors are solely responsible for the content of the report.

Gothenburg, June 2019

Helena Lindholm

Sammanfattning

1996 inledde Sida och flera andra givare en djärv försöksverksamhet tillsammans med Kambodjas regering. Man lanserade programmet ”Seila”, som betyder ”grundsten” på khmer, för att återuppbygga förtroendet för offentliga institutioner och förbättra den ekonomiska välfärden nedifrån och upp. Under 1970- och 1980-talet och i början av 1990-talet utsattes den kambodjanska befolkningen för stor förföljelse, våld och psykosociala trauman. Under slutet av 1970-talet tvångsförflyttade röda khmererna miljontals kambodjaner till arbetsläger på landsbygden för att främja regimens mål att bygga en socialistisk ekonomi baserad på jordbruk. Många dog i arbetslägren, antingen på grund av det hårda arbetet, svält eller genom att de avrättades. Sedan 1979 intervenerade Vietnam militärt och hjälpte till att installera en ny regim som kallades Kampuchean People's Revolutionary Council (KPRC). Stridigheterna fortsatte sedan fram till 1998 när Röda Khmererna lade ner vapnen. Under 1980-talets drevs ett stort antal civila på flykt, vissa hamnade i flyktingläger längs landets gräns mot Thailand. Lokala myndigheter upphörde effektivt att fungera under denna tidsperiod. Händelserna från 1970-talet, 1980-talet och början av 1990-talet skadade även allvarligt allmänhetens förtroende för offentliga institutioner.

Seila var ett försök att återuppbygga allmänhetens förtroende för de lokala myndigheterna. Man arbetade efter det uttalade syftet att bidra till minskad fattigdom genom förbättringar av den lokala samhällsstyrningen och kanalisering av medel till subnationell nivå och ge lokalt valda ledare möjlighet att hantera lokalt identifierade behov. Detta skulle nås genom att man 1) beviljade medel till lokalt förvaltade offentliga infrastrukturprojekt och 2) gav tekniskt och ekonomiskt stöd för att bygga upp och stärka institutioner för lokal samhällsstyrning (t.ex. genom att inrätta lokala myndigheter för att identifiera prioriterade infrastrukturprojekt genom lokala deltagandebaserade planeringsprocesser). Mellan 1996 och 2001 utvidgades Seila geografiskt från 4 kommuner och sangkats till 218.

Givarsamfundet bidrog därefter också med finansiering till en landsomfattande utvidgning av programmet mellan 2002 och 2010.

Detta skedde genom stöd till utformning och etablering av en offentlig överföringsmekanism kallad CSF (Commune/Sangkat Fund) samt en rad åtföljande decentraliseringsreformer och kapacitetsstärkande insatser som överförde ägarskapet för CSF till de kambodjanska myndigheterna. Efter att val till kommun och sangkat (CS) anordnats och CS-rådsmedlemmarna getts juridiskt ansvar för utvecklingsprojekt på lokal nivå investerade Sida och andra givare i att bygga CS-rådens administrativa kapacitet. CS-rådsmedlemmarna gavs omfattande utbildning inom bland annat budgetering, planering, projektutformning, upphandling och redovisning. Dessutom tillhandahöll en grupp bestående av 1 700 tjänstemän löpande kapacitetsstärkande insatser i samtliga 24 provinser. Genom CSF åstadkoms under denna tidsperiod en decentralisering av finansiering, urval och förvaltning av småskaliga infrastrukturprojekt till lokala råd i alla 1 621 kommuner och sangkat. Stödet gick i de allra flesta fall till anläggande och förbättringar av landsbygdsvägar, vattenförsörjningssystem samt bevattningsdammar och kanaler.

CSF finansieras idag fullt ut och drivs av de kambodjanska myndigheterna. Varje år anslår staten cirka 3 % av statsbudgeten, anslaget fördelas sedan till kommuner och sangkat enligt en formel (35 % utifrån befolkningsstorlek, 30 % utifrån fattigdomsnivå och en fast andel på 35 %). Till dags dato har CS-råden slutfört mer än 40 000 projekt, och sedan 2010 har varken Sida eller någon annan givare finansierat fonden. CSF utgör därför ett exempel på ett program som startades och drevs av Sida (och andra givare) men som så småningom överlämnades till de lokala myndigheterna och utvecklades på ett hållbart sätt. I en utvärdering av Sida från 2002 karaktäriserades Seila som ”ett av de sällsynta fall där ett biståndsprojekt med internationellt stöd inleds som ett projekt avgränsat till ett visst geografiskt område men som sedan utvecklas till ett brett offentlig program med progressiva och djupgående effekter på nationell nivå” (Rudengren och Öjendal 2002).

Seila och utvidgningen via CSF utgör i sig en betydande Sida-insats och ett långsiktigt engagemang med fokus på en specifik aspekt av ett partnerlands utveckling. Mellan 1996 och 2010 investerade Kambodjas regering och givarsamfundet tillsammans nästan 350 miljoner US-dollar i programmet. Under denna period

bidrog Sida med cirka 80 miljoner US-dollar, samtidigt som man stödde insamling och samordning av bidrag från mer än ett dussin bilaterala och multilaterala utvecklingspartner samt den kambodjanska regeringen. Detta biståndsprogram skiljer sig från andra program också genom att ägarskapet framgångsrikt och till fullo överfördes till mottagarlandet. Mellan 2011 och 2018 anslog den kambodjanska regeringen cirka 50 miljoner US-dollar varje år – totalt omkring 400 miljoner US-dollar – för att säkerställa fortsatt genomförande. Sammantaget har Kambodjas regering och givarsamfundet under en tjugotreårsperiod investerat omkring 750 miljoner US-dollar.

Trots detta har aldrig någon rigorös effektutvärdering av programmet – med kontrafaktisk evidens för vad som skulle ha ägt rum om programmet inte funnits – publicerats. Under programmets genomförande skedde en betydande ekonomisk utveckling och fattigdomsminskning i Kambodja. Det är dock hittills varit oklart om programmet bidrog till dessa avsedda socioekonomiska nyttor, eller om de i stället berodde på andra förändringar. Vår utvärdering fyller detta kunskapsgap.

Metoden i utvärderingen är kvasiexperimentell och vi använder ett panelramverk för att noggrant beräkna de socioekonomiska effekterna av CSF-projekten. Vi förlitar oss på variationer i tidpunkt för CSF-projektens slutförande i olika lokalsamhällen och inom respektive kommun för att identifiera effekterna, samtidigt som vi tar hänsyn till en rad potentiellt störande variabler på detaljerad geografisk nivå. Detta genom att vi skapar ett primärt dataset med årliga interventions- och resultatmått mellan 1992 och 2013 för rutnätsceller om 1 kvadratkilometer, där vi använder fjärregistrerad nattljusdata uppmätt med satellit som en proxyvariabel för lokal ekonomisk utveckling. För att kunna utöka analysen till ytterligare utvecklingsresultat på lokalsamhällesnivå använder vi administrativa data som årligen samlats in (mellan 2008 och 2016) av Kambodjas planeringsministerium.

Vi konstaterar att avslutade CSF-projekt i signifikant utsträckning ökade den ekonomiska utvecklingen, mätt som nattljuseffekt, i omgivande områden. Vi noterar även att den huvudsakliga orsaken till dessa resultat är transportprojekt på

landsbygden, effekterna är särskilt stora i tätbefolkade landsbygdsområden. Effekterna verkar ha växt över tid, vilket tyder på att insatserna inte bara kortsiktigt stärkte den ekonomiska utvecklingen utan också påverkat den långsiktiga utvecklingskurvan. Vår analys visar även att insatserna ledde till minskad spädbarnsdödlighet, vilket indikerar att de ekonomiska utvecklingseffekter som uppstod till följd av lokala infrastrukturförbättringar kom många i lokalsamhället till godo.

Det är svårare att mäta direkta programeffekter på lokal samhällsstyrning, detta eftersom det saknas tillförlitliga mått på lokalsamhälles- eller kommunnivå som observerats över tid och med tillräckligt täta mellanrum. Det finns dock flera datakällor som gör det möjligt att utvärdera huruvida befintliga lokala samhällsstyrningsförhållanden – har ökat eller minskat effekterna av CSF-projekten.

Det är viktigt att ha i åtanke att programgenomförandet skedde under väldigt utmanande förhållanden. I en Sida-utvärdering skrev man att det ”i realiteten saknades [lokala] förvaltningsstrukturer och [att] de behövde byggas upp från grunden”, Blench m.fl. (2002:14). Följaktligen lade skaparna bakom Seila-/CSF-programmen särskild vikt vid att stärka de lokala myndigheternas kapacitet och legitimitet genom ett antal grundläggande reformer och investeringar. Efter att ha arbetat tillsammans med Kambodjas regering för att upprätta lokalt valda CS-råd, investerades i att bygga upp de enskilda rådsmedlemmarnas administrativa kapacitet. Genom att åstadkomma en mängd lokala administratörer med kapacitet att tillgodose lokala utvecklingsbehov hoppades man skapa en grund för ett långsiktigt återupprättande av samhällskontraktet.

Resultaten i vår utvärdering visar tydligt att CS-rådens faktiska lokala kapacitet var en avgörande faktor för huruvida genomförandet av CSF-projekten blev framgångsrikt. Vi har samtidigt inte kunnat se att programmens effekter var mer omfattande i områden där CS-råden var mer lyhörda för medborgarnas prioriteringar. Inte heller kan vi se att projekten haft större effekter i lokalsamhällen med mer medborgarengagemang. Vi kan snarare konstatera det motsatta. Dessa oväntade resultat pekar på en generell insikt som förtjänar att beaktas i framtida Sida-

planering: vikten av att utforma och ordna decentraliseringsprogram på sätt som är realistiska och tydligt anpassade till lokala sammanhang och förutsättningar.

Många givare har idag anammat lokalt ledd utveckling (community-driven development, CDD) som ett sätt att främja decentralisering och demokratisering i länder med traditionellt centraliserade och autokratiska politiska system. Dessa program bygger ofta på en tudelad diagnos av den lokala demokratins problem: i väl fungerande politiska system delegerar medborgarna befogenhet att lösa problem som berör dem till offentliga tjänstemän eller politiker och byter ut eller straffar de som inte är lyhörda inför kraven; men sådana politiska systemen fungerar inte när medborgarna a) har begränsad information om prioriteringar och resultat och/eller b) inte har möjlighet att välja och utkräva ansvar. I CDD-programmen försöker man lösa detta genom att göra det enklare för medborgarna att direkt kommunicera med, övervaka, utkräva ansvar och belöna offentliga tjänstemän och politiker genom olika decentraliserade samhällsstyrningsmekanismer, t.ex. lokala val, medborgarbudgetar och offentliga möten med väljare. Alla dessa institutionella mekanismer är utformade för att göra det svårare och mer kostsamt att agera på sätt som är oförenliga med de lokala medborgarnas intressen.

Om förhållandena är sådana att medborgarna starkt misstror staten och fruktar de potentiella konsekvenserna av att uttrycka avvikande åsikter eller ifrågasätta de offentliga tjänstemän eller politiker kan dock alltför ambitiösa CDD-program leda till resultat som är nedslående eller rent av kontraproduktiva. En nyligen gjord genomgång av 23 CDD-programutvärderingar i 21 länder visar att de sällan förbättrar och ibland till och med undergräver den sociala sammanhållningen och kvaliteten på den lokala samhällsstyrningen. Ofta uppnås inte CDD-programmens mål om social sammanhållning och lokal samhällsstyrning på grund av brist på verklighetsförankring och anpassning till lokala förhållanden.

Två vanliga fallgropar inom CDD-program är a) förväntningar på att medborgarna i stor omfattning ska övervaka offentlig verksamhet även när det inte tas ut lokala skatter, och b) för låg grundnivå vad gäller myndigheternas kapacitet att göra något åt

synpunkter från medborgarna. En av de vanligast förbisedda faktorerna i CDD-program är i vilken utsträckning lokala utvecklingsprojekt finansieras med lokala skatteintäkter. Denna aspekt är viktig eftersom medborgare i allmänhet är mer villiga att bevaka hur lokala utvecklingsmedel används och utkräva ansvar av offentliga tjänstemän när de vet att lokala skatteintäkter ligger till grund för finansieringen. Däremot är medborgarna ofta mindre villiga att övervaka offentlig verksamhet när de vet att lokala utvecklingsprojekt finansieras av staten eller med bistånd. Ett annat sätt på vilket CDD-program ofta misslyckas med att ta hänsyn till det lokala sammanhanget är genom att processer för engagemang, tillsyn och synpunkter från medborgarnas sida tas i bruk innan de lokala myndigheterna har tillräcklig kapacitet att svara upp mot medborgarnas krav. CDD-program medför ofta att medborgarnas förväntningar på de lokala myndigheterna gradvis ökar, och i takt med att förväntningarna ökar finner administrativ personal vid de lokala myndigheterna inte sällan att det blir allt svårare att tillgodose medborgarnas krav. I situationer där de lokala myndigheternas kapacitet är kraftigt beskuren är det vanligt att man i programmen prioriterar medborgarengagemang framför uppbyggnad av lokala myndigheters kapacitet, och detta kan oavsiktligt leda till en ond cirkel med en inaktiv förvaltning och oengagerade medborgare, i stället för den avsedda positiva utvecklingen mot en lyhörd förvaltning och engagerade medborgare.

Sida verkar dock ha undvikit sådana problem genom att i hög grad utgå från bedömningar från reformvilliga aktörer inom den kambodjanska offentliga sektorn vid utformning och genomförande av Seila-/CSF-programmen. Programskaparna var även observanta och tog hänsyn till den unika kambodjanska politiska händelseutvecklingen under 1970-, 1980- och 1990-talen. Röda khmererna skadade allvarligt förtroendet för samhället och kapaciteten hos lokala myndigheter, och i stället för att prioritera en komplex uppsättning verksamheter som skulle ha krävt ett högt förtroende och omfattande samarbete mellan medborgare och offentliga tjänstemän fokuserade Sida och dess motpart inledningsvis på att bygga upp trovärdigheten för lokala myndigheter och dess förmåga att tillhandahålla grundläggande funktioner till förmån för lokalbefolkningen. Seila-/CSF-

programmen var dock i relativt liten omfattning inriktade på att hjälpa CS-råden att skapa stabila lokala skattebaser. Att tidigt inrikta programmen på att medborgarna ska bevaka offentlig verksamhet skulle av den anledningen mycket väl ha kunnat få endast en begränsad effekt, och sådana insatser skulle ha kunnat riktat uppmärksamheten och resurserna bort från ambitionen att bygga upp de lokala myndigheternas kapacitet. I det här avseendet stärker våra iakttagelser en central punkt i en annan EBA-utvärdering: betydelsen av att ”arbeta iterativt, placera lokala reformvänliga krafter i främsta ledet och tillämpa praktiska tillvägagångssätt för att genomföra reformer [i fattiga länder]”, Andrews (2015: 1).

Sammantaget är våra resultat uppmuntrande i och med att de talar för att Sida kan åstadkomma betydande och långvariga effekter – även i områden där de grundläggande förutsättningarna är mycket utmanande. Detta när man har ett nära samarbete med myndigheterna för att säkerställa att decentraliserings- och demokratiseringsprogram anpassas på lämpligt sätt till lokala förhållanden och när man samordnar med andra givare för att säkra en hög grad av kontinuitet och samstämmighet i programplaneringen under längre tidsperioder.

Utvärderingen belyser också vikten av tidiga och kontinuerliga investeringar i noggrann datainsamling och datahantering från myndigheter och givarsamfundet. Studien har endast kunnat genomföras tack vare att Sida och dess partner, i det här fallet, investerade i utveckling av datalagringssystem för lokalsamhällesnivån tidigt i programplaneringscykeln, och inrättade en databas för projektgenomförande (Project Implementation Database, PID) och även en kommundatabas (Commune Database, CDB). Dessa två datakällor har varit ovärderliga för denna utvärdering, då de gjorde det möjligt att mäta genomförandet av CSF-programmet detaljerat i tid och rum, samt även årliga förändringar i utvecklingsvillkoren på lokalsamhällesnivå. Häri ligger en viktig lärdom för framtida Sida-program: investeringar i datasystem i ett tidigt skede till en förhållandevis låg kostnad kan möjliggöra noggranna mätningar av programeffekter längre fram.

En extra fördel med att investera i datasystem i *mottagarlandet* som kvarstår efter givarens programplaneringsperiod är möjligheten att

göra utvärderingar av effekterna på lång sikt efter programmets slutförande. Det är sällan programutvärderare får möjlighet att utförligt utvärdera programeffekter fem eller tio år efter att ett program slutförts på grund av de höga kostnaderna för att löpande samla in data i programområden och icke-programområden. När det gäller CSF-program investerade Sida och dess partner i att utveckla två datasystem som därefter har fortsatt att användas av Kambodjas regering. PID och CDB ger tillgång till årliga data om investeringar och resultat på lokalsamhällesnivå, både för år när Sida (och andra givare) tillhandahöll finansiellt stöd och för år när givarfinansieringen hade fasats ut och ersatts med nationella medel. Följaktligen kunde vi mäta både kortsiktiga och långsiktiga effekter av CSF med relativt blygsam tidsåtgång och till en förhållandevis låg kostnad.[1] Vår utvärdering visar att Sidas program skapat betydande socioekonomiska fördelar under många år efter programmets slutförande, vilket återigen understryker värdet av att investera i system i värdlandet som möjliggör löpande datainsamling i hela landet.

