

EDI Research Link Up Research Presentation



Center for Effective Global Action

*The Political Economy and Governance of
Rural Electrification (Kenya)*

Edward Miguel

University of California, Berkeley

ECONOMIC
& DEVELOPMENT
INSTITUTIONS



The Political Economy and Governance of Rural Electrification

Edward Miguel, University of California, Berkeley and NBER

Joint work with

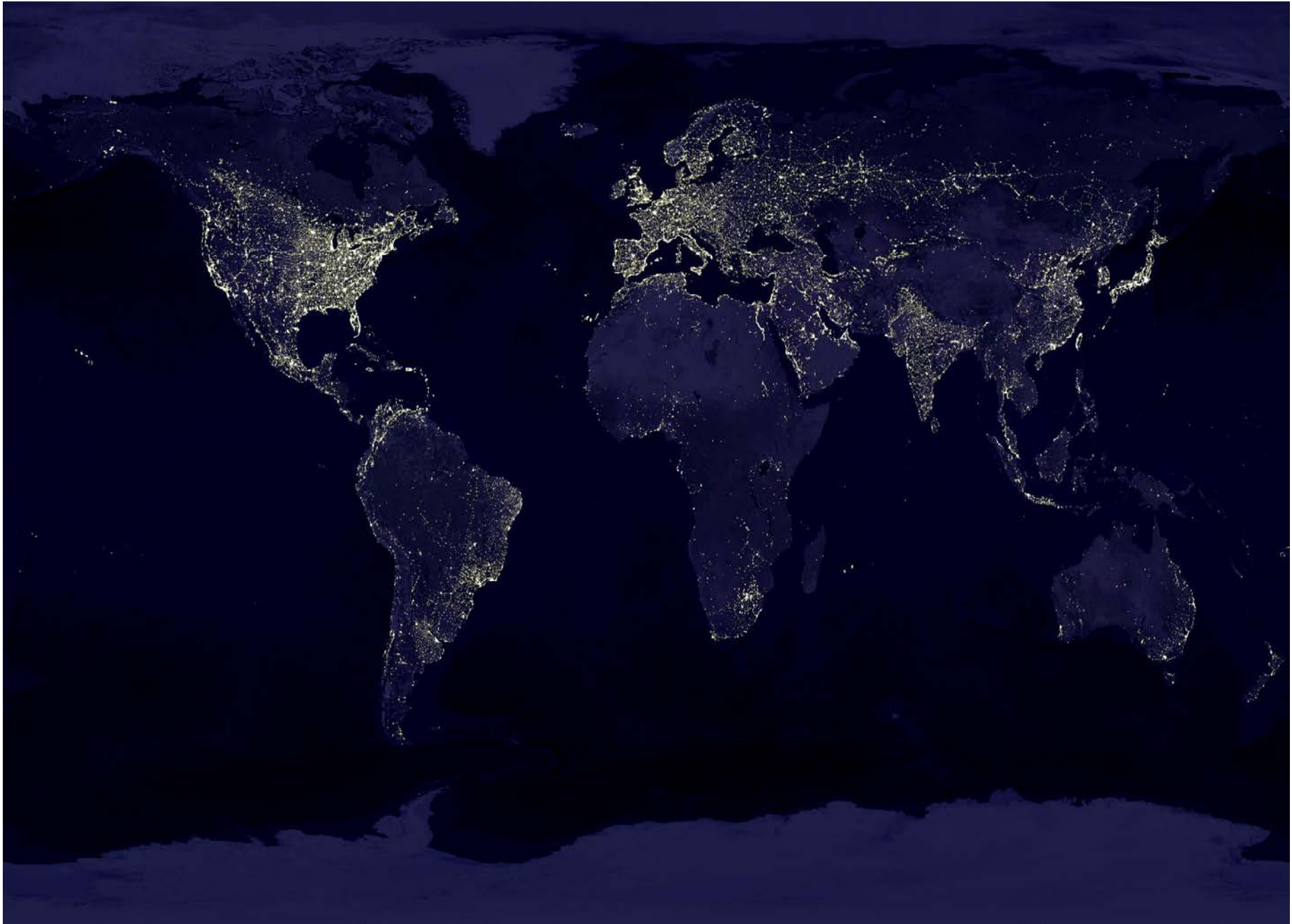
Susanna Berkouwer, University of California, Berkeley