[1] Den sammanlagda kostnaden för denna utvärdering var lägre än 100 000 US-dollar, och datainsamling och analys tog ungefär nio månader. Geospatiala effektutvärderingar som denna är i allmänhet mindre tidskrävande och billigare än randomiserade kontrollerade studier eftersom de utgår från befintliga data i program- och icke-programområden, BenYishay (2017). Som referenspunkt kan anges att en typisk randomiserad kontrollerad studie kan ta fem eller fler år att genomföra och kostnaden kan vara 500 000–1 miljon US-dollar (på grund av behovet av *anpassad* datainsamling från behandlings- och kontrollgrupper vid olika tillfällen under ett programs livslängd).

Executive Summary

In 1996, the Swedish International Development Cooperation Agency (Sida) and several other donors embarked upon a bold experiment with the Government of Cambodia. They launched a program called "Seila," which means "foundation stone" in Khmer, to rebuild confidence in government institutions and improve economic welfare from the bottom up. The Cambodian population had been subjected to exceptionally high levels of predation, violence, and psychosocial trauma during the 1970s, 1980s, and early 1990s. The Khmer Rouge forcibly displaced millions of Cambodians to labor camps in the rural countryside during the late 1970s in order to advance the regime's goal of building a socialist, agrarian economy. Many of these laborers were worked to death, starved to death, or executed by agents of the state. Then, in 1979, Vietnam intervened militarily and helped install a new regime called the Kampuchean People's Revolutionary Council (KPRC). The conflict, which displaced large numbers of civilians, continued until 1998 when Khmer Rouge ended the military fighting. Local government effectively ceased to function during this period of time. The events of the 1970s, 1980s, and early 1990s also severely eroded public trust in government institutions.

Seila represented an attempt to rebuild public confidence in local government institutions. Its stated purpose was to "contribute to poverty reduction through local governance, and… improve local governance by channeling funds to the sub-national level to allow locally elected leaders to respond to locally identified needs." It sought to achieve this goal by providing (1) grant financing for locally-managed public infrastructure projects, and (2) technical and financial support to build and strengthen institutions of decentralized governance (e.g. establishing local government bodies to identify priority infrastructure projects through local, participatory planning processes). Between 1996 and 2001, Seila's geographical reach expanded from 4 communes and sangkats to 218.

The donor community then helped finance the nationwide expansion of the program between 2002 and 2010. They did so by

supporting the design and implementation of an inter-governmental transfer mechanism called Commune/Sangkat Fund (CSF) and a suite of accompanying decentralization reforms and capacity-building efforts that transitioned ownership of the CSF to the Cambodian authorities. After commune and sangkat (CS) elections were organized and CS council members were made legally responsible for village-level development projects, Sida and several other development partners invested in building the administrative capacities of CS councils. They provided CS council members with extensive training—in participatory budgeting and planning, project design, procurement, and financial accounting, among other things—and ongoing technical assistance from a team of 1700 civil servants in every one of the country's 24 provinces. During this period of time, the CSF decentralized the funding, selection, and management of small-scale economic infrastructure projects to local councils in every one of the country 1,621 communes and sangkats. The vast majority of these projects supported the construction and upgrading of rural roads, water supply systems, and irrigation dams and canals.

The CSF is now fully funded and operated by the Cambodian authorities. The central government transfers approximately 3% of the national budget each year to the CSF and this funding is allocated to communes and sangkats according to a formula (35% weight assigned to population size, 30% weight assigned to the poverty rate, and a 35% fixed contribution). CS councils have completed more than 40,000 economic infrastructure projects to date, and neither Sida nor any other donor has directly funded the CSF since 2010. As such, the CSF represents a program that was launched and nurtured by Sida but eventually handed over to the local authorities and made sustainable. A 2002 Sida performance evaluation characterized Seila as "one of those rare instances when an internationally supported aid project starts as a geographically delimited area-based project and then evolves into a government-owned programme with progressive and profound impact at a national level" (Rudengren and Öjendal 2002).

Moreover, the Seila pilot and CSF scale-up reflect a flagship investment by Sida, with long-term engagement focused on a

specific aspect of a partner country's development. The Government of Cambodia and donor community jointly invested nearly $350 million in this program between 1996 and 2010. Sida itself provided approximately $80 million over this period, while also helping to mobilize and coordinate counterpart contributions from more than a dozen bilateral and multilateral development partners as well as the Cambodian Government. This foreign aid program is also unlike many others in that it was successfully transitioned to full country ownership. Between 2011 and 2018, the Cambodian Government allocated roughly $50 million each year—or roughly $400 million to date—to sustain program implementation. In total, the Government of Cambodia and the donor community have invested around $750 million in this program over a twenty-three-year period.

Yet a rigorous impact evaluation of this program—with counterfactual evidence of what would have occurred in the absence of the program—has never been published. Cambodia achieved major economic development and poverty reduction gains during the period of program implementation. However, it remains unclear if the scale-up and institutionalization of this program contributed to these socioeconomic gains, or whether these gains were instead driven by other changes. Our evaluation fills this evidence gap.

We employ a quasi-experimental panel framework to rigorously estimate the socioeconomic impacts of CSF projects. We rely on variation in the timing of CSF project completion in different villages within each commune to identify these impacts, while accounting for a variety of potential confounds at fine geographic levels. To do so, we construct a primary dataset with yearly treatment and outcome measures between 1992 and 2013 for 1 km square grid cells, using remotely sensed nighttime light output data as a proxy for local economic development. To extend our analysis to additional village-level development outcomes, we use administrative data collected by Cambodia's Ministry of Planning on an annual basis between 2008 and 2016.

We find that the completion of CSF projects significantly increased economic development—as measured by nighttime light

output—in surrounding areas. We also find that rural transport projects are the main driver of these results, and that these impacts are particularly large in more densely populated rural areas. These impacts also appear to have grown over time, which suggests that rural road improvements increased not only the level but also the trajectory of economic development. Our analysis also reveals that that CSF projects reduced infant mortality, which indicates the economic development gains resulting from local infrastructure improvements were broadly shared by village residents.

Direct program impacts on local governance are significantly more difficult to measure, as there are no reliable measures of village- or commune-level governance that are observed over time at sufficiently frequent intervals. However, there are several data sources that make it possible to evaluate whether pre-existing local governance conditions—and governance interventions undertaken during the early stages of program implementation—have resulted in larger or smaller CSF project impacts.

It is important to keep in mind that program implementation took place under a very challenging set of circumstances. As described in a previous Sida evaluation, there was "a virtual absence of [local] government structures and [a] need to rebuild them from the ground up" (Blench et al. 2002: 14). Consequently, the architects of the Seila/CSF program placed special emphasis on rebuilding local government legitimacy and capacity through a foundational set of reforms and investments. After working with the Government of Cambodia to establish locally elected CS councils, they invested heavily in building the administrative capacities of individual CS council members. By creating a cadre of local administrators who were capable of addressing local development needs, they hoped to lay the groundwork for a longer-term process of rebuilding the social contract.

Our evaluation results clearly indicate that the local capacity of CS councils was a key determinant of successful CSF project implementation. However, we do not find that program impacts were larger in areas where CS councils were more responsive to citizen priorities. Nor do we find larger project impacts in areas with high baseline levels of civic engagement. If anything, we find the

opposite to be true. These counterintuitive results call attention to a broader insight that merits consideration in future Sida programming: the importance of designing and sequencing decentralization programs in ways that are realistic and tailored to the local context.

Many donors have embraced community-driven development (CDD) programming as a way of promoting decentralization and democratization in countries with traditionally centralized and autocratic political systems. These programs generally rely upon a shared diagnosis of the political problem that needs to be solved: in well-functioning political markets, citizens delegate authority to public officials to solve problems that affect them and replace or discipline those public officials who are not responsive to their demands; however, political market failures occur when citizens (a) possess limited information about the priorities and performance of public officials, and/or (b) lack the ability to select and sanction their public officials. CDD programs seek to address this problem by making it easier for citizens to directly communicate with, monitor, discipline, and reward public officials through various mechanisms of decentralized governance—for example, local elections, participatory budgeting, and town hall meetings. All of these institutional mechanisms are designed to make it more costly and difficult for public officials to behave in ways that are inconsistent with the interests of their local constituents.

However, in settings where citizens deeply distrust the state and fear the potential consequences of expressing dissent or otherwise challenging public officials, overly ambitious CDD programs can lead to disappointing—or even counterproductive—results. Indeed, a recent review of 23 CDD program evaluations in 21 countries finds that they rarely improve and sometimes undermine social cohesion and the quality of local governance. CDD programs often underperform vis-à-vis their social cohesion and local governance objectives because of a lack of realism and attention to local conditions.

Two particularly common pitfalls in CDD programming are (a) expectations of robust civic monitoring in the absence of significant

local taxation, and (b) insufficiently high baseline levels of local government capacity to respond to citizen feedback. One of the most common contextual factors overlooked in CDD programming is the extent to which local development projects are financed via local tax revenue. This program design feature matters because, as a general rule, citizens are more willing to monitor the use of local development expenditure and sanction public officials when they know that the underlying funding source of the expenditure is their own local tax revenue. By contrast, citizens are generally less willing to engage in civic monitoring activities when they know than local development projects are being financed with central government or foreign aid revenue. Another way that CDD programs commonly fail to account for local context is by activating processes of citizen engagement, oversight, and feedback before local government has achieved a reasonable baseline level of capacity to respond to citizen demands. CDD programs typically ratchet up citizens' expectations of local government over time, and as these expectations rise, local government administrators often find it increasingly difficult to satisfy the demands of their constituents. Therefore, in settings where local government is severely capacity-constrained, a common design flaw in CDD programs is the prioritization of citizen engagement over local government capacity building, which can inadvertently set in motion a vicious circle of government inaction and citizen disengagement rather than the intended virtuous circle of government responsiveness and citizen engagement.

To its credit, Sida seems to have avoided these "premature load-bearing" problems by relying heavily on the judgment of reformers inside the Cambodian Government to guide the design and implementation of the Seila/CSF program. The intellectual architects of the program clearly appreciated the need to account for the unique set of political events that transpired in Cambodia during the 1970s, 1980s, and 1990s. The Khmer Rouge severely damaged social trust and the capacities of local government institutions, so rather than prioritizing a complex set of activities that would have required high levels of trust and collaboration between citizens and public officials, Sida and its host country counterparts focused initially on rebuilding local administrators'

levels of credibility and capacity to perform basic functions that would benefit local residents. The Seila/CSF program also placed relatively little emphasis on helping CS councils build strong local tax bases. Therefore, an early programmatic focus on civic monitoring may very well have had a limited effect, and its pursuit may have diverted attention and resources away from the first-order concern of rebuilding local government capacity. In this regard, our findings reinforce a key point from another EBA evaluation: the importance of "working in more iterative ways, putting local reformers in the forefront and applying a more practical approach to doing reform [in poor country contexts]" (Andrews 2015: 1).

Overall, our evaluation results are encouraging in that they suggest Sida can achieve substantial and long-lasting impacts—even in places with very challenging baseline conditions—when it works in close collaboration with the authorities to ensure that decentralization and democracy programming is appropriately tailored to local conditions and when it coordinates with other donors to ensure high levels of programming continuity and coherence over an extended period of time.

This study also highlights the power of early, sustained investments in careful data collection and management by national governments and the donor community. The present study was only possible because, in this particular instance, Sida and its partners invested in the development of village-level data systems at a relatively early stage in the programming cycle, in this case creating the creation of a Project Implementation Database (PID) and a Commune Database (CDB). These two sources of data were essential ingredients for the present evaluation, as they enabled precise measurement of the spatio-temporal rollout of the CSF program and annual changes in village-level development conditions. And herein lies an important lesson for future Sida programs: the fact that relatively inexpensive upstream investments in data systems can enable rigorous measurement of downstream program impacts.

An added benefit of investing in *host country* data systems that outlive donor programming is the ability to conduct evaluations of

long-run, post-program impacts. Program evaluators are rarely able to rigorously estimate program impacts five or ten years after program closure due to the high cost of ongoing data collection in both program and non-program areas. However, in the case of the CSF program, Sida and its partners invested in the development of two data systems that the Government of Cambodia has maintained over time. The PID and the CDB provide annual data on village-level investments and outcomes—for years when Sida (and other donors) provided financial support and for years when donor funding was phased out and replaced with host government financing. Consequently, we were able to measure both the short-term and long-term impacts of the CSF at a relatively modest time and financial cost. [2] Our evaluation demonstrates that SIDA programming generated significant socioeconomic benefits for many years following program closure, which again underscores the value of investing in host country systems that enable ongoing data collection across the country.

[2] The present evaluation was completed at a cost of less than US$100,000, with the data collection and analysis lasting approximately nine months. Geospatial impact evaluations like this one are generally less time-consuming and expensive than randomized control trials because they leverage already existing data in program and non-program areas. (BenYishay 2017). As a point of reference, a typical RCT might take five or more years to implement and cost $500,000 to $1 million (due to the need for *customized* data collection in treatment and control groups at various points during the life of a program).

1.Introduction and Background

This study seeks to rigorously evaluate the socioeconomic impacts of a large-scale, local infrastructure and governance program in Cambodia. The Seila program was initially launched as a pilot in 1996 in four Cambodian communes with support from Sida and other donors. It was then scaled and institutionalized through the establishment of the Commune/Sangkat Fund (CSF) to achieve nationwide coverage across more than 1,600 communes/sangkats (CS) and 14,000 villages during the 2000s.[3]

Today, the CSF is fully funded and operated by the Royal Government of Cambodia (RGC). From 2002-2010, Sida and two other donors (UNDP and DFID) contributed approximately 20% of the funding for the CSF, while the RGC funded the remainder. However, since 2010, neither Sida nor any other donor has directly funded the CSF. As such, the CSF represents a program that was launched and nurtured by Sida but eventually handed over to the local authorities. Program evaluators are rarely able to rigorously estimate program impacts five or ten years after program closure due to the high cost of ongoing data collection in both program and non-program areas. However, in this case, we have a unique opportunity to evaluate the short- and long-run effects of a Sida-financed program because of the availability of village-level satellite and administrative data that encompass a fourteen-year period (2003-2016), including years when Sida (and other donors) provided financial support and years when donor funding was phased out and replaced with host government financing.

This study does not focus on estimating the impacts of this program during its pilot phase (from 1996 to 2002).[4] Instead, it

[3] Seila established and initially financed the CSF, but then the CSF effectively replaced the Seila program. Therefore, the program that we evaluate in this study is the CSF.

[4] We have chosen not to focus on the pilot phase of the program for two reasons. First, the program underwent major changes during this period of time, and the set of interventions that it supported was far more heterogeneous during the pilot phase than during the nationwide scale-up and institutionalization phase. During the pilot phase, the program supported some

seeks to provide rigorous estimates of program impact during the nationwide scale-up and long-run institutionalization phase (from 2003 to 2016).[5]

Pre-Program Conditions

"Seila," which means "foundation stone" in Khmer, was first introduced in 1996. It represented a joint effort by the donor community and the Government of Cambodia to promote peace and reconciliation, create democratic institutions, rebuild confidence in government, and improve economic welfare from the bottom up. Extremely high levels of violence and misrule characterized the twenty-year period prior to program initiation. From 1975-1979, the Khmer Rouge forcibly displaced millions of

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local infrastructure and governance activities, but it also involved a wider set of activities, including demining and the repatriation, resettlement, and reintegration of refugees (Rudengren and Öjendal 2002). By contrast, during the nationwide scale-up and institutionalization phase, the program supported a relatively homogeneous set of interventions—namely, rural road, water supply, and irrigation investments. Second, we were able to obtain detailed data on the implementation of CSF investments across villages from 2003 to 2016 from the Government of Cambodia's National Committee for Sub-National Democratic Development (NCDD). However, after a 12-month search process undertaken in coordination with archivists at Sida, Regeringskansliet, and Riksarkivet, Seila project personnel, the Head of Development Cooperation at Swedish Embassy in Phnom Penh, and EBA staff, we were not able to retrieve equally granular data on the 1996-2002 rollout of the program across Cambodian communes/sangkats or villages.

[5] Here we consider "the program" to be the Commune/Sangkat Fund (CSF) and its institutional predecessor (Seila). We differentiate between the program (which has been underway since 1996) and the various donor financing mechanisms that supported it between 1996 and 2010. Three, sequential Sida-financed projects supported the program: the Seila/Carere2 project from 1996 and 2001, the Partnership for Local Governance (PLG) project from 2001 to 2006, and the Project to Support Democratic Development through Decentralisation and Deconcentration (PSDD) from 2007 to 2010. From 2010 onward, no donor funding supported the implementation of the program. Since 2011, the central government has allocated approximately $50 million a year on average to the CSF (RGC 2015). Thus, the CSF received approximately $400 million of central government funding from 2011 to 2018.

Cambodians to labour camps in the rural countryside (now known as the "Killing Fields") in order to increase rice production and advance the regime's goal of building an agrarian economy. Many of these laborers were worked to death, starved to death, or executed by agents of the state.[6] Then, in 1979, Vietnam intervened militarily and helped install a new regime called the Kampuchean People's Revolutionary Council (KPRC). The domestic war continued until 1998 when Khmer Rouge ended the military fighting. Specially during the 1980´s large numbers of civilian were displaced and some ended up in the refugee camps along the country's border with Thailand. The United Nations later assumed civil administration responsibilities until a constitutional monarchy was re-established in 1993. These events prior to the initiation of the Seila program severely eroded social cohesion and public trust in government institutions (Iwanowsky and Madestam 2018). Local government essentially ceased to function during this period of time. According to Blench et al. (2002: 14), there was a "virtual absence of government structures and [a] need to rebuild them from the ground up" at baseline.

A December 2007 review of Seila described pre-program conditions in the following manner:

> "[a]t the outset of the initial phase of Seila in 1996, the baseline on sub-national governance was rather bleak. In establishing the role of the State following the 1993 elections, the powers and functions that had previously been devolved to sub-national authorities in the past had lapsed and all revenue had been centralized to the national level. As such, a vacuum had been created at [the] sub-national level with regards to governance functions at the same time as large volumes of external resources were beginning to be committed by the international development partner community. In the absence of clearly defined functions, systems, procedures, and transparent financial management systems, development partners had little

[6] Approximately 20% of the Cambodian population (somewhere between 1.7 and 3 million people) was killed during this four-year period of genocide (Kiernan 2008).

choice but to establish project-based systems and parallel mechanisms in order for development cooperation to be delivered at the local level. At the sub-national level, there were virtually little development resources available to the provincial administrations, and certainly none that were discretionary, and as such there was little need for planning and decision-making. Below [the] province level there were no resources at all and the planning that was being undertaken in the absence of resources was undermining the very integrity of planning itself. Largely because of this, there were not horizontal mechanisms at any sub-national levels with which to discuss territorial development priorities and coordination. Finally, there were no participatory platforms that engaged the local population in prioritization, decision-making and implementation. While the national authorities were engaged in national building and political reconciliation, in essence sub-national authorities were becoming 'observers' of development programs negotiated at [the] national level and were only occasionally consulted to provide perfunctory signatures on project reports*"* (Kingdom of Cambodia 2007a: i).

Design and Rollout of a Pilot Program

The Seila program sought to address this challenge. Its stated purpose was to "contribute to poverty reduction through local governance, and… improve local governance by channeling funds to the sub-national level to *allow locally elected leaders to respond to locally identified needs*" (Kingdom of Cambodia 2007a: 11, emphasis added).[7] Its pilot phase, which cost approximately $78 million, ran from 1996 to 2002 and was funded by more than a dozen development partners (including Sida, UNDP, WFP, UNHCR, the European Union,

[7] According to a 2007 program review conducted by the Cambodian Government "[t]he basic [theory of change] assumption of the Seila program has always been that decentralization of responsibility coupled with resources to fund appropriate investments planned, programmed and implemented at the appropriate sub-national level would contribute to poverty reduction" (Kingdom of Cambodia 2007a: 12).

IFAD, the World Bank, Australia, Canada, France, Finland, the Netherlands, Norway, and the United Kingdom).[8] Seila supported two parallel activities. It provided (1) grant financing for locally-managed development projects, and (2) technical support to build and strengthen institutions of decentralized governance. A special grant facility was created to support the implementation of village-level development projects that were prioritized through a participatory planning process. Seila also created Provincial Facilitation Teams, District Facilitation Teams, and Technical Support Staff to help commune chiefs and village leaders perform a wide array of tasks for which they had almost no previous experience. These tasks included developing village development plans and commune investment plans in consultation with local constituents, selecting qualified contractors to implement projects, and monitoring and evaluating progress.[9] By 2002, Seila had expanded to 509 communes/sangkats (Rudengren and Öjendal 2002; Kingdom of Cambodia 2007a).[10]

Design, Rollout, and Institutionalization of a Nationwide Program

2002-2003 marked an important period of transition for the program—from a pilot phase to a nationwide scale-up and long-run institutionalization phase. The geographic scope of the program increased dramatically during this period: from 509

[8] Sida provided approximately $19 million for the Seila/Carere2 program (UNDP/UNOPS 2001). Sida and UNDP also supported for decentralization through an earlier program called Carere that took place between 1992 and 1996.

[9] During the pilot phase of the program, the members of Village Development Committees (VDCs) were elected. However, commune chiefs were not elected and they played significant roles in project selection and prioritization (Rudengren and Öjendal 2002).

[10] Cambodia has three tiers of government administration: (i) provinces and the capital; (ii) districts, municipalities, and khans; and (iii) communes and sangkats. A sangkat is the urban equivalent of a rural commune. Cambodia has 1,621 communes/sangkats and approximately 14,000 villages (nested within communes/sangkats).

communes/sangkats (31.4% coverage) in 2002 to 1,621 communes/sangkats (100% coverage) in 2003.[11] Also, whereas the commune and sangkat leaders who were responsible for prioritizing, managing, and monitoring village-level development projects during the pilot phase of the program were unelected and almost exclusively male, a more diverse mix of male and female leaders ("commune councilors") were popularly elected to represent the interests of their constituents during the nationwide scale-up and long-run institutionalization phase of the program (Kingdom of Cambodia 2007a).

In the February 2002 elections, 10,245 men and 1,016 women were elected as members of 1,621 newly-formed commune/sangkat councils and charged with implementing the 2001 Law on Administration and Management of the Commune/Sangkat.[12] The law stipulated that the newly elected commune/sangkat (CS) councils would assume responsibility for identifying and designing local development priorities and investment priorities in consultation with their constituents, managing procurement and financial accounting processes, monitoring project implementation,

[11] The successor programs to Seila/Carere2—the Partnership for Local Governance (PLG) and the s (PSDD)—ran from 2001-2006 and 2007-2010, respectively, and they supported this nationwide expansion and the design and implementation of the Commune/Sangkat Fund (CSF). The PLG was originally designed as a $64 million joint investment by SIDA, UNDP, and DFID (of which $27.9 million came from Sida). However, it was later re-scoped to support the nationwide expansion to all of the country's communes and sangkats. It ultimately mobilized $215 million in contributions from the central government and various development partners between 2001 and 2006. SIDA, UNDP, and DFID then invested an additional $55.7 million in the CSF between 2007 and 2010 (through the PSDD). See Kingdom of Cambodia 2007b and http://odacambodia.com/.

[12] The 2001 Law on the Administration and Management of Commune/Sangkat laid the groundwork for the establishing of communes and sangkats as elected, legal entities responsible for local affairs. The commune- and sangkat-level elections in February 2002 led to the creation of commune/sangkat councils, which consisted of 5, 7, 9 or 11 elected councilors (depending on population size). The law stipulated that members of the commune/sangkat councils would serve 5-year terms of office and have broad responsibilities "to meet the basic needs of its Commune/Sangkat for serving the common interests of the residents."

and reporting on progress. However, relatively few of these councilors had experience managing community-driven development (CDD) projects and processes, so the Sida-financed Partnership for Local Governance (PLG) focused on building the capacities of CS councils during the transitional period.[13] CS councilors received training in the law (and associated regulations), and an extensive set of capacity-building activities were undertaken at the commune/sangkat level to prepare CS councilors to perform their new CDD responsibilities.[14]

CS councilors received substantial institutional support (so-called "facilitation services") from the Executive Committee (ExCom) of the Provincial Rural Development Committee (PRDC). ExCom acted as the key interface between the donor community (funders of the program) and CS councils (local implementers and overseers of the program). It employed 1,700 civil servants across the country's 24 provinces and provided technical assistance to CS councils. ExCom's Contract Administration Unit supported CS councils in their efforts to run transparent and competitive procurement processes that would result in the selection of qualified contractors and cost-effective implementation of public investment projects; its Finance Unit provided a team of accountants to facilitate financial management and oversight of public investment contracts; its Technical Support Unit managed the provision of engineering services to CS councils (for survey, design, procurement, and construction supervision of small-scale infrastructure projects); and its Local Administration Unit was

[13] According to a 2007 review of the Seila program, "[n]one of these men and women had any previous experience as an elected representative. Some had experience as appointed Commune or Village chiefs, but the range of tasks, operating procedures, and expectations of these officials were substantially different from those of the new councils. Even those councilors with previous exposure to participatory planning and development project implementation under Seila, were not equipped with any of the specific administrative and financial management skills needed to fulfill their new role effectively" (Kingdom of Cambodia 2007a: 71).

[14] CS councilors received specialized training in participatory development planning, competitive procurement, project management, financial accounting, monitoring and evaluation, gender sensitivity, and good governance, among other things.

responsible for training and capacity building of CS councils (Kingdom of Cambodia 2007a).

During the 2002-2003 period of transition, Sida and other funders of the PLG also sought to institutionalize and scale the Seila program by supporting the design and implementation of an intergovernmental fiscal transfer system—called the Commune/Sangkat Fund (CSF)—and a suite of accompanying decentralization reforms to transition ownership of the CSF to the Cambodian authorities. The institutional precursor to the CSF was an off-budget mechanism called the Local Development Fund (LDF) that the donor community used to transfer money to communes and sangkats for the design and implementation of CDD projects. The LDF facilitated the rollout of the Seila program to approximately 30% of the country's communes and sangkats between 1996 and 2001. However, its long-run sustainability was a key concern for Sida and other PLG funders, and the passage of the 2001 Law on Administration and Management of the Commune/Sangkat provided a solution. It effectively replaced the LDF with the CSF by (1) setting aside a fixed percentage of the central government budget for the country's 1,621 CS councils and (2) introducing a transparent formula to facilitate the allocation of this annual budget across communes and sangkats each year.

Under the CSF, each commune received an average annual CSF allocation of approximately $20,000 per year. These allocations varied on the basis of the commune's population and poverty.[15] Within each commune, approximately 75% of this funding was allocated to local public goods projects, with the remaining 25% set aside for administrative and oversight costs at the commune level. Decision-making over the use of the public funds was given to newly formed CS councils, who generally consulted with village chiefs. While there were relatively few *de jure* restrictions on the use of the funding (for example, it could fund a variety of social services such as health clinics or schools), the vast majority of projects supported local road construction and rehabilitation (76%). The average funding amount (~$15,000) was generally sufficient to

[15] The exact formula for allocations included 35% weight to population size, 30% weight to the poverty rate, and 35% to a fixed contribution.

construct or upgrade a 1 km gravel village road, which could be expected to last 3-5 years before requiring repair. The remaining projects funded irrigation dams and canals (10%), water supply systems (6%), and a small number of urban roads and other services.

With an average of 8 villages within each CS, councils usually had sufficient funding for one project each year. Official guidelines from the Ministry of Planning and Ministry of Interior stipulated that CS councils were to draw up commune investment plans in close consultation with village chiefs, who in turn were responsible for consulting with village members to understand their needs and preferences, representing these needs and preferences to CS councils, and working with CS councils to align commune investment plans with village development plans. [16] Annual identification of CSF beneficiary villages took place at meetings between the members of the CS council and village chiefs. These decisions were usually made through consensus rather than a formal vote, and previous studies suggest that the village selection process was generally characterized by cooperation rather than conflict. According to a joint review of CSF project implementation in 12 communes by the World Bank and the Asia Foundation, "[v]illagers that had not received recent investments explained that they were nevertheless content because 'they knew that their turn would come'" (Plummer and Tritt 2012: 24).

The flexible nature of CSF funding also presented a significant risk of elite capture and corruption. [17] However, there is little evidence that the funds were either widely misused or allocated in particularly biased ways. Case study evidence suggests that CSF funds were not subject to high levels of misuse.[18] The 2012 joint

[16] See Kingdom of Cambodia 2007b.

[17] On this point, see Platteau and Gaspart 2003.

[18] There were reportedly more problems with elite capture and corruption in the early years of the CSF. In June 2005, a CSF Accountability System was put in place that involved informing local stakeholders of their rights and responsibilities related to oversight of CSF projects; collecting, recording, and investigating written complaints from community members that were submitted through "Accountability Boxes"; and imposing sanctions and disciplinary measures in instances in which CSF resources were misused. The CSF

review of the World Bank and the Asia Foundation found little evidence of elite capture and concluded that project prioritization decisions were generally "based on local needs and preferences" (Plummer and Tritt 2012: 5).[19] In Section 4 of this evaluation ("Findings"), we also find little evidence that the timing of CSF allocations to villages was correlated with preceding changes in nighttime light output, suggesting that projects were not primarily allocated to already favored villages.

The Quality of Program Implementation

By most accounts, the quality of program implementation during the pilot phase and the nationwide scale-up and institutionalization phase was high. A 2001 completion report by UNDP and UNOPS judged the program to be "highly satisfactory" on 11 out of 13 dimensions of performance (UNDP/UNOPS 2001). A strategic evaluation commissioned by Sida in 2000 concluded that "Seila has succeeded beyond expectations. ...[c]ommunities have become more active and self-reliant, [and] provincial and district government staff has become more responsive to community needs" (Evans et al. 2000: 1). A 2002 Sida performance evaluation went even further, characterizing Seila as "one of those rare instances when an internationally supported aid project starts as a geographically delimited area-based project and then evolves into a government-owned programme with progressive and profound impact at a national level" (Rudengren and Öjendal 2002).

Evaluations of the quality of CSF implementation have been similarly positive. The 2012 joint review of the World Bank and the Asia Foundation concluded that "local development activity carried

Accountability System was not fully implemented across all provinces until early 2007 (Kingdom of Cambodia 2007a).

[19] The authors of this joint evaluation by the World Bank and the Asia Foundation note that CSF-funded road projects were generally responsive to the collective needs and preferences of local residents. But they also find some indications that irrigation and water supply projects may have disproportionately benefited some individuals and communities within CSs (Plummer and Tritt 2012: 24).

out with the use of the [CSF funding] is managed strictly according to the regulations" and "[c]ommunes are attempting to achieve clean, transparent and responsible practices that result in surprisingly well-managed processes and appropriate projects" (Plummer and Tritt 2012: 5).

Yet a rigorous impact evaluation of this program—with counterfactual evidence of what would have occurred in the absence of the program—has never been published.[20] Cambodia achieved major economic development and poverty reduction gains during the period of program implementation.[21] However, it remains unclear if the scale-up and institutionalization phase of this program (from 2003 to 2016) contributed to these socioeconomic welfare gains. The purpose of this evaluation is to address this evidence gap.

[20] There is some "grey literature" on this topic. However, most of the studies that exist have serious methodological shortcomings (e.g. Tracey-White and Petts 2001). Blench et al. (2002: 36) lament the absence of good baseline and endline data for villages and communes that did and did not benefit from the program, but they also emphasize that "all indirect indicators suggest both regional economic growth and an increase in overall wealth, as well as improvements in livelihoods. Income proxies such as newly roofed houses, personal transport and omnipresent small businesses represent very concrete signs of such progress."

[21] The national poverty rate fell from 47.8 percent in 2007 to 13.5 percent in 2014 (ADB 2014).

2. Evaluation Design

Geospatial impact evaluation (GIE) is an innovative methodology for estimating the causally attributable impacts of development programs (BenYishay et al. 2017; Isaksson 2017). GIEs use precisely georeferenced intervention data and outcome data to establish a counterfactual retroactively, aiming to generate as-good-as-random variation in the treatment status of individual units. GIEs also leverage readily available data like satellite observations, so they can be implemented even when a development program did not conduct baseline and endline surveys in "treated" and "untreated" areas.

Previous studies that were commissioned to evaluate Seila and the CSF concluded that a rigorous impact evaluation would not be possible because baseline and endline data were never collected in project areas and non-project areas. For example, Blench et al. (2002: 36) concluded that the "absence of baseline data for [Seila] inevitably makes quantitative assessment impractical." However, the GIE methods that we use in this study solve this problem by leveraging (a) remotely sensed and in situ outcome measures that cover nearly all Cambodian villages and communes before, during, and after the CSF program implementation period supported by Sida; and (b) data on the spatio-temporal rollout of the CSF program.