Eric Hsu, University of California, Berkeley

Catherine Wolfram, University of California, Berkeley and NBER

Economic Development and Institutions Research Link-up

August 2018



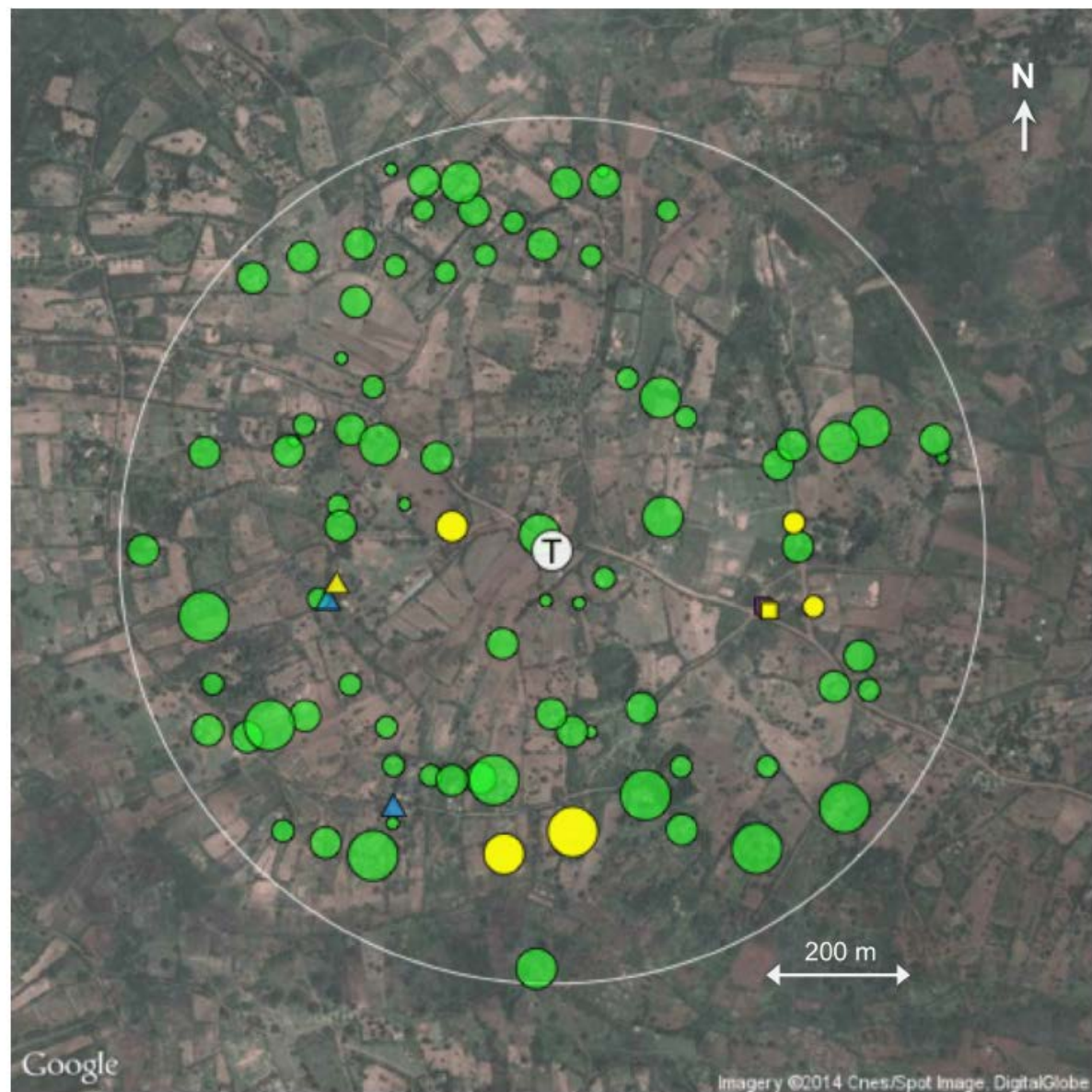
Rural electrification provision

- Rapid electric grid expansion in many African settings, where half the world's 1.2 billion people without electricity live.
- Major foreign aid priority, e.g., USAID Power Africa, DFID, WB, AfDB

Rural electrification provision

- Rapid electric grid expansion in many African settings, where half the world's 1.2 billion people without electricity live.
- Major foreign aid priority, e.g., USAID Power Africa, DFID, WB, AfDB
- Earlier work: provide experimental evidence on the economics of rural electrification in Kenya, a country where the grid is rapidly expanding.
- >90% of Kenyan schools, clinics, market centers connected.
- What happens when rural households are connected? (Lee et al 2018)

Figure 2—Example of a “transformer community” of typical density



“Under grid” households

Legend

- Ⓣ Transformer & 600 meter radius
- Households (scaled by household size)
- Businesses
- ▲ Public facilities (e.g. schools, health)
- Electrified households
- Electrified businesses
- ▲ Electrified public facilities



Rural electrification provision

- Rapid electric grid expansion in many African settings, where half the world's 1.2 billion people without electricity live.
- Major foreign aid priority, e.g., USAID Power Africa, DFID, WB, AfDB
- Earlier work: provide experimental evidence on the economics of rural electrification in Kenya, a country where the grid is rapidly expanding.
- >90% of Kenyan schools, clinics, market centers connected.
- What happens when rural households are connected? (Lee et al 2018)

>> **This project:** examine how to improve provision of residential electricity connections in the context of Kenya's Last Mile Connection Program (LMCP), which aims to provide nearly universal coverage by 2020.

LMCP in Kenya

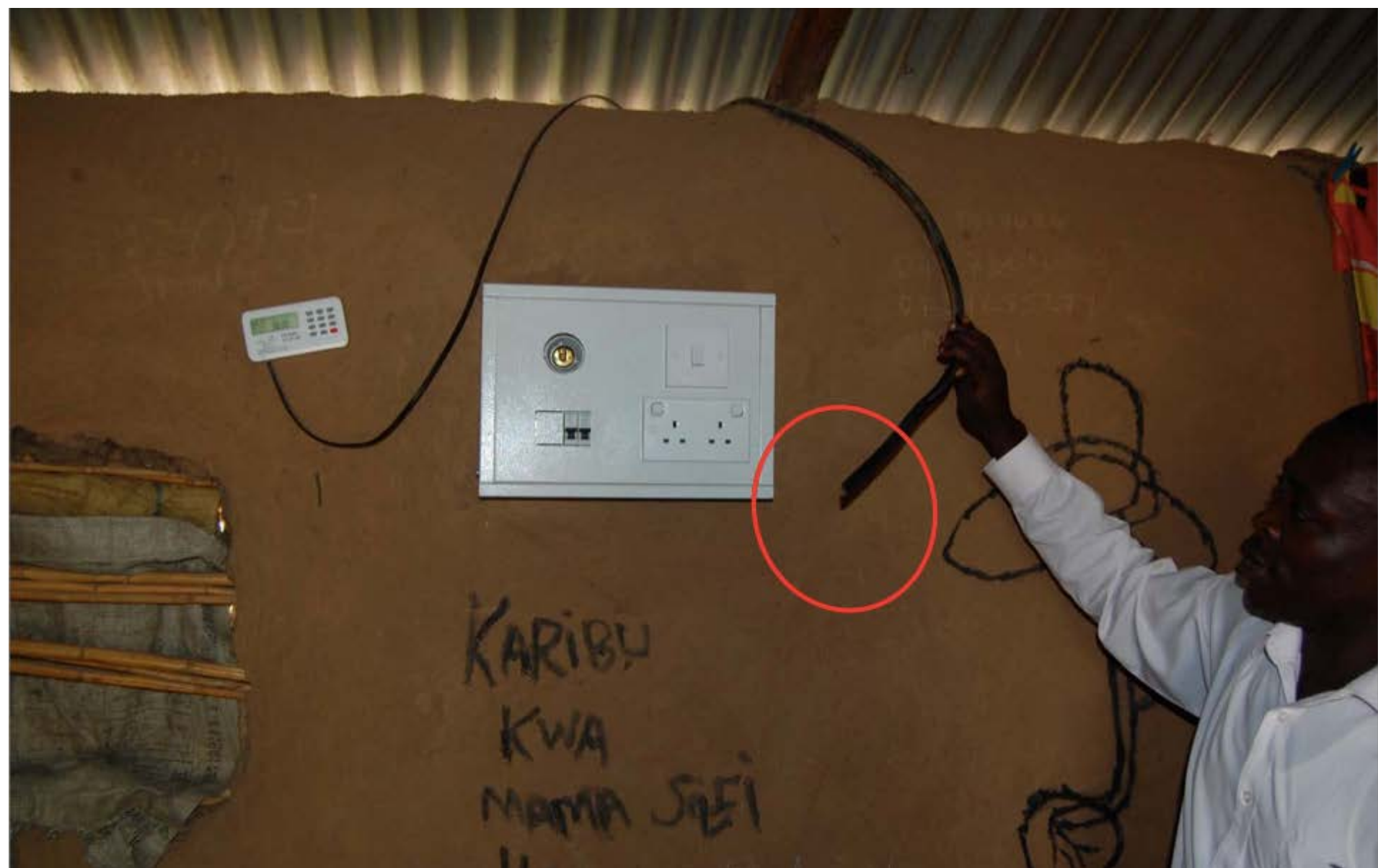
- Seen as a major policy accomplishment of the current government, with millions of Kenyans connected to electricity for the first time
 - Large project with funding from African Development Bank (US\$270M) and World Bank (US\$300M); degree of oversight varies across donors
- >> Implemented by 40+ private construction firms

- Phase I: Maximize 8,500 transformers nationwide
 - Connect all households <600m from transformer
 - 20-100 new connections per community
- Phase II: (Launching 2018-2019)
 - Maximize additional transformers, build new transformers

LMCP: Governance issues

- Despite progress made, widespread concern in the media about lack of accountability, poor construction quality, and corruption
- Lee, Miguel and Wolfram (2018) document leakage, challenges:
 - 21% more poles invoiced than constructed
 - 33% longer travel distances invoiced (compared to optimal)
 - Bureaucratic red-tape leads to long delays (188 days on average)
 - Grid reliability is low: 19% of transformers failed in a year, median repair time of 4 months. Plus frequent black-outs.
- Also: residents may be asked to pay bribes, or to dig holes for poles
- Connections may be overstated (e.g., compounds with several meters)
- Quality of installations varies (distance between poles, pole tilt, wiring)



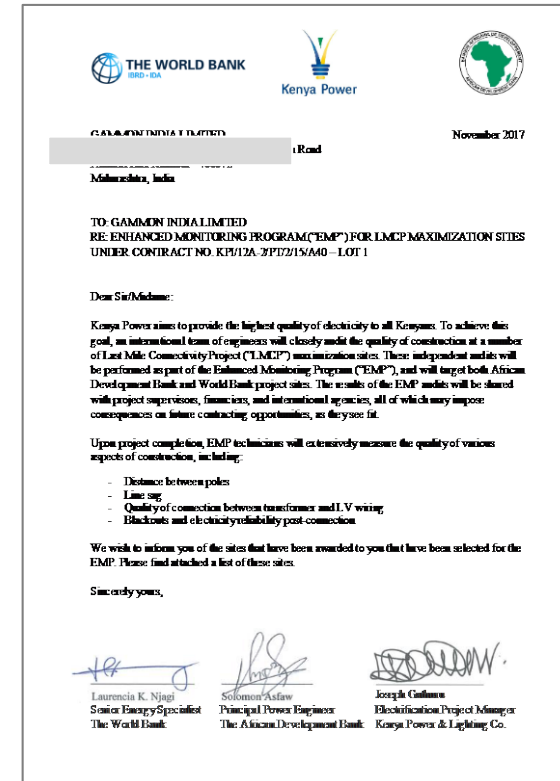


Key issues and questions

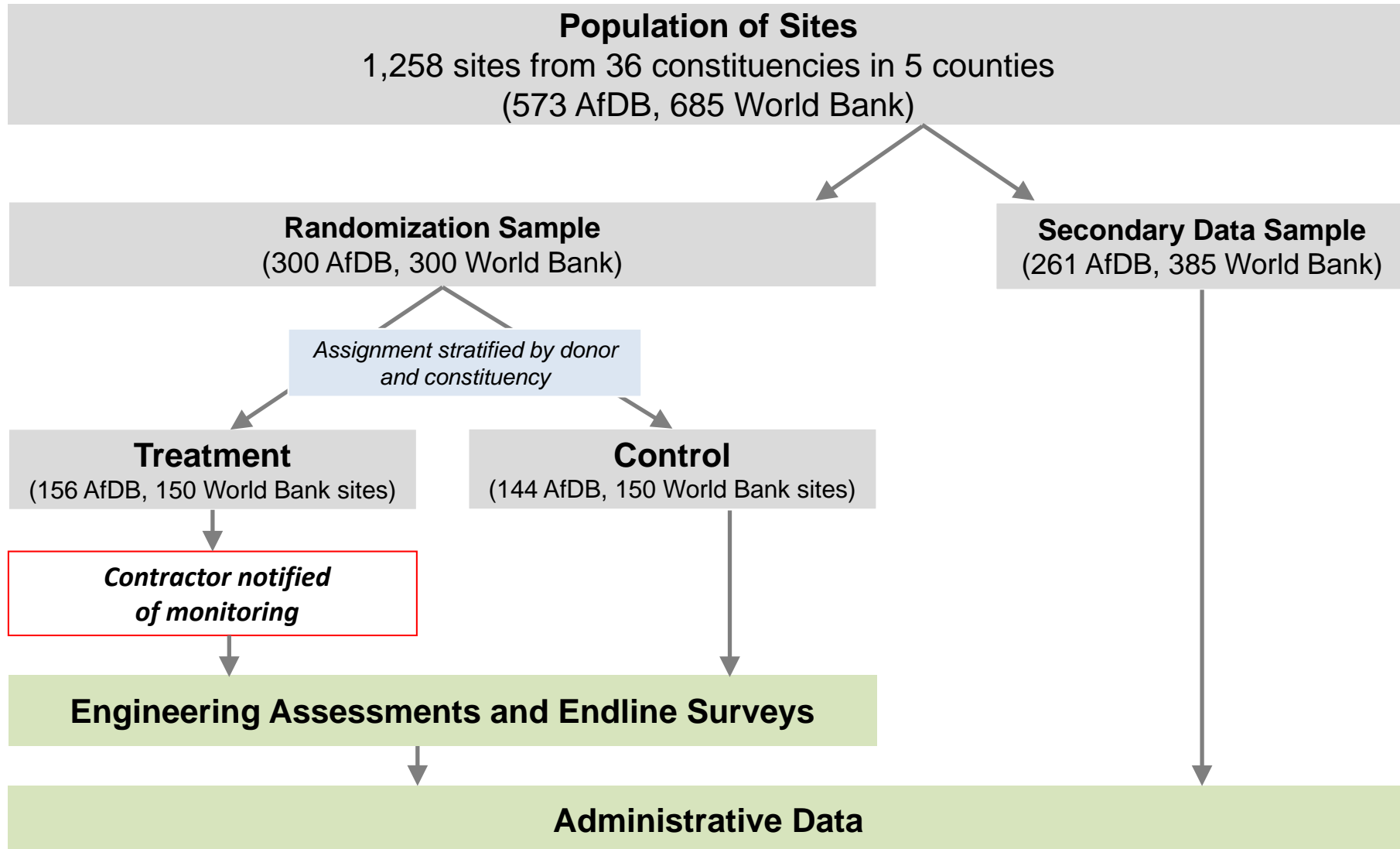
- How can the government be held accountable for the quality of public goods provision, especially when private firms implement projects?
 - 1) External construction monitoring
 - Independent monitoring RCT in 600 transformer communities.
 - >> Detailed engineering quality assessment (new), plus HH surveys.