In this GIE, we employ a quasi-experimental panel framework to assess socioeconomic development outcomes before and after CSF-sponsored infrastructure projects (or "treatment") in areas surrounding the projects. We utilize two sources of socioeconomic outcome data: (1) nighttime lights (NTL) data measured via satellite for 1 km x 1 km grid cells between 1992 and 2013, which serves as a proxy for economic development, and (2) survey data on electricity access, infant mortality, and household wealth measured at the village level between 2008 and 2016. We measure the extent of treatment in an area based on the number and timing of completed CSF projects. We use these sources of georeferenced program and outcome data with quasi-experimental methods to estimate what would have happened in the absence of the program, and thus

rigorously estimate the impact of CSF projects on our outcomes of interest.

We also explore whether the program appears to have different impacts based on the governance conditions in the communes. We use a variety of data from administrative and independent sources to proxy for these governance conditions, reflecting both pre-existing conditions and areas where the CSF program aimed to make improvements, including both local capacity and responsiveness to local priorities and preferences.

We do note that our evaluation design cannot capture potential benefits from spillovers to private sector investments due to CSF efforts. For example, district integration workshops convened as part of the CSF efforts may have actually created further projects funded by international donors or the private sector. Similarly, remittances from abroad may well have varied based on the overall activity of the CSF in some regions of the country. In general, these potential benefits lie outside the scope of our study. We expect our impact estimates from CSF infrastructure investments are nonetheless valid because the variation in these spillovers occurs largely across regions, districts or communes, whereas our impact estimates are based on differential timing of investments *within* communes. Moreover, to the extent that there are "knock-on" effects on remittances that occur due local CSF funding, our long-term results can be effectively thought of as measuring the broad, total effects on each the local economy.

In this section, we first describe the identification of the evaluation sample and the sources of geospatial data that we use in the NTL outcome analysis. A brief description of the administrative outcome sample and data follows. We explain the quasi-experimental panel methodology and construction of the counterfactual that we use for all outcomes in greater detail in the subsequent Methodology section.

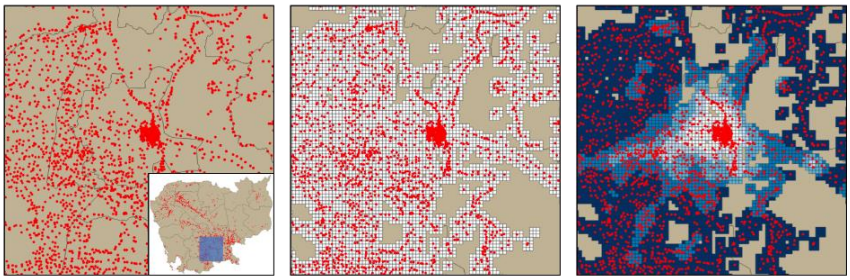
Data

Sample

We use village-level geospatial data provided by Open Development Cambodia to identify the point coordinates of 14,073 villages within Cambodia. Each village is eligible for CSF projects, though not all villages within a commune actually receive one. The satellite outcome data is measured in 1 km x 1 km square grid cells that cover the entire globe; we use the georeferenced villages to identify the sample of 1 km square grid cells to include in our analysis (see Figure 1). Specifically, our sample includes any 1 km square grid cell that includes a village within its boundaries or is adjacent to such a cell – in other words, one center cell that includes the village and eight border cells to form a 3 km x 3 km square around all georeferenced villages (see Figure 2). Note that a given cell may include a village within its boundaries and also serve as a border cell for one or more villages.

Our sample includes 53,156 unique grid cells. Using this sample of grid cells, we build a dataset that includes yearly treatment (CSF project exposure) and outcome data (NTL) for each cell from 1992-2013 (see Figure 1). Many grid cells are in proximity to multiple projects. We address the implications of this data structure and how we assemble the treatment measures in the next section.

Figure 1: Creating the Evaluation Sample



Plot village coordinates

Identify grid cells intersecting with and bordering a village. Unit of analysis = 1km square grid cell

Measure nighttime lights outcome for each grid cell for each year, 1992-2013

Treatment Data

In this impact evaluation, "treatment" occurs when the planned infrastructure improvements from a CSF-sponsored project are completed. We first identified the locations of all projects supported through the CSF between 2003 and 2016. We retrieved records of all projects supported through the CSF from the Project Implementation Database (PID), managed by the Monitoring and Evaluation Unit of the Government of Cambodia's National Committee for Sub-National Democratic Development (NCDD). The PID provides detailed information about the attributes of each CSF project, including the nature of the project (e.g. rural roads, irrigation, water supply); the year of project approval and completion; and the locations where the project took place (village names and coordinates). We merge the PID data with a comprehensive set of village names and coordinates provided by Open Development Cambodia to obtain 41,850 records of CSF projects georeferenced to the village level. The data sources do not identify specific coordinates that characterize the spatial scope of a project; i.e., we know that a road or irrigation project occurs in or near a certain village, but the exact line route of the road or the precise coordinates of the irrigation canal are unknown.

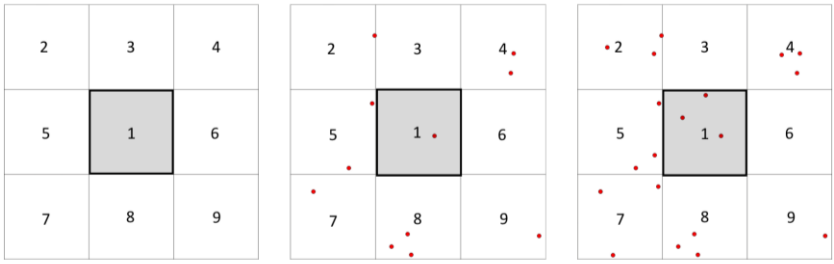
We utilize the georeferenced CSF projects to measure treatment at the cell level using the year of completion for the 41,850 projects included in this analysis. The earliest treatment year is 2003 and the

latest treatment year is 2016, though we do not include any projects completed after 2013 in the cell-level analysis using NTL as the outcome. Projects completed in 2014-2016 are only evaluated through the village-level analysis (because the nighttime lights historical data series changes significantly post-2013). Variation exists in the sector of improvements carried out through the program (e.g., rural transport, urban transport, water supply, irrigation) and we explore the overall effect of all CSF projects as well as sector-specific effects in the Findings section of this report.

Prior to treatment, a cell is part of the control (untreated) group. Approximately 18% of the grid cells in our sample do not intersect with any CSF projects during the period of evaluation, as not all villages within a commune receive a CSF project. As these cells are never treated, they always remain in the control group with a treatment value equal to zero. For all other cells, treatment begins during the year the first project is completed in its associated village. As a result, the treatment and control groups are dynamic, and a cell moves from the control group to the treatment group at the time of treatment.

A number of cells in our sample (38%) intersect with more than one project during the period of evaluation. While treatment begins in the earliest year of project completion for all cells, the treatment measure increases as additional projects are completed. This cumulative count of completed projects increases by one unit for a grid cell each time an additional project is completed within the cell, capturing not only the presence but also the intensity of treatment. As most projects provided similar levels of funding (~$15,000), we do not observe variation in funding amounts per project, and instead consider intensity of treatment along these lines of multiple nearby projects falling within the same cell. See Figure 2 for an illustration of the construction of the treatment measure.

Figure 2: Constructing the Count Treatment Measure



2002 is the year before project roll-out began. Accordingly, no projects have been completed yet in cell #1 or the adjacent 8 cells. **For cell #1, the project count is 0 for 2002.**

As project roll-out begins in 2003, the treatment count begin rising. There is 1 project completed in cell #1 and 10 projects completed among the adjacent 8 cells in 2003. **For cell #1, the project count is 11 in 2003.**

As additional projects are completed in 2004, the total number of completed projects in cell #1 rises to 3 and the total number of completed projects in the adjacent 8 cells rises to 16. **For cell #1, the project count is 19 in 2004.**

* This figure is an example of how we construct the treatment measure for one grid cell (#1) in Cambodia's Phnom Penh province from 2002-2004. For the count, we include projects completed within the grid cell as well as the adjacent 8 grid cells. In the analysis, the cumulative count is measured through 2013. The same process is conducted for any cell that ever includes a project within its boundaries.

Outcome Data: Nighttime Light Output

We use remotely sensed nighttime light output, as measured by the National Oceanic and Atmospheric Administration (NOAA) Defense Meteorological Satellite Program (DMSP), as an outcome variable in this study (Elvidge et al. 1997, 2009). This measure is increasingly used in impact evaluations of infrastructure investments (e.g. Corral et al. 2016; Bunte et al. 2018; BenYishay et al. 2018) because it is strongly and positively correlated with local GDP (Henderson et al. 2012; Hodler and Raschky 2014), household consumption and asset wealth (Khomba and Trew 2017; Weidmann and Schutte 2017), and a wide array of human development outcomes (Michalopoulos and Papaioannou 2014; Bruederle and Hodler 2018).[22] However, unlike most sources of household survey data and administratively collected GDP data, remotely sensed nighttime light output is measured consistently and reliably at a high level of spatial resolution.

[22] Weidmann and Schutte (2017) demonstrate that nighttime lights correlate strongly (.73) with survey-based measures of asset wealth at the local level (Demographic and Health Survey enumeration areas with 2km-5km buffers). Khomba and Trew (2017) also find a strong, positive correlation (.53) between nighttime light growth and household consumption gains.

Nightly satellite images collected by the DMSP measure nighttime light (NTL) emissions from 1992 to 2013 for pixels that correspond to individual square kilometers. These raw nightly data measure radiance or brightness in a given pixel and are aggregated into yearly composites. Given that comparisons of nighttime light output over time can be problematic due to sensor degradation and the fact that satellites capture both persistent lighting (e.g. residential and commercial buildings that emit light, street lights) and ephemeral lights (e.g. fires, gas flares), we use a measure that removes all ephemeral events.[23] This measure varies between 0 (totally unlit areas) and 63 (brightly lit areas).[24] Higher values indicate higher levels of economic development in a wide variety of contexts and at a wide array of geographic scales, making this a particularly well-validated outcome measure in our setting (Henderson et al. 2012; Hodler and Raschky 2014).[25]

As we previously noted, the DMSP NTL measure has a maximum of 63, which necessarily limits measurement of luminosity in the brightest areas. Consequently, our full sample of cells includes 53,156 grid cells, but we exclude 62 cells in the Phnom Penh province from our analysis because these cells include maximum DMSP values that do not enable accurate measurement over time. This top censoring of the DMSP NTL data is a well-known phenomenon; the fact that it occurs for only <0.1% of cells (and those occur only in one urban area) gives us confidence in the overall results.

[23] Our measurements are also calibrated across sensors and years using the coefficients reported in Elvidge et al. (2014: 102).
[24] These values are best understood in relation to each other (e.g., the mean value in relation to the minimum and maximum values, the amount of change experienced by the average grid cell during the evaluation period, etc.).
[25] Hodler and Raschky (2014: 1028-1031) use subnational GDP estimates from Gennaioli et al. (2014), covering 1,503 subnational regions within 82 countries, to estimate the relationship between nighttime light output and subnational GDP. They estimate elasticities between nighttime light output and GDP at the national and subnational levels, respectively, of around 0.3.

Outcome Data: Commute Database

Our analysis includes a secondary set of outcome measures sourced from the Commune Database (CDB) managed by the RCG's Ministry of Planning. The CDB provides yearly data on 360 village-level variables between 2008 to 2016, including measures of infant mortality, asset ownership, and electricity access. These data are collected annually by village chiefs,[26] although there is some question as to whether chiefs have sufficient time or incentive to collect accurate, unbiased data. As a result, we treat these data as extensions of the NTL results. We further analyze the dynamics in the CDB data and correlation between CDB outcomes—especially asset ownership—and NTL as validation of our results.

Infant mortality is likely one of the CDB variables that is more accurately reported, so we use this measure directly. For asset ownership, we construct a weighted index of the underlying variables by taking the first principal component of asset ownership in each village. By contrast, we use electricity access (measured as a dummy indicating whether there is any household connected to the electrical grid in the village) as a validation of the NTL data. As established in the aforementioned studies, the NTL data are generally correlated with socioeconomic outcomes in villages with existing access to electricity. If we observe that CSF projects were shortly followed by extensions of the electrical grid to villages, we would not be able to disentangle changes in NTL due to

[26] The CDB provides a set of indicators that measure the demographic, socio-economic and physical conditions of each village. It is based on an administrative census that is undertaken each year in all Cambodian villages. Each December, village chiefs complete a questionnaire (or so-called "Village Data Book") about conditions in their villages. The data are then reviewed by commune/sangkat clerks and submitted to district planning offices for an additional round of verification. They in turn submit the data to provincial planning offices (PPOs), and after consolidating, reviewing, and digitizing the data, PPOs submit the data to the Ministry of Planning for integration into a national database. The CDB was previously called the "Seila commune database" and it was initially developed for the purpose of village-level monitoring of Seila program implementation. However, once Seila was phased out, the CDB became the primary monitoring mechanism for the CSF program. The poverty measure that is used in the CSF allocation formula is based on CDB data (Kingdom of Cambodia 2012).

socioeconomic gains from those due to the grid expansion. We thus check whether we observe CSF treatment effects on electricity access as a validation of the NTL outcomes.

We construct a panel dataset of yearly treatment and outcome data for 13,909 villages. Like the cell-level treatment measure, the village-level treatment measure is constructed as a cumulative count of the number of CSF projects completed for a village, in which the count increases by one in the year in which each project is completed.

The CDB data are complicated by the fact that they are first available in 2008, by which point the CSF scale-up had been in implementation for five years and many projects had been completed. As a result, we do not observe all villages at a baseline of zero, but instead some may start with a treatment value of 1 or more that reflects the count of projects implemented before 2008. The CDB data thus allows us to better estimate what happens five or even ten years after villages first experience CSF projects, as well as what happens when they benefit from multiple projects over time.

Governance Data: Pre-existing Conditions

We also use data on pre-existing governance conditions from the Cambodian Genocide Program Interactive Geographic Database (Yale University 2019). These data reflect the intensity of Khmer Rouge political violence and related citizen attitudes toward local government. We expect higher levels of exposure to Khmer Rouge will correspond to lower levels of trust in local government and community engagement during our period of study, based on recent findings by Iwanowsky (2018).

This spatial dataset documents exposure to the Khmer Rouge regime (from 1975 to 1979) by recording the coordinates of 158 prisons run by the Khmer Rouge, 309 mass graves where the Khmer Rouge engaged in state-sponsored genocide, and 76 memorial sites commemorating those who were victimized by the Khmer Rouge. It also provides the coordinates of 115,273 locations that the U.S.

Government bombed between October 1965 and May 1975, which "likely indicate areas of stronger support for the Khmer Rouge" Iwanowsky (2018: 140). We use these data to build four dummy variables indicating whether a bombing, burial, prison, or memorial site is present in a given commune. We also build an intensity measure for each type of site, documenting how many instances of the site occur in a given commune.

Governance Data: CSF Interventions

The CSF program involved a variety of efforts aimed at strengthening local governance in conjunction with local infrastructure funding. Because many of these interventions took place at the province or commune level (rather than the village level), we cannot identify their direct effects beyond village infrastructure construction. Instead, we evaluate the extent to which early governance interventions increased the impacts of subsequent infrastructure investments.

The 2003 Seila Program Annual Program Report includes a number of tables with commune- and province-level measures of local governance capacity at the outset of the program. We use the following measures:

1. *Percent of commune priorities that received funding in 2002-03*. Before funds were allocated, communes submitted a set of funding priorities to the Department of Planning. A higher percentage of funded priorities should indicate greater central government responsiveness to local development preferences. This province-level variable measures the percent of total priorities in a province that received funding.
2. *Percent of commune councilors that are female in 2002-03*. The CSF governance program prioritized an increase in the number of women serving in local government. This province-level variable measures the share of female councilors in all communes in a given province.
3. *Percent of newly elected commune chiefs in 2002 who had previously served as unelected commune chiefs*. This province-level variable measures the combined percentage of all new commune chiefs that

previously served in an unelected capacity in a province. This measure can be used as a proxy for the prior experience among these chiefs.

4. *Percent of newly elected commune council members in 2002 who had previously served as unelected commune council members*. This province-level variable measures the combined percentage of all new commune council members that previously served in an unelected capacity in a province, again reflecting local experience.
5. *Ratio of commune councilors to villages in 2003-04*. This commune-level measure captures the capacity of local government in a commune, essentially measuring the number of commune councilors per village in a commune.
6. *Number of ExCom Staff assigned to support CSF implementation in 2003*. This province-level measure captures the degree of external governance support provided to a province by the central government. ExCom staff support was a feature of the CSF program, and higher levels of ExCom support indicate increased local governance capacity.