Monitoring RCT

- **Treatment:** letter delivered to private contractors at in-person meetings and follow-up conversations, signed by Kenya Power, World Bank, AfDB
 - *"An international team of engineers will audit quality of construction. These independent audits will target AfDB and World Bank sites. Results will be shared with project supervisors, financiers, and international agencies... may impose consequences on future contracting opportunities"*
- >> List construction aspects to be measured
- >> Attachment: list of monitored sites ("treatment")



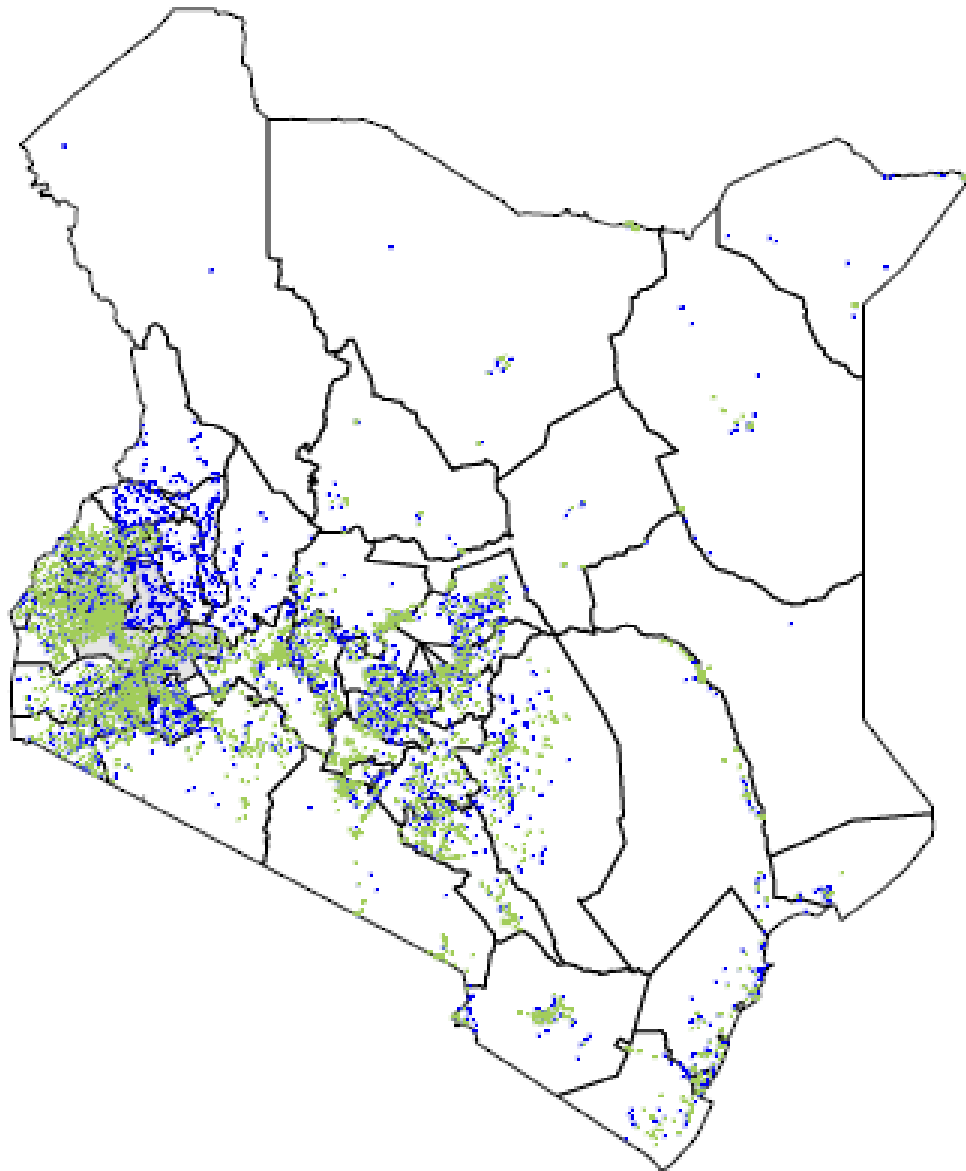
Monitoring RCT



Key issues and questions

- How can the government be held accountable for the quality of public goods provision, especially when private firms implement projects?
 - 1) External construction monitoring
 - Independent monitoring RCT in 600 transformer communities.
 - >> Detailed engineering quality assessment (new), plus HH surveys.
 - 2) Aid donor conditionality
 - World Bank has far more stringent anti-corruption contracting and financial requirements than African Development Bank.
 - >> WB, AfDB sites scattered quasi-randomly in counties through Kenya

World Bank, AfDB project locations



AfDB Phase I sites



World Bank Phase I sites

Key issues and questions

- How can the government be held accountable for the quality of public goods provision, especially when private firms implement projects?

1) External construction monitoring

- Independent monitoring RCT in 600 transformer communities.

2) Aid donor conditionality

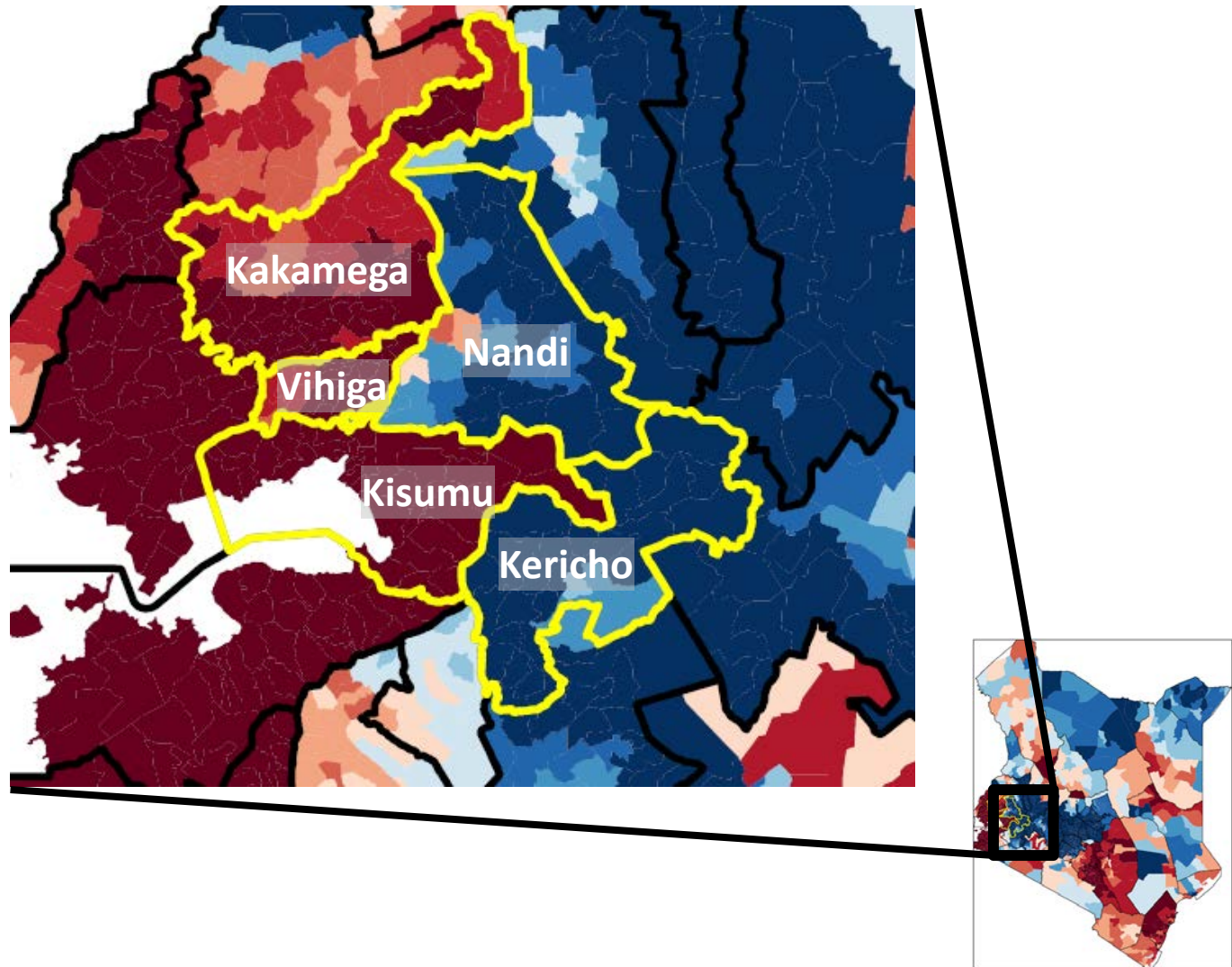
- World Bank has far more stringent anti-corruption contracting and financial requirements than African Development Bank.

3) Political and electoral incentives

- Examine sharp local geographic shifts in political affiliation.

>> Are government supporters likely to get connections first, or experience better construction quality or reliability, and less leakage?