Governance Data: Unit Cost and Bid Data

To understand the extent to which additional CSF interventions may have limited the misuse of funds, we further analyze data on the bids and unit costs associated with each contract recorded in the Project Implementation Database (PID). The PID includes a measure of the cost per unit of output for each CSF project, which we use as a measure of the efficiency of implementation of each project. As a project's unit cost value is correlated with project type (i.e., a concrete road will have a higher unit cost than a dirt road because the inputs are more costly), we de-mean our unit cost measure, dividing each observation by the mean unit cost for all projects with the same activity type. We then aggregate these data to create the mean unit cost for each commune across all projects within that commune (adjusted for project type differences). That is, we can compare the project impacts in communes where average costs are high (potentially due to the misuse of funds) to project impacts in communes where costs are on average lower.

The PID also contains data on whether a project was subject to competitive bidding and, if so, the number of bidders for the project. These data are merged with the panel to create two variables: one measuring the percent of projects in a grid cell that were subject to competitive bidding, and another tracking the mean number of bidders for all projects within each grid cell. Both of these variables are measured temporally, so they adjust each year an additional project is completed in a given grid cell. We then aggregate these measures as well to create means at the commune level.

3. Methodology

Nighttime Lights Analysis at the Grid Cell Level

For our nighttime lights (NTL) analysis, we use 1 km square grid cells as the unit of analysis to improve the precision of our outcome measures and the validity of our estimates. Our panel dataset includes 22 annual observations (1992-2013) of NTL for 53,156 cells. The dataset also identifies two cumulative treatment measures for each cell that reflect the timing of completed CSF projects within or adjacent to a cell. The timing of completion differs for each project, and thus varies across grid cells, as does the cumulative number of projects completed. Panel methods essentially align the timing of treatment and aim to identify a pattern of change in nighttime light for all cells relative to each cell's treatment. In other words, do we see a pattern of change in nighttime light for all cells in the years after a cell is treated?

The variation in the actual calendar date of treatment across cells helps to address concerns about confounding variables, or other factors specific to each grid cell that may also correlate with changes in nighttime light during the study period. In a panel model at fine geographic scale and with varied timing of treatment, these alternative explanations are very unlikely to affect each cell at the exact time that CSF-supported projects are completed. For example, if a donor-funded road improvement program is rolled out through Cambodia in 2007, we would expect it to benefit areas near grid cells that have already been treated through CSF projects and those that are yet to be treated through CSF projects. The threat to our causal attribution from external confounding factors is thus limited to factors that differentially affected areas surrounding newly completed CSF projects with the very same timing as CSF project completion. This threat appears quite small given the dispersion of CSF projects over both time and geographic space.

A second potential threat to our analysis is the potential selection bias associated with the allocation of funding to villages based on other, contemporaneous changes in outcomes. For example, if the

villages that received funding earlier in the program implementation period were also more likely to experience earlier changes in outcomes for secular reasons, our panel estimates could be biased. Here, again, the sharp timing of CSF project completion guards against some of these slower and broader changes. As part of our main analysis, we also test whether there is any evidence of differential preceding (NTL) trends just prior the completion of each CSF project. We find little evidence of any such trends. This suggests that while CS councils and village chiefs may have selected villages to receive CSF projects earlier on the basis of certain characteristics, these characteristics are not correlated with changes in socioeconomic conditions happening immediately around the CSF project completion. We are thus confident that our empirical approach produces causal estimates that can be attributed to CSF projects.

Our models include year and cell-level fixed effects, as well as province-level linear time trends. Year fixed effects control for year-specific impacts on NTL that affect a large number of cells at the same time (e.g. a minimum wage increase or change in the cost of electricity). Cell-level fixed effects control for the time-invariant characteristics of each cell, many of which might also impact average NTL values (e.g., proximity to a larger city, population density, or elevation). Controlling for the time-invariant features of each cell is a key advantage of a panel model and allows each cell to serve as its own counterfactual (rather than trying to match similar control and treatment cells with limited data). Applying year and cell-level fixed effects at high levels of spatial resolution helps to control for potential confounds and omitted variables that would otherwise bias our results. We include province-level linear time trends to control for different rates of change in NTL by province during the evaluation period and to help smooth out some of the year-to-year inconsistencies we initially observed in the outcome data.

Using the panel framework with fixed effects, we estimate the following equation:

$$Nighttime\ Lights_{icpt} = \alpha + \beta\ CSF\ Count_{icpt} + D_i + D_t + D_p * t + \epsilon_{ict}$$

where $CSF\ Count_{icpt}$ indicates the cumulative count of CSF projects within the boundaries of cell *i* or its surrounding eight cells in commune *c* in province *p* by year *t*, D_i is a vector of grid-cell fixed effects, D_t is a vector of year fixed effects, and $D_p * t$ is a vector of province-specific smooth year trends. The term ϵ_{ict} denotes all unmeasured idiosyncratic factors that affect NTL outcomes in cell *i* in commune *c* in year *t*. We estimate treatment effects via ordinary least squares. We also use two-way clustering of standard errors by commune and year.

In order to understand the role of both pre-existing governance conditions and CSF's governance interventions in shaping the impacts of CSF-supported infrastructure, we examine heterogeneity in treatment effects along measures of these governance conditions. That is, we estimate the following equation:

$$Nighttime\ Lights_{icpt} = \alpha + \beta\ CSF\ Count_{icpt} + \gamma\ CSF\ Count_{icpt} * governance_{cp} + D_i + D_t + D_p * t + \epsilon_{ict}$$

where $governance_{cp}$ represents our varied measures for commune *c* in province *p*. For pre-existing governance conditions, we use measures of preceding factors that affected the extent of support for the Khmer Rouge in each commune and thus shape local residents' engagement with government and local public efforts. We also use measures of early CSF governance interventions at the commune and the province scale, assessing the extent to which these early interventions affected subsequent outcomes from CSF infrastructure investments at the village level.

Commune Database Outcome Analysis at the Village Level

We estimate the effects of treatment on infant mortality, asset ownership, and electricity access for 13,909 villages over 2008-16. Commune Database (CDB) data is collected at the village level, so we choose this as our unit of analysis for the most precise estimates.

For the CDB models, we include year and village-level fixed effects (rather than cell-level), as well as province-level linear time trends. Using the panel framework with fixed effects, we estimate the following equation:

$$CDB\ outcome_{vcpt} = \alpha + \beta\ CSF\ Project\ Count_{vcpt} + D_v + D_t + D_p * t + \epsilon_{vcpt}$$

where $CSF\ Project\ Count_{vcpt}$ indicates the cumulative count of CSF projects implemented in village *v* in commune *c* in province *p* by year *t*, D_v is a vector of village fixed effects, D_t is a vector of year fixed effects, and $D_p * t$ is a vector of province-specific time trends. The term ϵ_{vcpt} denotes all unmeasured idiosyncratic factors that affect outcomes in village *v* in commune *c* in year *t*. We estimate treatment effects via ordinary least squares. We also use two-way clustering of standard errors by commune and year.

4. Findings: Nighttime Lights Outcome

Main Treatment Effect

Table 11 presents the main model results of the effect of CSF project completion (treatment) on NTL. Column 1 provides a simple correlation between CSF counts and NTL without any fixed effects or other adjustments, showing that in general over the full data, NTL increases are significantly correlated with CSF project counts (coefficient = 0.12). In Column 2, we add year fixed effects, thereby adjusting for any changes happening across Cambodia over time, finding little difference in this overall correlation. We add grid cell fixed effects in Column 3, and these are the first results we can consider plausibly causal. We find an increase in NTL of 0.07 points for each CSF project completed, significant at the 99% confidence level. Notably, the R^2 increases from 0.03 to 0.75 when we add the cell fixed effects, indicating that we are accounting for the vast majority of variation in NTL at the grid cell level. In other words, even when adding covariates that account for more than 70% of the remaining variation in our outcomes, we continue to see significant treatment effects. Column 4 adds province-specific linear time trends accounting for differing changes across the country that may have been correlated with the CSF scale-up. We continue to see significant, similarly sized effects (coefficient = 0.0556).

The meaning of a numeric change in NTL is not particularly intuitive. The average luminosity at baseline (2002) and the average amount of change experienced by all treated cells between baseline and endline (2013) can help us to better understand the magnitude of the observed treatment effect. At baseline, the mean lights value for cells that will receive treatment is 0.247 (see 1

Table 1). At endline, the average lights measure is 0.840, indicating an average change of 0.59 during the project implementation period. Within the full luminosity measurement range of 0 to 63, these average levels are relatively low (and there are many cells throughout the country that remain fully dark throughout the study period).

Given the low average levels, the increases in NTL resulting from treatment are substantive in magnitude. An increase of 0.056 due to each CSF project completed is about 20% of the average baseline lights value and nearly 9% of the change over time experienced by the average cell. As discussed below, the median cell was treated by four projects, and would experience a gain of nearly 80% of the mean baseline NTL value, a sizable impact due to the full set of project activities.

Treatment Effect by Time and Project Exposure

We explore the variation in treatment effects over time and intensity of treatment in columns 5-8. In column 5, we interact project counts with a dummy reflecting whether the year is 2008 or later (thereby splitting our post-scale-up period evenly into 2003-07 and 2008-13). We find that the treatment effects from CSF projects grow over time, with each project having roughly twice the impact in 2008 and later as in the first few years.

We explore the timing of treatment effects more fully in Figure 1, which plots the time path of these effects (accounting for year and cell fixed effects and province-specific trends, as in column 4 of Table 11). The graph shows very little change prior to the first year of treatment, confirming our earlier hypothesis that the timing of CSF funding across locations is independent of the preceding changes in outcomes. Beginning shortly after the completion of the CSF projects in a given cell, we observe large and sustained gains in NTL. In fact, these effects continue to grow over time, indicating that the largest gains from the CSF-funded infrastructure appear to accrue many years after its completion. This time path also rules out the possibility that the gains are largely due to project construction or other short-term phenomena. That is, we do not observe any jumps or dips in the year of funding itself, minimizing any concerns about increases or decreases in NTL due to the construction itself (either involving lighting or the displacement of other economic activity during construction).

Our main specification estimates a linear model in project counts; we next assess the monotonicity and potential nonlinearities in this relationship. Our sample of cells includes nine 1 km square grid cells for every georeferenced Cambodian village. When we consider whether a cell was exposed to a CSF project either within its boundaries or in an adjacent cell, about 18% of cells never receive any CSF treatment and another 10% are only exposed to 1 CSF project. The remaining 70% of cells are exposed to two or more projects – the median cell is exposed to 4 projects and the top 10% of cells are exposed to 12 or more projects (with a maximum of 111). We create a categorized treatment measure that reflects the number of projects to which a given cell is exposed over the course of the evaluation period—we specifically create categories of exposure to 1 project, 2-4 projects, 5-9 projects, or 10 or more projects.

In column 6, we show that the effects of the first completed project are negligible (and may even be slightly negative). The effects of completing 2-4 projects are 0.04 NTL points, while the effects of completing 5-9 projects are 0.08. Completing more than 10 projects are enormous (0.441), although cells that experience such intense treatment are rare. Taken together, the results indicate quite consistent and generally linear effects from additional treatment beyond the first CSF project.

In column 7 of Table 11, we further show that these findings are consistent with our prior results indicating increasing effects over time. The effects for each of these project intensity categories increase substantially after 2008, although we do not have sufficient statistical power to distinguish these effects. Finally, in Column 8, we show that the effects of increasing project intensity are primarily driven by densely populated rural areas. We include an interaction between our main project count measure and the number of villages within each grid cell. This coefficient is large and highly significant, while those on each project count category are negative and marginally significant. These results are consistent with our grid-cell model, in which each cell is potentially affected by many villages' projects and larger effects are expected in more densely populated cells.

Before proceeding to examine heterogeneity in treatment effects, we address one potentially confounding aspect that may lead us to misattribute impacts to the CSF program using the NTL data: if road construction projects also included new or upgraded large-scale lighting along the roads, the effects we observe on NTL may not reflect changes in economic activity. We consider this to be very unlikely, given three pieces of evidence:

1. The Project Implementation Database (PID) contains information about the specific activities that were contracted for a reasonable share of the projects. While we do not have detailed information on the contents of all contracts, a review of the available data revealed almost no references to lighting or lighting-related materials.
2. The project impacts that we detect accrue over time, from nearly zero in the year of the project construction to substantially larger impacts 5-10 years later. If the installation of new lighting infrastructure was the underlying reason why we observe these impacts, we would expect to observe a very different time path, with nearly immediate impacts that stay constant or even degrade over time (as the lighting degrades).
3. We primarily observe improvements along small, rural roads (~1km). These are not major highways or even trunk roads, and lighting along these roads—if present at all—was most likely minimal and low-grade. It is very unlikely that the construction or rehabilitation of these road required major or frequent use of floodlights.

Heterogeneous Effects: Project Characteristics

We also consider whether treatment effects vary due to key project characteristics. We focus our analysis by sector, by type of improvement (i.e., new, repair, or upgrade), and spatial extent of projects, as these are characteristics for which we also have sufficient variation in our sample to reliably estimate heterogeneous effects.

Sector

We explore treatment effects in four separate sectors (in decreasing order of share of projects): rural transport (76%), irrigation (10%), rural domestic water (6%), and urban transport (4%). For the sector analysis, we identify the subset of cells in our sample with exposure to a project in a given sector and define treatment by the timing of completion of projects in that sector only (i.e., a cell could experience exposure to a project in another sector, but this would not contribute to the treatment measure for the sector analysis). We present the results in Table 12.

Of the four sectors, we only observe a statistically significant treatment effect for the rural transport sector, which demonstrates an increase of 0.0658 in NTL (see Column 3 of Table 12). Given a mean baseline lights value of 0.282 among this subset of cells, a .0658 increase corresponds to roughly 27% of the baseline value and about 11% of the average change experienced by a cell between baseline and endline.

The rural transport sector includes the largest number of projects by far, and thus impacts the largest number of cells (as shown by the large number of observations included in the sector-only analysis), so it is not surprising that it appears to drive much of the treatment effect we observe in the main model. It is also worth noting that these results do not indicate that CSF projects in other sectors failed to bring about any benefits, but that these projects are not largely responsible for the overall increase in NTL.

Single or Multiple Village Projects

We consider differential treatment effects based on whether project implementation occurred in one village or in multiple villages. We use this measure as a mechanism to identify projects that might extend beyond a single area within a village, such as a road or irrigation canal. The source data that geo-references CSF project locations only provides village-level coordinates, rather than information on the actual spatial boundaries of the project (e.g., the line of an improved road or irrigation system or the point at which

a new structure is built). We include the nine cells in a 3 km x 3 km square surrounding each village point to help account for this lack of specificity in our treatment measures, and we identify projects that span multiple villages as a way to differentiate between the effects of larger and more connective projects. It is reasonable to assume that this subset of projects is more likely to include infrastructure that connects multiple points (e.g., multiple villages along a new or improved road), and also that more connective projects could demonstrate larger treatment effects as a result of a larger potential area for spillover effects compared to single village projects (e.g., impacts for all of the cells through which the road travels).

Table 13 presents the results, in which single village projects demonstrate a slightly larger treatment effect. Column 1 shows an increase of 0.0728 in NTL for single village projects and Column 2 shows an increase of 0.0581 for multi-village projects. However, we cannot statistically distinguish these effects, and thus find similar treatment effects irrespective of the number of villages targeted by a specific project.

Type: New, Repair, or Upgrade

We consider if results vary by whether a project was classified as new, repair, or upgrade. We again run three separate models in which the treatment value is assigned separately for each of the three project types. We find that projects that upgrade existing infrastructure have nearly double the impact of new or repair projects. Column 3 of Table 13 identifies an increase of 0.062 in NTL for new projects, while Column 4 identifies an increase of 0.0843 for repair projects, and 0.156 for upgrade projects. For upgrade projects, this corresponds to 27% of the total change experienced by treated cells between 2002 and 2013.

It is not possible to determine the causal explanation for these results without additional information. It is possible that upgrade projects allow beneficiaries to make better use of other existing infrastructure or economic opportunities (that have already

developed because some form of infrastructure existed), as opposed to new infrastructure that is less likely to be part of an existing network immediately after construction. Further information on the existing road network or other infrastructure in project areas would potentially make it possible to unpack these nuanced empirical results.

Heterogeneous Effects: Governance

In order to understand whether and how pre-existing governance conditions—and governance interventions undertaken as part of the CSF program—affect the size of the economic development impacts we observe, we also test for heterogeneity in treatment effects across a variety of measures.

Pre-existing Governance Conditions

Variation in political violence under the Khmer Rouge regime has been traced to more contemporary differences in political behavior (Iwanowsky 2018). Between 1965 and 1973, the American military's bombing campaign created deep resentment in targeted areas, spawning particularly strong support for the Khmer Rouge in these locations. The subsequent Khmer Rouge's regime targeted the most agriculturally productive regions with intense violence. In areas that experienced high levels of political violence during the rule of the Khmer Rouge, Iwanowsky (2018) shows in detail that we now observe lower levels of social trust, less civic engagement, and more support for opposition political parties and democratic principles.[27] To the extent that community involvement in the CSF project may have shaped project outcomes by constraining local elites' ability to direct resources to less productive uses, one would expect communes that experienced higher levels of political violence under the Khmer Rouge to achieve smaller CSF project impacts. Conversely, in areas that were more heavily bombed by the U.S., that exhibited stronger public support for the Khmer Rouge, and

[27] These long-term links are observable despite considerable internal migration and other potentially confounding factors.

where community engagement is likely higher, we expect to see larger CSF project impacts. We test these hypotheses by assessing the extent of treatment effect heterogeneity using data on bombings, mass graves (burials), prisons, and memorials described above.