Political variation: August 2017 Election Western, Nyanza, and Rift Valley





Center for Effective Global Action

ECONOMIC
& DEVELOPMENT
INSTITUTIONS



END – EXTRA SLIDES

2015: African Development Bank

***“Without electricity
there is no future,
no growth,
no progress”***

**-- President Akinwumi
Adesina, Sept. 2015**



Figure 7—Discrepancies in project costs and electrical poles, by contractor

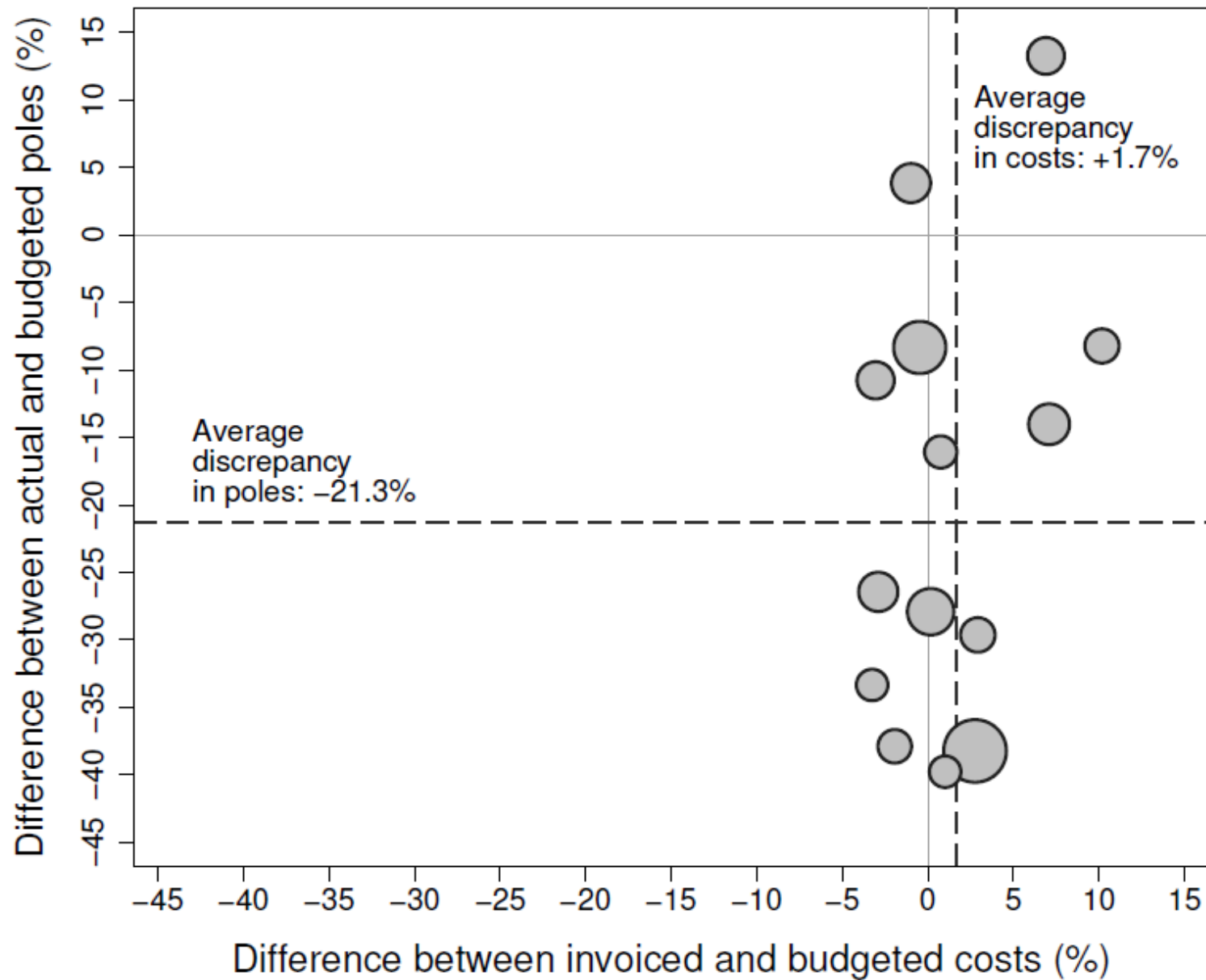


Figure 8—Timeline of the rural electrification process

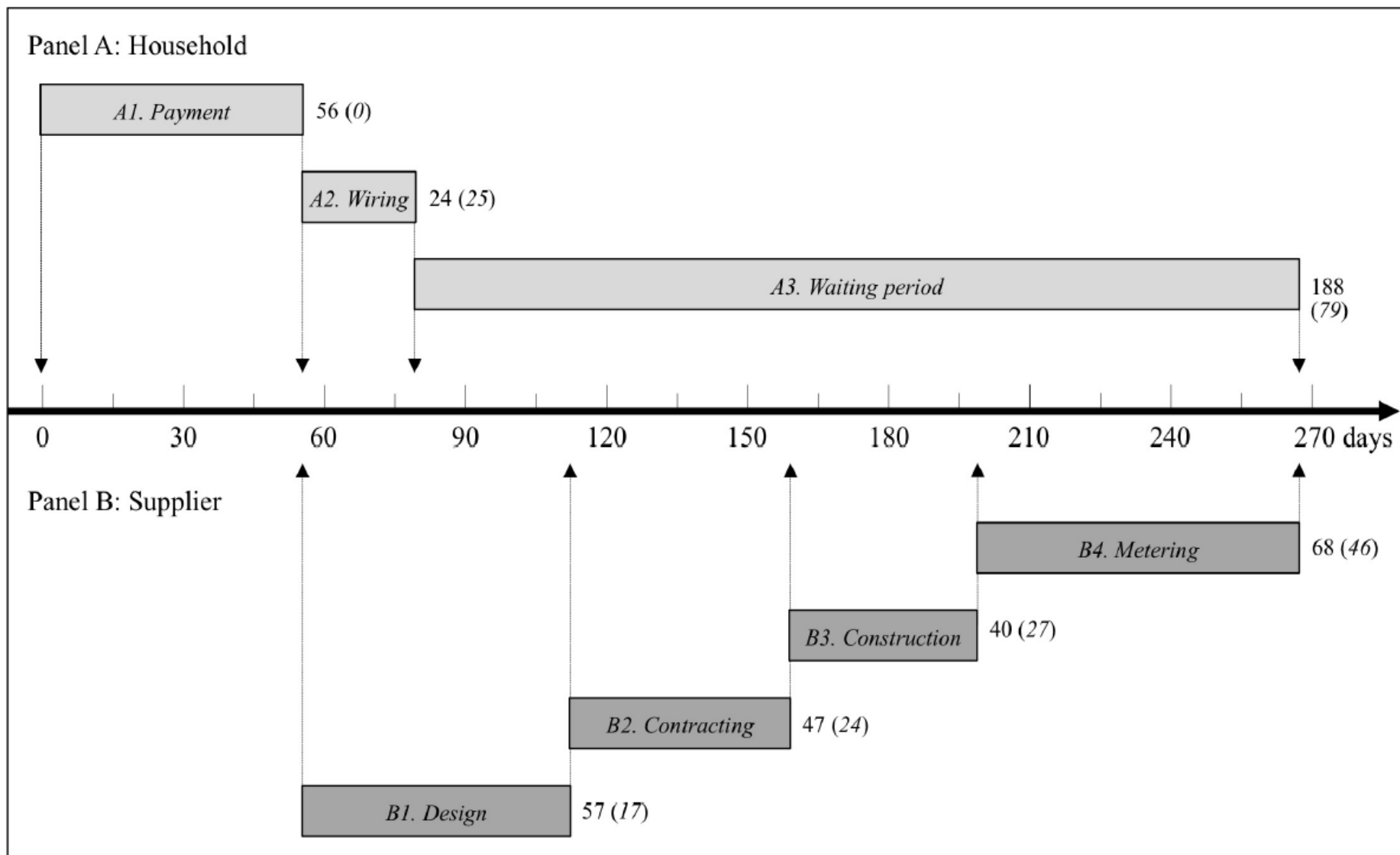


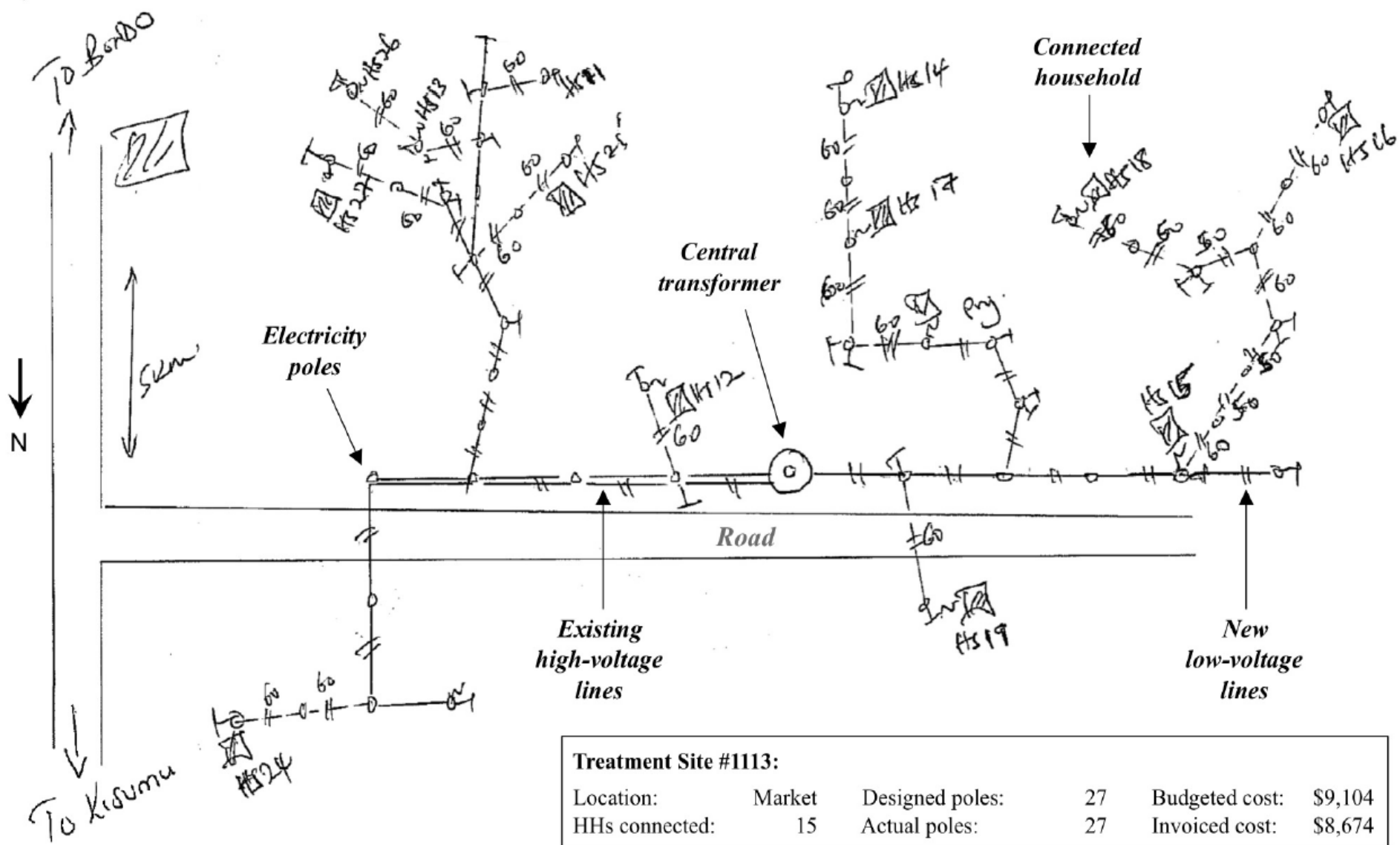
Table 4—Costs of infrastructure construction associated with electricity connection projects