In Table 14, we present these results, with each measure entering separately as a dummy indicator for any exposure in the commune and as a continuous count of exposure. We find some heterogeneity across a subset of these variables. Neither the existence nor the count of mass graves or prisons alters the treatment effects we observe. However, we do observe that communes where U.S. bombings took place (and where support for the Khmer Rouge was more intense) experience CSF impacts that are only half as large as those regions that were spared (and where support for the Khmer Rouge was weaker). We see consistent results using data on memorials. Communes in which war memorials were erected (and where there was greater violence under the Khmer Rouge) see larger gains from CSF projects. Both of these heterogeneous effects contradict any positive role for pre-existing community engagement in shaping impacts from the CSF infrastructure investments. In fact, they indicate that areas with weaker community engagement may actually have experienced larger economic development gains as a result of CSF projects.

CSF Governance Interventions

Given the prior results on preceding levels of community engagement, we also consider whether governance interventions under the CSF program effectively compensated for these pre-existing conditions. The CSF program involved a number of concrete efforts to ensure project resources were well managed and allocated equitably. As we discussed in Section 1, the institutional predecessor of the CSF program (Seila) led to the creation of CS councils, some of which were supported by Executive Committee (ExCom) staff. We therefore examine the size and composition of these councils, the level of support from ExCom staff, and the correlation between commune priorities and funding outcomes in the first several years of the program. Some of these measures are

available at the commune level, while others are only available at the province level. We again assess the heterogeneity in the main treatment effects based on these measures. Using measures of these interventions at the program's outset allows us to treat them as relatively exogenous (i.e., more likely to be orthogonal to the subsequent timing of project funding across villages within each commune). At the same time, using only these early, cross-sectional differences in governance interventions may constrain the heterogeneous effects we can identify. We thus take these results as suggestive but not necessarily definitive evidence on the impacts of the CSF's institutional design.

Results on these heterogeneous effects are shown in Table 15. We find some variation in treatment effects based on the size of the CS councils and the prior experience of the councilors. Communes with larger councils (relative to the number of villages in the commune) experience slightly larger nighttime light gains from CSF project, with the effects concentrated among the most intensely treated locations (cells with more than 10 active projects). Similarly, in provinces where a larger share of CS council members had previously experience as (unelected) commune leaders, treatment effects are slightly larger (with these differences again taking place in areas with many projects). This pair of results suggests that in cases where management of multiple CSF investments required attention and expertise, the CS councils created under the Seila program effectively provided these. At the same time, we do not observe larger treatment effects in provinces where more ExCom staff were assigned to support CSF project implementation, which suggests that local capacities of the CS councils mattered more than the supplemental technical assistance that they received.[28]

Nor do we observe heterogeneous effects based on the gender composition of the CS councils, as provinces with larger shares of women among CS council members do not experience gains that are different from those with fewer women councilors. Similarly, we observe no heterogeneity based on the share of commune priorities

[28] We confirm that these results are robust to including measures of pre-existing governance (bombing exposure and memorial counts), allaying concerns that these reflect reversion to the mean dynamics rather than causal effects.

that were actually funded by the CSF in these early years. In other words, provinces where the CSF funds disproportionately went to those projects initially identified by the CS councils as priorities did not see larger gains. These results suggest that CS councils' ability to direct resources on the basis of citizen preferences may have been limited. Taken together, these results indicate that the institutional development supported by the CSF appears to have created some local capacity for administering local infrastructure projects, but may not have substantially altered these institutions' responsiveness to citizens' interests.

Under the CSF program, substantial efforts were also devoted to limiting the misuse of project funds, especially after the 2005 review described in Section 1. We do not have direct measures of these transparency and accountability interventions, but we do have data on the bids and construction costs for projects funded under CSF. We are able to capture variation in the extent of competitive bidding and the costs of constructing each type of project across projects, even after these efforts were put in place. We thus test whether communes with a greater number of bids for each project and communes with more competitively bid projects (i.e., projects had more than one bidder) experienced larger impacts from active CSF projects. Our results are reported in Table 16. We see no differential impacts from CSF projects with multiple bids relative to those with only one bid (or those that were not competitively bid). Nor do we see differential impacts from projects with higher numbers of bidders.

We also examine the unit costs reported for each contract associated with various activities under each project in the PID.[29] We first normalize reported unit costs by project type and then assess whether communes in which these costs appear particularly high—and thus where rent-seeking and corruption may have been most likely to have occurred—experienced smaller gains from the CSF funding. We use both measures of the unit costs themselves, as well as an indicator for whether the costs are in the top tail of the

[29] Civic monitors often use unit costs (e.g. the average cost of 1 kilometer of paved road) to identify possible instances of bid-rigging, kickbacks, and other forms of corruption.

distribution. We find no differential impacts from CSF projects along either of these unit cost measures. In other words, the varied bidding and unit cost measures—proxy indicators for potential misuse of project funding—do not alter the effect sizes of the CSF investments. While the PID data on both bidding and unit costs could have been administratively manipulated to mask such misuse, it is also possible that misuse of funds occurred rarely and that CSF investments had similar impacts across communes with high and low levels of rent-seeking and corruption.

5. Findings: Commune Database Outcomes

In addition to our measure of NTL, we make use of the Commune Database (CDB) to examine additional measures of wellbeing, validate the use of NTL as a proxy, and explore the effects of CSF projects that take place beyond 2013. In these models, we include year and village fixed effects and measure treatment as the cumulative count of projects that a village has been exposed to by a given year. We also run a robustness check that controls for both high and low outlying values. We have not included these results, as they are consistent with the models shown here.

Table 17 presents the results separately for each of the three outcome measures (infant mortality, household access to electricity, and household asset wealth). We only observe a statistically significant treatment effect on infant mortality (Column 2), which is measured as the number of deaths of infants less than 1 month old. The reduction of 0.00784 for villages due to each CSF project completed is 3.2% of the mean value at baseline (see Table 10). In Figure 3, we plot the time path for these effects, showing sustained gains over time.

Why do we observe effects on infant mortality? We hypothesize that there are at least two potential mechanisms at work. First, rural roads could provide faster, cheaper access to health clinics and other health services, potentially allowing families with young children to vaccinate their infants, monitor their growth, and treat illnesses. Second, in many contexts, infant mortality is highly correlated with socioeconomic development and can thus serve as a proxy for broader welfare changes. In other words, these mortality measures reflect income and consumption gains due to the roads improvements.

As noted above, we assess treatment impacts on household access to electricity primarily as a validation of our NTL outcome measure. The electricity access outcome is a dichotomous measure of whether one or more households in a village have access to

electricity—i.e., does the electrical grid extend to a village? The percent of villages with electricity access grows from 28% in 2008 to 80% by 2016, indicating an expansion of the electricity grid to include many new villages. The correlation coefficient between NTL and the electricity access measure is 0.0267, indicating a positive but very weak correlation. Moreover, in our regression results, we do not observe a significant effect on electricity access. This suggests that the observed treatment impact on NTL is not due to a small number of households gaining electrical access in newly electrified villages, but likely to be the result of more widespread household access in villages where electricity was or became present.

Finally, we also assess impacts on asset ownership (which we summarize in an index derived from the first principal component of various assets). We find no statistically significant impacts on this measure. In Figure 4, we show the time path for treatment differences; in this case, we find assets trended upward even before the actual completion of CSF projects. The fact that pretrends are correlated with CDB-based asset measures but not infant mortality or NTL may be due to actual selection bias in CSF project allocation towards improving villages or due to potential systematic bias in the CDB data collection itself. As further evidence of challenges with the asset measure, we observe very weak correlation between NTL and CDB-based assets in the 2008-13 period. Conditional on village and year fixed effects, we observe no significant relationship between these measures; the point estimate of the correlation is *negative*. We therefore take the asset results with a hefty grain of salt

6. Conclusions

In this study, we evaluate the short-term and long-term impacts of a flagship Sida investment in a local infrastructure and governance program. This particular foreign aid program is unusual in that it was launched and nurtured by Sida and other donors, but eventually transitioned to full country ownership. Neither Sida nor any other donor has supported the Commune/Sangkat Fund (CSF) since 2010. The Cambodian Government now fully funds and manages the CSF. It allocated roughly $50 million each year—or roughly $400 million to date—between 2011 and 2018 to sustain nationwide program implementation.

Yet, prior to completion of this study, a rigorous impact program evaluation—with counterfactual evidence of what would have occurred in the absence of the program—had never been published. Cambodia achieved major economic development and poverty reduction gains during the period of program implementation, and some observers speculated that the scale-up and institutionalization of this program might have contributed to these socioeconomic gains. However, in the absence of a rigorous impact evaluation, it was not possible to determine if these socioeconomic gains were driven by other changes (unrelated to the CSF) that were underway in Cambodia during the same period of time. Our evaluation fills this evidence gap.

Program evaluators are rarely able to rigorously estimate program impacts five or ten years after program closure due to the high cost of ongoing data collection in both program and non-program areas. However, in this case, we had a unique opportunity to evaluate the short- and long-run effects of a Sida-financed program because of the availability of village-level satellite and administrative data that encompass a fourteen-year period (2003-2016), including years when Sida (and other donors) provided financial support and years when donor funding was phased out and replaced with host government financing. Consequently, we were able to remotely and retrospectively measure the effects of the CSF at a relatively modest

time and financial cost.[30] We did so by leveraging the geospatial impact evaluation methodology introduced in a 2017 EBA report (Isaksson 2017).

Our evaluation employs a quasi-experimental panel framework to rigorously estimate the socioeconomic impacts of CSF projects. We exploit variation in the timing of CSF project completion in different villages within each commune to identify these impacts, while accounting for a variety of potential confounds at fine geographic levels. To do so, we construct a primary dataset with yearly treatment and outcome measures between 1992 and 2013 for 1 km square grid cells. We rely on the Government of Cambodia's Project Implementation Database to measure variation in the timing of CSF project completion and remotely sensed nighttime light output data to measures changes in local economic development outcomes. To extend our analysis to additional village-level development outcomes, we use administrative data collected by Cambodia's Ministry of Planning on an annual basis between 2008 and 2016. In this regard, our study calls attention to an important lesson for future Sida programs: the fact that relatively inexpensive upstream investments in host country data systems can enable rigorous measurement of downstream program impacts.

We find evidence that CSF projects—particularly rural roads—increase economic development in the surrounding areas. Consistent with our geospatial outcome measures (NTL in 1km grid cells), we find treated areas that are more densely populated register larger increases in NTL. These effects appear to grow over time, suggesting that improved roads not only increase the level but also the trajectory of economic development. We also find an acceleration of infant mortality improvements after roads

[30] The present evaluation was completed at a cost of less than US$100,000, with the data collection and analysis lasting approximately nine months. Geospatial impact evaluations like this one are generally less time-consuming and expensive than randomized control trials because they leverage already existing data in program and non-program areas. (BenYishay 2017). As a point of reference, a typical RCT might take five or more years to implement and cost $500,000 to $1 million (due to the need for *customized* data collection in treatment and control groups at various points during the life of a program).

improvements, indicating that economic development gains are broadly shared by residents.

Overall, the positive impacts we measure on economic development and infant mortality from rural roads investments are encouraging. Beyond the infrastructure funding, however, the CSF program (and Seila, its institutional predecessor) involved considerable institutional change, decentralizing funding decisions and building the capacity of local governments to provide public goods. Isolating the impacts on these particular interventions is challenging because, unlike our socioeconomic outcomes, measures of local governance and capacity over time are not available. Moreover, the nationwide scale-up of Seila in 2002-2003 means there is little variation in treatment at the commune/sangkat level, further complicating clean identification of program impacts.

To address these challenges, we examine the role of pre-existing community engagement as well as early CSF institutional interventions in shaping the overall impacts of village-specific gains from CSF investments. We find that the CSF addressed an important factor for successful project implementation under demanding, complex conditions. Local capacity, embodied in the CS council's size and prior experience, clearly shaped the gains from CSF-supported infrastructure. The fact that we do not observe extensive variation in treatment impacts based on bidding patterns or cost outliers also suggests that CSF funds were not frequently misused. However, we do not see that gains were particularly large in areas where the councils were more responsive to citizen priorities. Nor do we find that CSF project impacts were larger in communes with higher baseline levels of community engagement. These seemingly counterintuitive results call attention to a broader insight that merits attention in future decentralization programming: *the importance of designing and sequencing programs in ways that are realistic and tailored to the local context.*

Many donors have embraced community-driven development (CDD) programming as a way of promoting decentralization and democratization in countries with traditionally centralized and autocratic political systems. These programs generally rely upon a shared diagnosis of the political problem that needs to be solved: in

well-functioning political markets, citizens delegate authority to public officials to solve problems that affect them and replace or discipline those public officials who are not responsive to their demands; however, political market failures occur when citizens (a) possess limited information about the priorities and performance of public officials, and/or (b) lack the ability to select and sanction their public officials. CDD programs seek to address this problem by making it easier for citizens to directly communicate with, monitor, discipline, and reward public officials through various mechanisms of decentralized governance—for example, local elections, participatory budgeting, and town hall meetings. All of these institutional mechanisms are designed to make it more costly and difficult for public officials to behave in ways that are inconsistent with the interests of their local constituents (Olken 2010; Beath et al. 2017).

However, in settings where citizens deeply distrust the state and fear the potential consequences of expressing dissent or otherwise challenging public officials, overly ambitious CDD programs can lead to disappointing—or even counterproductive—results. Indeed, a recent review of 23 CDD program evaluations in 21 countries finds that they rarely improve and sometimes undermine social cohesion and the quality of local governance (White et al. 2018). CDD programs often underperform vis-à-vis their social cohesion and local governance objectives because of a lack of realism and attention to local conditions.

Two particularly common pitfalls in CDD programming are (a) expectations of robust civic monitoring in the absence of significant local taxation, and (b) insufficiently high baseline levels of local government capacity to respond to citizen feedback. One of the most common contextual factors overlooked in CDD programming is the extent to which local development projects are financed via local tax revenue (Rodden and Wibbels 2019). This program design feature matters because, as a general rule, citizens are more willing to monitor the use of local development expenditure and sanction public officials when they know that the underlying funding source of the expenditure is their own local tax revenue. By contrast, citizens are generally less willing to engage in civic monitoring activities when they know than local development projects are being

financed with central government or foreign aid revenue (Paler 2013). Another way that CDD programs commonly fail to account for local context is by activating processes of citizen engagement, oversight, and feedback before local government has achieved a reasonable baseline level of capacity to respond to citizen demands. CDD programs typically ratchet up citizens' expectations of local government over time, and as these expectations rise, local government administrators often find it increasingly difficult to satisfy the demands of their constituents. Therefore, in settings where local government is severely capacity-constrained, a common design flaw in CDD programs is the prioritization of citizen engagement over local government capacity building, which can inadvertently set in motion a vicious circle of government inaction and citizen disengagement rather than the intended virtuous circle of government responsiveness and citizen engagement (Parks et al. 2019).

To its credit, Sida seems to have avoided the problem of "premature load-bearing" by relying heavily on the judgment of reformers inside the Cambodian Government to guide the design and implementation of the Seila/CSF program.[31] The intellectual architects of the program clearly appreciated the need to account for the unique set of political events that transpired in Cambodia during the 1970s, 1980s, and 1990s. The Khmer Rouge severely damaged social trust and the capacities of local government institutions, so rather than prioritizing a complex set of activities that would have required high levels of trust and collaboration between citizens and public officials, Sida and its host country counterparts focused initially on rebuilding local administrators' levels of credibility and capacity to perform basic functions that would benefit local residents.

In this regard, the Seila/CSF program was intentionally not designed as a CDD program. Whereas CDD programs often worked *around* local governments, the architects of the Seila/CSF

[31] Like a bridge that is under construction and prematurely expected to bear the weight of multiple tractor-trailers, donors often insist upon the simultaneous pursuit of activities that exceed local capabilities (or "the carrying capacity of the bridge"). On this this tendency among donors to place unrealistic demands on embryonic systems, see Pritchett et al. 2013.

program chose to work *with and through* local governments. The World Bank, which is one of the most important funders of CDD projects, defines CDD as "giving direct control to the community over planning decisions and investment resources through a process that emphasizes participatory planning and accountability" (World Bank 2007: 2, emphasis added). Likewise, Sheely (2010) defines CDD as "development projects in which residents of localities are given direct control over key project decisions." Seila/CSF program incorporated some elements of local participation and bottom-up monitoring and accountability, but its theory of change was ultimately premised on the assumption that rebuilding between governor and governed would first require that local administrators demonstrate their willingness and ability to provide local public goods.[32]

In this regard, the findings of the present evaluation reinforce a key point from a previous EBA evaluation: the importance of "working in more iterative ways, putting local reformers in the forefront and applying a more practical approach to doing reform [in poor country contexts]" (Andrews 2015: 1). It is important to remember that the Seila/CSF program represented a major decentralization effort that provided public resources to local governments (many of which were newly created) for the first time in more than a generation. This itself was a major step forward. Expecting citizens (many of whom were traumatized by the Khmer Rouge and deeply distrusted the state) to actively monitor the selection, design, and implementation of local infrastructure projects and hold local leaders accountable for results may have been a bridge too far during the early stages of the decentralization process. Simply demonstrating that local administrators are capable of providing public goods that will benefit local residents may be a

[32] In this respect, the Seila/CSF program more closely resembled a community-driven reconstruction (CDR) program. According to Sheely (2010), CDR projects typically have 4 distinct objectives: (1) creating or building the capacities of democratic local government institutions, such as Community Development Councils (CDCs); (2) institutionalizing processes to identify and prioritize local infrastructure and reconstruction needs; (3) providing grants for the implementation of projects selected by CDCs; and (4) oversight, monitoring, and evaluation of these projects.

key stepping stone to achieve broader improvements in local governance and development.[33] Indeed, Casey (2018) conducts a meta-analysis of 7 rigorous evaluations of CDD programs and finds no evidence that these programs increase social capital or improve local governance.[34] She concludes her study by recommending that future CDD programs focus on "sustainably building state capacity" and "providing technical assistance to local government."

At the same time, we would caution readers against assuming that these results are generalizable to all post-conflict settings where the social contract between governor and governed needs to be repaired. It is important to keep in mind that the Seila/CSF program placed little emphasis on helping CS councils build strong local tax bases.[35] Therefore, an early programmatic focus on bottom-up monitoring and accountability would have likely had a limited effect, and its pursuit may very well have diverted attention and resources away from the first-order issue of rebuilding local government capacity.

[33] Indeed, more recent decentralization efforts in Cambodia (through the so-called Implementation Plan for Social Accountability in Sub-National Democratic Development, or I-SAF) have focused on promoting public access to budgetary information, increasing citizen monitoring of public service providers, and cementing the accountability relationship between taxpayers and public officials. The results from a 2017 survey of 1,596 men and women from all 25 provinces of Cambodia reinforce the importance of thinking about decentralization as a long-term process that requires patient investment. 85% of respondents indicated that they were aware of their right to participate in the annual meeting for the commune/sangkat development plan, investment program and budget. Yet only 28% reported that they had previously exercised this right. 81% of survey respondents also reported that they had no knowledge of their personal obligation to pay taxes (Transparency International Cambodia 2018).

[34] Her results are consistent with those reported in White et al. (2018).

[35] Recall that citizens are generally more willing to monitor the use of local development expenditure and sanction public officials when they know that the underlying funding source of the expenditure is their own local tax revenue (Paler 2013).

References

Andrews, Matt. 2015. Has Sweden Injected Realism into Public Financial Management Reforms in Partner Countries? Report 2015:05. Stockholm: Expert Group on Aid Studies (EBA).

Asian Development Bank (ADB). 2014. Cambodia Country Poverty Analysis 2014. Manila: ADB.

Beath, Andrew, Fotini Christia & Ruben Enikolopov. 2017. Direct democracy and resource allocation: Experimental evidence from Afghanistan. Journal of Development Economics 124: 199-213.

BenYishay, Ariel, Daniel Runfola, Rachel Trichler, Carrie Dolan, Seth Goodman, Bradley Parks, Jeffery Tanner, Silke Heuser, Geeta Batra, and Anupam Anand. 2017. A Primer on Geospatial Impact Evaluation Methods, Tools, and Applications. AidData Working Paper #44. Williamsburg, VA: AidData at William & Mary.

Blench, Roger, Karin Ralsgård, Stephen Gossage, Dessalegn Rahmato, and Guy Scott. 2002. Area Development Projects, Poverty Reduction, and the New Architecture of Aid. Volume II – Case Studies. Evaluation Report 02/14:01. Stockholm: Sida.

Bruederle, Anna and Roland Hodler. 2018. Nighttime lights as a proxy for human development at the local level. PLOS ONE 13(9): e0202231.

Bunte, J., Desai, H., Gbala, K., Parks, B., Runfola, D.M., 2018. Natural resource sector FDI, government policy, and economic growth: Quasi-experimental evidence from Liberia. World Development 107: 151-162.

Casey, Katherine. 2018. Radical Decentralization: Does community-driven development work? Annual Review of Economics 10: 139-165.

Cook, Thomas D, William R Shadish, and Vivian C Wong. 2008. Three conditions under which experiments and observational studies produce comparable causal estimates: New findings from within-study comparisons. Journal of Policy Analysis and Management 27 (4): 724–750.

Corral, Leonardo, Maja Schling, Cassandra Rogers, Janice Cumberbatch, Fabian Hinds, Naijun Zhou, Michele H. Lemay. 2016. The Impact of Coastal Infrastructure Improvements on Economic Growth: Evidence from Barbados. IDB Working Paper 729. Washington DC: Inter-American Development Bank.

Elvidge, C. D., Baugh, K. E., Kihn, E. A., Kroehl, H. W., Davis, E. R., & Davis, C. W. 1997. Relation between satellite observed visible-near

infrared emissions, population, economic activity and electric power consumption. International Journal of Remote Sensing 18(6): 1373-1379.

Elvidge, C. D., Sutton, P. C., Ghosh, T., Tuttle, B. T., Baugh, K. E., Bhaduri, B., & Bright, E. 2009. A global poverty map derived from satellite data. Computers & Geosciences 35(8): 1652-1660.

Elvidge, C. D., Hsu, F.-C., Baugh, K. E. & Ghosh, T. 2014. "National trends in satellite-observed lighting." In Global urban monitoring and assessment through earth observation. Edited by Qihao Weng. Boca Raton: CRC Press. Pp. 97–118.

Evans, H., Birgergaard, L., Cox, P., and Lim Siv Hong. 2000. Cambodia Area Rehabilitation and Regeneration Project. Sida Evaluation 00/8.

Gennaioli, N., La Porta, R., Silanes, F. Lopez-de & Shleifer, A. 2014. Growth in regions. Journal of Economic Growth 19 (3): 259–309.

Henderson, J. V., Storeygard, A. and Weil, D. N. 2012. Measuring Economic Growth from Outer Space. American Economic Review 102 (2): 994–1028.

Hodler, Roland and Paul Raschky. 2014. Regional Favoritism. The Quarterly Journal of Economics 129 (2): 995–1033.

Evans, Hugh et al. 2000. Strategic Evaluation of CARERE. Stockholm: Sida.

Evans, Hugh, Ngin Chanrith, Heracles Lang, and Min Muny. 2010. Final Evaluation of Project to Support Democratic Development through Decentralization and Deconcentration (PSDD). New York: UNDP.

Isaksson, Ann-Sofie. 2017. Geospatial impact evaluation: A new approach to aid evaluation. Report 2017:09. Stockholm: Expert Group for Aid Studies (EBA).

Iwanowsky, Mathias. 2018. Essays in Development and Political Economics. Ph.D. Dissertation. Stockholm: Stockholm University.

Iwanowsky, Mathias and Andreas Madestam. 2018. State repression, exit, and voice: Living in the shadow of Cambodia's Killing Fields. Paper presented at BREAD/CEPR/LSE/TCD Workshop in Development Economics. London School of Economics. 21–22 September 2018.

Khomba, Daniel Chris and Alex Trew. 2017. Aid and Growth in Malawi. AidData Working Paper #42. Williamsburg, VA: AidData.

Kiernan, Ben. (ed.). 2008. The Pol Pot Regime. Yale University Press.

Kingdom of Cambodia. 2007a. Final Report for the Seila Program Supported by the UN/Donor Partnership for Local Governance Project (PLG). Volume 1: Design, Implementation, and Management. December 2007. Phnom Penh: Kingdom of Cambodia.

Kingdom of Cambodia. 2007b. Guideline on C/S Development Plan and C/S Investment Program. Prepared by Inter-ministerial Working Group. July 2007. Phnom Penh: Kingdom of Cambodia.

Kingdom of Cambodia. 2012. Poverty Reduction by Capital, Provinces, Municipalities, Districts, Khans, and Communes, Sangkats — Based on Commune Database (CDB) 2004-2012. Prepared by the Ministry of Planning's Working Group of Decentralization and Deconcentration and Sethkomar. Phnom Penh: Kingdom of Cambodia.

Michalopoulos, Stelios, and Elias Papaioannou. 2014. National Institutions and Sub-national Development in Africa. Quarterly Journal of Economics 129 (1): 151-213.

Olken, Benjamin A. 2010. Direct Democracy and Local Public Goods: Evidence from a Field Experiment in Indonesia. American Political Science Review 104 (02): 243–267.

Paler, Laura. 2013. Keeping the Public Purse: An Experiment in Windfalls, Taxes, and the Incentives to Restrain Government. American Political Science Review 107 (4): 706–725.

Parks, Bradley C., Matthew DiLorenzo, and Daniel Aboagye. 2018. Closing the Broken Feedback Loop in Development Projects: Can Responsive Aid Strengthen State Legitimacy? Working Paper. Accessed at https://www.dropbox.com/s/ybshuusro8bxir9/broken-feedback-full.pdf?dl=0

Platteau, J. P. and F. Gaspart. 2003. The risk of resource misappropriation in community-driven development. World Development 31 (10): 1687-1703.

Plummer, Janelle and Gavin Tritt. (eds.) 2012. Voice, Choice and Decision: A Study of Local Governance Processes in Cambodia. The World Bank and The Asia Foundation.

Pritchett, Lant, Michael Woolcock, and Matt Andrews. 2013. Looking like a State: Techniques of persistent failure in state capability for implementation. Journal of Development Studies 49(1): 1–18.

Rodden, Jonathan A. and Erik Wibbels. (eds.) 20190. Decentralized Governance and Accountability: Academic Research and the Future of Donor Programming. Cambridge, UK: Cambridge University Press.

Royal Government of Cambodia (RGC). 2015. Report of the Evaluation on the Public Financial Management System of Cambodia. Phnom Penh: RGC. Accessed at http://www.pfm.gov.kh/document/publication/PEFA.pdf

Rudengren, Jan and Joachim Öjendal 2002. Learning by Doing: An Analysis of the Seila Experiences in Cambodia. Stockholm: Sida.

Sheely, Ryan. 2010. Existing Evidence and Unanswered Questions about Community Driven Reconstruction. Presentation at the World Bank DIME Workshop in Dubai. 31 May to 4 June 2010. Accessed at http://web.worldbank.org/archive/website01542/WEB/IMAGES/3_SHEELY.PPT

Tracey-White, John, and Robert Petts. 2001. Study into the Socioeconomic Impact of the Local Development Fund/Local Planning Process 1996-2000. Phnom Penh: UNCDF.

Transparency International Cambodia. 2018. Accountability and Transparency of Budget Processes: National Survey. Phnom Penh: Transparency International Cambodia. Accessed at http://ticambodia.org/library/wp-content/files_mf/1526534245FullreportonAccountabililtyandTransparencyofBudgetProcess.pdf

UNDP/UNOPS. 2001. Cambodia Area Rehabilitation and Regeneration Project: Draft Terminal Report. CMB/95/011. Phnom Penh: UNDP/UNOPS.

UNDP. 2010. Final Evaluation of "Project to Support Democratic Development through Decentralization and Deconcentration (PSDD)." Contract No. : PSC/2010/07/005 FINAL REPORT. 11 November 2010. New York: UNDP.

Weidmann, N. B. & Schutte, S. 2017. Using night light emissions for the prediction of local wealth. Journal of Peace Research 54(2): 125–140.

White, Howard, Radhika Menon and Hugh Waddington. 2018. Community-driven development: does it build social cohesion or infrastructure? A mixed-method evidence synthesis. 3ie Working Paper 30. New Delhi: 3ie.

World Bank. 2007. CDD in the context of conflict-affected countries: challenges and opportunities. Washington DC: World Bank.

Yale University. 2019. Cambodian Genocide Program Interactive Geographic Database (CGEO). Data retrieved from http://maps.library.yale.edu/images/public/CGP/

Appendix 1

Table 1: NTL Summary Statistics (grid-cell level)

Statistic	Mean	St. Dev.	Min	Max
NTL, 1992-2013	0.334	2.379	0	63
NTL, 1992	0.059	0.683	0.000	28.546
NTL (treatment cells only), 2002	0.247	1.909	0.000	47.554
NTL (treatment cells only), 2013	0.840	3.600	0.000	47.000
CSF Project Count	1.502	3.292	0	111

Notes: Table 1 displays descriptive statistics for the DMSP cell-year panel dataset used to estimate the main model for 1km square grid cells (see Table x for main model regression results. The first two rows summarize nighttime lights (NTL) values for all years (1992-2013) and for 1992 only. The third and fourth row summarize NTL values in the baseline and endline years (2002 & 2013) only for cells that receive treatment.

Table 2: Project Counts for Heterogeneous Effect Models (grid-cell level)

Statistic	Mean	St. Dev.	Min	Max
Single-Village Project Count	0.440	1.293	0	49
Multi-Village Project Count	1.061	2.624	0	93
New Project Count	0.705	1.730	0	46
Repair Project Count	0.536	1.570	0	50
Upgrade Project Count	0.183	0.777	0	38

Notes: Single-village projects are those that only occur in a single village. Multi-village projects occur in multiple villages (i.e., roads).

Table 3: Irrigation Projects Summary Statistics (grid-cell level)

Statistic	Mean	St. Dev.	Min	Max
NTL, Irrigation Treated Cells	0.298	1.830	0	61.496
NTL, Irrigation Treated Cells, 1992	0.051	0.596	0	16.843
NTL, Irrigation Treated Cells, 2002	0.188	1.270	0	31.959
NTL, Irrigation Treated Cells, 2013	0.855	3.152	0	46.917
CSF Project Count	0.740	1.416	0	17

Note: Descriptive statistics for the subset of cells that are treated with an irrigation project.

Table 4: Rural Transport Projects Summary Statistics (grid-cell level)

Statistic	Mean	St. Dev.	Min	Max
NTL, Rural Transport Treated Cells	0.373	2.652	0	63
NTL, Rural Transport Treated Cells, 1992	0.084	1.226	0	63
NTL, Rural Transport Treated Cells, 2002	0.282	2.229	0	58.835
NTL, Rural Transport Treated Cells, 2013	0.931	3.763	0	47
CSF Project Count	1.341	2.865	0	81

Note: Table 4 displays descriptive statistics for the subset of cells that are treated with a rural transportation project.

Table 5: Urban Transport Projects Summary Statistics (grid-cell level)

Statistic	Mean	St. Dev.	Min	Max
NTL, Urban Transport Treated Cells	6.729	11.276	0	63
NTL, Urban Transport Treated Cells, 1992	1.727	3.951	0	39.207
NTL, Urban Transport Treated Cells, 2002	5.891	9.240	0	51.545
NTL, Urban Transport Treated Cells, 2013	12.181	14.266	0	47
CSF Project Count	0.903	2.722	0	42

Note: Descriptive statistics for the subset of cells that are treated with an urban transportation project.

Table 6: Domestic Water Projects Summary Statistics (grid-cell level)

Statistic	Mean	St. Dev.	Min	Max
NTL, Domestic Water Treated Cells	0.179	1.296	0	47.273
NTL, Domestic Water Treated Cells, 1992	0.035	0.413	0	11.289
NTL, Domestic Water Treated Cells, 2002	0.102	0.868	0	22.579
NTL, Domestic water Treated Cells, 2013	0.603	2.437	0	38.099
CSF Project Count	0.891	1.515	0	18

Note: Table 6 displays descriptive statistics for the subset of cells that are treated with a domestic water project.

Table 7: Summary Statistics for Khmer Rouge Exposure Variables

Statistic	Mean	St. Dev.	Min	Max
Burial Sites in Commune (Dummy)	0.147	0.354	0	1
Bombing Sites in Commune (Dummy)	0.794	0.405	0	1
Prison Sites in Commune (Dummy)	0.088	0.283	0	1
Memorial Sites in Commune (Dummy)	0.039	0.195	0	1
# of Burials Sites in Commune	0.224	0.625	0	6
# of Bombing Sites in Commune	95.878	217.105	0	1,853
# of Prison Sites in Commune	0.103	0.359	0	3
# of Memorial Sites in Commune	0.042	0.214	0	2

Table 8: Summary Statistics for Seila Governance Variables

Statistic	Mean	St. Dev.	Min	Max
Councilors per Village (Commune-Level)	0.896	0.486	0.250	5.500
% Councilors Prev. Unelected, 2002 (Province-Level)	24.384	18.673	0.000	72.727
# of ExCom Staff (Province-Level)	76.543	24.139	14.000	137.000
% Women in Councils, 2002 (Province-Level)	8.158	3.429	4.000	17.000
% Women in Councils, 2003 (Province-Level)	8.379	3.411	4.000	18.000
% Commune Priorities Funded, 2002 (Province-Level)	28.331	10.019	11.000	63.000

Table 9: Summary Statistics for Bidding and Unit Cost Variables

Statistic	Mean	St. Dev.	Min	Max
# of Bids	5.367	3.285	0.000	32.000
% Competitive Bids	0.901	0.250	0.000	1.000
Unit Cost	0.941	0.543	0.018	12.515
Unit Cost >95th Percentile Dummy	0.138	0.344	0	1

Note: The "Unit Cost >95th Percentile Dummy" variable indicates if, for any year, a grid cell is above the 95th percentile for unit cost.