	Budgeted		Invoiced			Difference	
	Total	Per HH	Total	Per HH	Allocation	Amount	%
<i>Panel A: Project costs (reported)</i>							
Local network	383,207	798	358,235	749	61.1%	-24,972	- 6.5%
Labor and transport	177,457	370	200,080	419	34.1%	22,623	12.7%
Service lines	15,812	33	27,684	58	4.7%	11,873	75.1%
Total cost	576,476	1,201	585,999	1,226	100.0%	9,523	1.7%
<i>Panel B: Project materials (reported and observed)</i>							
			Observed				
Electricity poles	1,449	3.0	1,141	2.4	—	-308	-21.3%

Table A8—Transformer problems in study communities during the 14-month study period (between September 2014 and October 2015)

Transformer ID	Group	Wave	Treated HHs	Connected	Metered	Blackout	Primary issue
1204	Treatment	2	15	Feb-15	May-15	4 months	Burnt out
1403	Treatment	1	15	Mar-15	Jul-15	1 month	Commissioning
1505	Treatment	2	1	Mar-15	May-15	1 month	Commissioning
2101	Treatment	1	0	n/a	n/a	8 months	Burnt out
2103	Treatment	1	0	n/a	n/a	4 months	Technical failure
2106	Treatment	1	15	Nov-14	Nov-14	8 months	Commissioning
2114	Treatment	1	8	Dec-14	Dec-14	12 months	Relocated by Kenya Power
2116	Treatment	1	14	Sep-14	May-15	2 months	Technical failure
2202	Treatment	1	1	Sep-14	Oct-14	1 month	Technical failure
2217	Treatment	1	13	Oct-14	Dec-14	1 month	Technical failure
2222	Treatment	1	3	Oct-14	Dec-14	4 months	Leaking oil
2303	Treatment	2	7	May-15	Jun-15	4 months	Technical failure
2406	Treatment	2	15	Apr-15	Jun-15	1 month	Burnt out
2503	Treatment	1	1	Oct-14	Oct-14	6 months	Burnt out
2506	Treatment	1	15	Dec-14	Feb-15	9 months	Commissioning
1103	Control	n/a	0	n/a	n/a	2 months	Technical failure
1109	Control	n/a	0	n/a	n/a	6 months	Burnt out
1203	Control	n/a	0	n/a	n/a	1 month	Technical failure
1205	Control	n/a	0	n/a	n/a	1 month	Technical failure
1405	Control	n/a	0	n/a	n/a	6 months	Burnt out
1410	Control	n/a	0	n/a	n/a	2 months	Relocated by Kenya Power
2103	Control	n/a	0	n/a	n/a	4 months	Burnt out
2115	Control	n/a	0	n/a	n/a	2 months	Technical failure
2212	Control	n/a	0	n/a	n/a	5 months	Burnt out
2220	Control	n/a	0	n/a	n/a	8 months	Burnt out
2304	Control	n/a	0	n/a	n/a	3 months	Stolen
2315	Control	n/a	0	n/a	n/a	3 months	Burnt out
2504	Control	n/a	0	n/a	n/a	4 months	Technical failure
2515	Control	n/a	0	n/a	n/a	4 months	Damaged by weather

Figure A9—Example of a REA design drawing in a high subsidy treatment community



Budgeted and invoiced administrative cost data

Fittings Summary Sheet:

LINE: 11/33Kv 11Kv S/S No.: 54077 Route Length 0 KM-HV

POLES	11M	12M	14M
WOODEN:	—	3 —	—
CONCRETE:			
H.V. Fittings		LV Fittings:	
INT:	3 + 14 aerial 4 end 11/10	POLES:	2 29
DKA:		STAYS:	2 27
VFA:	—	FLYING STAYS:	—
VS:	—	STRUT POLES:	—
HS:	—	INT/TERMS SPH.	2 31
2 MEMBER H/S	—	INT/TERMS 3PH.:	—
3 MEMBER H/S	—	SECTION SPH.	— 5
T OFF:	—	SECTION 3PHASE:	—
TP:	—	T-OFF SPH.	1 10
STAYS:	— 1	T-OFF 3PH.	—
FLYING STAYS:	—	Woodpole insps — 180 Km/180	
STRUT POLES	—	Material transport — 120 Km/120	
	Total no premises	No.	P.M.E
NO OF PREMISES:	a) Single Phase: 174	No. 15	2 18
	b) Three Phase: —	No. —	—
LENGTH OF CONDUCTORS:	a) Single Phase: 245	(Meters) 4040	—
	b) Three Phase: —	(Meters)	—
No. of transformers N/A			
Name of project ORY — IPA-3921913/14003			
Constituency RARIEDA			
Prepared by Gt 17/12/2014			

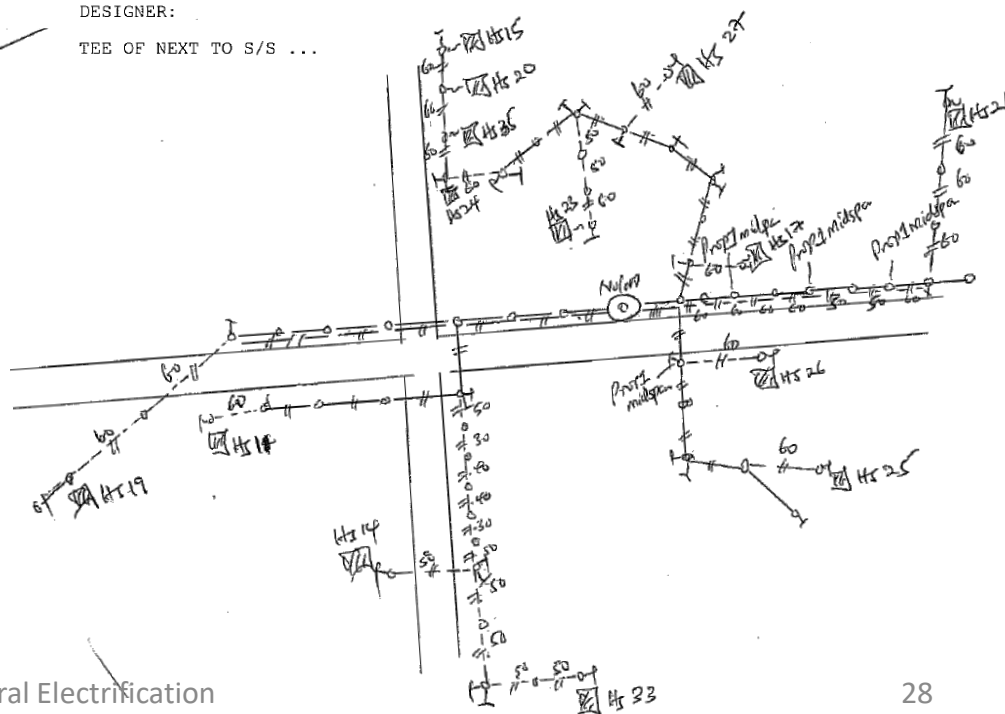
IPA-3921913/14003.