Table 10: CDB Summary Statistics (village level)

Statistic	Mean	St. Dev.	Min	Max
Infant Mortality	0.101	0.458	0	35
Electricity Access (Dummy)	0.517	0.5	0	1
Unweighted Household Wealth	0.266	0.159	0	8.498
Weighted Household Wealth (PC1)	0	1.932	-2.676	58.03
CSF Project Count	2.130	2.176	0	21

Note: Table 10 displays descriptive statistics for the outcomes and treatment in the village-level panel.

Table 11: Main Treatment Results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	NTL	NTL	NTL	NTL	NTL	NTL	NTL	NTL
Project Count	0.123***	0.131***	0.0701***	0.0556***	0.0278**			
	(0.0137)	(0.0161)	(0.0113)	(0.0120)	(0.0111)			
Project Count * 2008+ Dummy					0.0303** (0.0112)			
Treatment: 1 Project (Trt_1)						-0.0447 (0.0285)	-0.0341 (0.0284)	-0.0737** (0.0286)
Treatment: 2-4 Projects (Trt_2)						0.0385* (0.0191)	0.0169 (0.0189)	-0.0268 (0.0186)
Treatment: 5-9 Projects (Trt_3)						0.0784** (0.0324)	0.0621 (0.0495)	-0.104*** (0.0345)
Treatment: 10+ Projects (Trt_4)						0.441*** (0.0885)	0.189 (0.138)	-0.113* (0.0636)
Trt_1 * 2008+ Dummy							-0.0193 (0.0341)	
Trt_2 * 2008+ Dummy							0.0474 (0.0282)	
Trt_3 * 2008+ Dummy							0.0181 (0.0532)	
Trt_4 * 2008+ Dummy							0.267*	

							(0.138)	
Project Count * # of Villages								0.00968***
								(0.00141)
Observations	1,168,068	1,168,068	1,168,068	1,165,934	1,165,934	1,165,934	1,165,934	1,165,934
R-squared	0.029	0.031	0.749	0.787	0.787	0.785	0.785	0.789
Year FEs	N	Y	Y	Y	Y	Y	Y	Y
Grid cell FEs	N	N	Y	Y	Y	Y	Y	Y
Lin. Time Trends by Prov.	N	N	N	Y	Y	Y	Y	Y

Note: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 12: Treatment Results by Sector

VARIABLES	(1) Rural Domestic Water Projects	(2) Irrigation Projects	(3) Rural Transport Projects	(4) Urban Transport Projects
CSF Project	0.0357	0.0003	0.0658***	0.230
Count	(0.0212)	(0.0185)	(0.0146)	(0.152)
Observations	231,704	295,944	922,064	25,102
R-squared	0.634	0.702	0.813	0.861

Note: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. All columns include yearly and grid cell fixed effects, and linear time trends by provider.

Table 13: Treatment Results by Project Properties

VARIABLES	(1) Single-Village Projects	(2) Multi-Village Projects	(3) New Projects	(4) Repair Projects	(5) Upgrade Projects
CSF Project	0.0728***	0.0581***	0.0620***	0.0843***	0.156***
Count	(0.0204)	(0.0133)	(0.0171)	(0.0216)	(0.0371)
Observations	1,165,934	1,165,934	1,166,110	1,166,154	1,166,044
R-squared	0.788	0.791	0.789	0.791	0.790

Note: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. All columns include yearly and grid cell fixed effects, and linear time trends by provider.

Table 14: Treatment Results for Khmer Rouge Interaction Models

VARIABLES	(1) NTL	(2) NTL	(3) NTL	(4) NTL	(5) NTL	(6) NTL	(7) NTL	(8) NTL
Project Count (PC)	0.0672***	0.0643***	0.0997***	0.0616***	0.0673***	0.0676***	0.0631***	0.0605***
	(0.0165)	(0.0164)	(0.0256)	(0.0161)	(0.0164)	(0.0161)	(0.0162)	(0.0161)
PC * Burial Dummy	0.00171							
	(0.0176)							
PC * Prison Dummy		0.0321						
		(0.0248)						
PC * Bombing Dummy			-0.0459**					
			(0.0212)					
PC * Memorial Dummy				0.0843**				
				(0.0374)				
PC * # of Burials					0.001000			
					(0.00947)			
PC * # of Bombings						-1.99e-06		
						(8.97e-05)		
PC * # of Prisons							0.0388	
							(0.0238)	
PC * # of Memorials								0.0946**
								(0.0357)
Observations	1,167,804	1,167,804	1,167,804	1,167,804	1,167,804	1,166,990	1,167,804	1,167,804
R-squared	0.790	0.790	0.791	0.791	0.790	0.791	0.791	0.791

Note: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. All columns include yearly and grid cell fixed effects, and linear time trends by provider.

Table 15: Treatment Results for CSF Governance Intervention Models

VARIABLES	(1) NTL	(2) NTL	(3) NTL	(4) NTL	(5) NTL	(6) NTL	(7) NTL	(8) NTL
Project Count (PC)	0.0250		0.0452***		0.0797*	0.0697**	0.0733**	0.0667**
	(0.0154)		(0.0123)		(0.0400)	(0.0256)	(0.0271)	(0.0288)
PC * # Councilors per Village	0.0374*							
	(0.0186)							
PC * % Councilors Prev. Unelected 02			0.00133*					
			(0.00071)					
PC # of ExCom Staff					-0.00011			
					(0.00043)			
PC * % Women in Councils 02						6.92e-05		
						(0.00331)		
PC * % Women in Councils 03							-0.00034	
							(0.00340)	
PC * % Priorities Funded 02								0.00012
								(0.00090)
Treatment: 1 Project (Trt_1)		0.0126		-0.0378				
		(0.0377)		(0.0291)				
Treatment: 2-4 Projects (Trt_2)		0.0409		0.0590**				
		(0.0316)		(0.0221)				
Treatment: 5-9 Projects (Trt_3)		0.0450		0.0589				
		(0.0584)		(0.0354)				
Treatment: 10+ Projects (Trt_4)		-0.0933		0.286**				

		(0.173)		(0.134)				
Trt_1 * # Councilors per Village		-0.0169						
		(0.0460)						
Trt_2 * # Councilors per Village		-0.00884						
		(0.0361)						
Trt_3 * # Councilors per Village		0.0659						
		(0.0680)						
Trt_4 * # Councilors per Village		0.651***						
		(0.220)						
Trt_1 * % Councilors Prev. Unelected 02				-6.53e-05				
				(0.000914)				
Trt_2 * % Councilors Prev. Unelected 02				-0.000349				
				(0.000730)				
Trt_3 * % Councilors Prev. Unelected 02				0.00410*				
				(0.00228)				
Trt_4 * % Councilors Prev. Unelected 02				0.0180**				
				(0.00825)				
Observations	1,065,548	1,065,548	783,948	783,948	1,093,884	1,093,884	1,093,884	1,093,884
R-squared	0.809	0.807	0.650	0.648	0.793	0.793	0.793	0.793

Note: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. All columns include yearly and grid cell fixed effects, and linear time trends by provider.

Table 16: Treatment Results for Unit Cost & Bidding Interaction Models

VARIABLES	(1) NTL	(2) NTL	(3) NTL	(4) NTL	(5) NTL	(6) NTL	(7) NTL	(8) NTL
Project Count	0.0787**		0.0550		0.0511***		0.0729***	
	(0.0284)		(0.0373)		(0.0142)		(0.0187)	
Project Count * # of Bids	-0.00275							
	(0.00312)							
Project Count * % Compet. Bids			0.00836					
			(0.0363)					
Project Count * Unit Cost					0.0103			
					(0.0171)			
Project Count * UC Pctl. Dummy							-0.0298	
							(0.0241)	
Treatment: 1 Project (Trt_1)								0.00822
								(0.0168)
Treatment: 2-4 Projects (Trt_2)		-0.0974**		-0.0866		-0.0753		-0.00891
		(0.0359)		(0.0648)		(0.0563)		(0.0170)
Treatment: 5-9 Projects (Trt_3)		0.117		0.123		0.180***		0.0989**
		(0.0742)		(0.0943)		(0.0525)		(0.0372)
Treatment: 10+ Projects (Trt_4)		0.554**		0.497		0.182		0.368***
		(0.214)		(0.415)		(0.152)		(0.0983)
Trt_2 * # of Bids		0.0123**						
		(0.00482)						
Trt_3 * # of Bids		-0.00684						
		(0.00843)						

Trt_4 * # of Bids		-0.0377						
		(0.0246)						
Trt_2 * % Compet. Bids				0.0626				
				(0.0647)				
Trt_3 * % Compet. Bids				-0.0477				
				(0.0924)				
Trt_4 * % Compet. Bids				-0.188				
				(0.395)				
Trt_2 * Unit Cost						0.0469		
						(0.0563)		
Trt_3 * Unit Cost						-0.108*		
						(0.0557)		
Trt_4 * Unit Cost						0.149		
						(0.181)		
Trt_1 * UC Pctl. Dummy								-0.0623
								(0.0499)
Trt_2 * UC Pctl. Dummy								-0.0170
								(0.0371)
Trt_3 * UC Pctl. Dummy								-0.174*
								(0.0892)
Trt_4 * UC Pctl. Dummy								-0.104
								(0.223)
Observations	321,195	321,195	321,195	321,195	328,091	328,091	583,902	583,902
R-squared	0.887	0.887	0.887	0.887	0.886	0.886	0.888	0.887

Note: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. All columns include yearly and grid cell fixed effects, and linear time trends by provider

Table 17: Treatment Results for CDB Outcomes, Village Level

VARIABLES	(1) Electricity Dummy	(2) Infant Mortality	(3) Household Wealth (PC1)
CSF Project Count	-0.00106	-0.00784**	0.00968
	(0.00376)	(0.00268)	(0.0316)
Observations	116,972	116,972	116,972
R-squared	0.518	0.192	0.687
Year FEs	Y	Y	Y
Village FEs	Y	Y	Y

Note: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Figure 1: Average Nighttime Lights by Time To/From Treatment

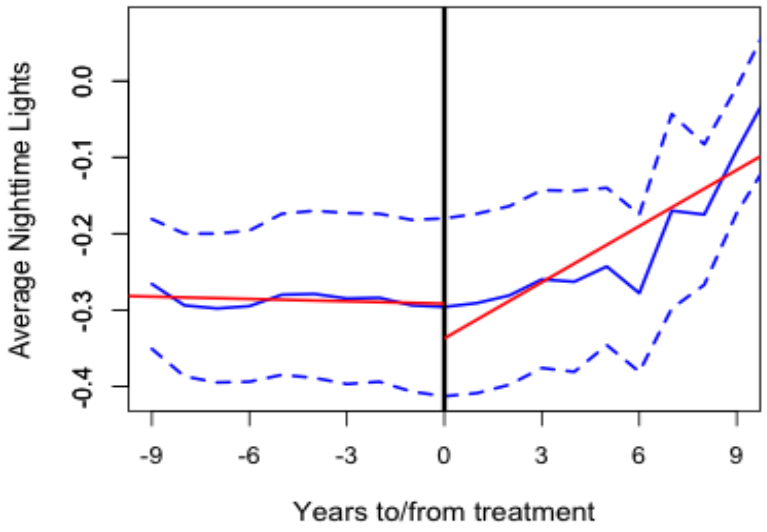


Figure 2: Average Electricity Access by Time To/From Treatment

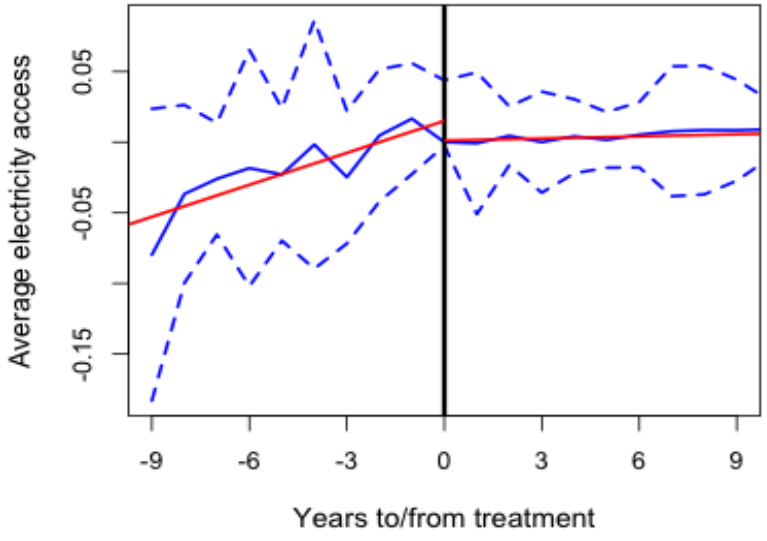


Figure 3: Average Infant Mortality by Time To/From Treatment

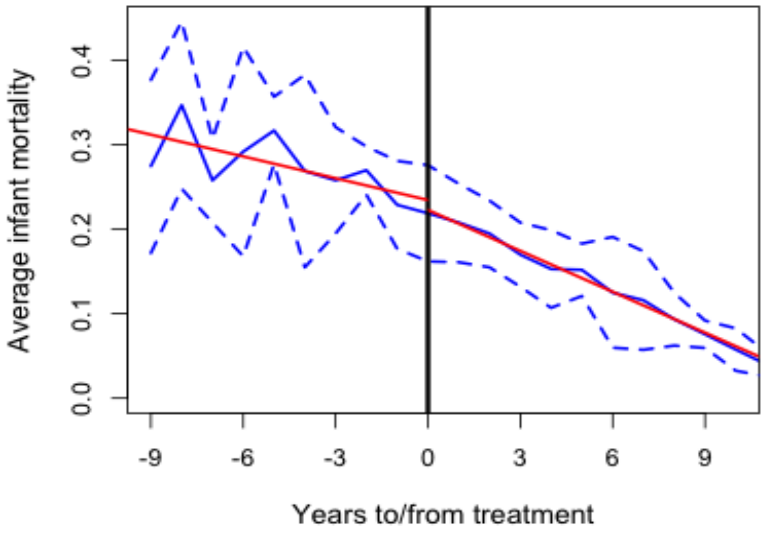
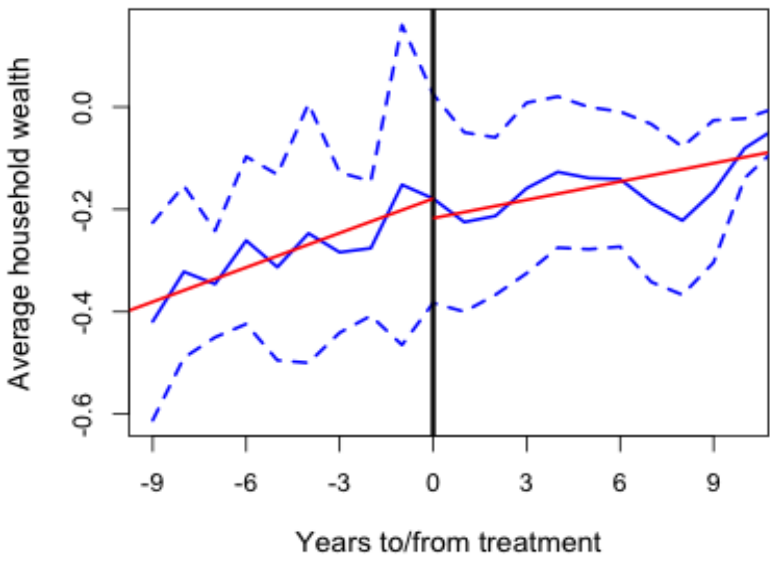


Figure 4: Average Household Asset Ownership by Time To/From Treatment



Annex 2 Acronyms

CDB	Commune Database
CDD	community-driven development
CSF	Commune/Sangkat Fund
GIE	Geospatial Impact Evaluation
LDF	Local Development Fund
NTL	Nighttime Lights
PID	Project Implementation Database
PLG	Partnership for Local Governance
PRDC	Provincial Rural Development Committee
PSDD	Project to Support Democratic Development

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