DATE:17/12/2014

- (1) Project Survey works ===== 0
 - (2) Provision for Wayleaves ===== 0
 - (3) 0X50KVA 11/0.433 KV TX ===== 0
 - (4) S/S Works ===== 0
 - (5) 0Km of 11kv in 75 sq mm bare acsr == 111,080.65
 - (6) 0m of Lv 3ph in 50 sq mm bare aa == 749,498.95
 - (7) 0 No. S/L in 25 sq mm 4/c ug cable == 40,458.90
 - (8) Per diem, shutdown and press advert == 10,000.00
 - (9) Labour & Transport Costs == 357,916.92
- TOTAL PLANNED PROJECT COST == 1,268,955.42

DESIGNER:

TEE OF NEXT TO S/S ...



Timeline

AfDB

Phase I Contracting

Turn-key:
Designs, Procurement,
and Construction

Phase II Contracting

Turn-key:
Designs, Procurement,
and Construction

Jan 2016

Jan 2017

Jan 2018

World Bank

Phase I Contracting: Designs

Designs

Phase I Contracting: Procurement

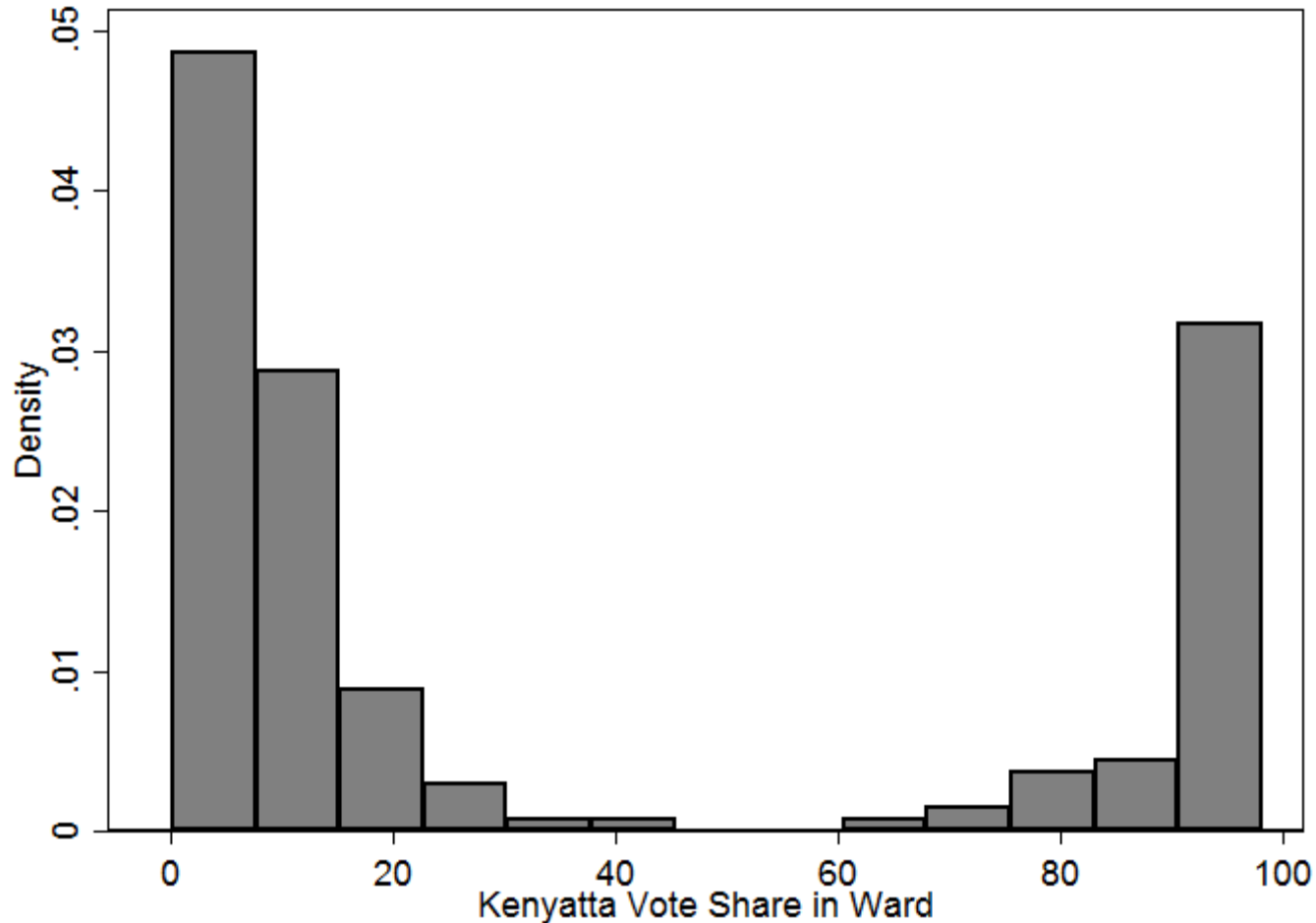
Procurement

Phase I Contracting: Construction

Construction

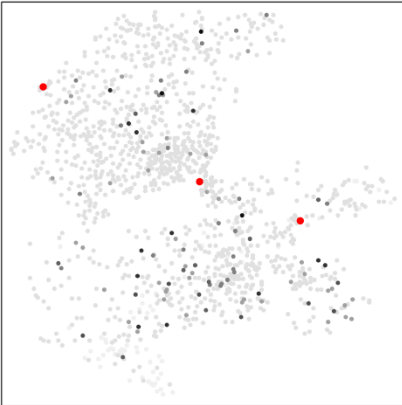
Phase I

Political variation: August 2017 Election (five counties)

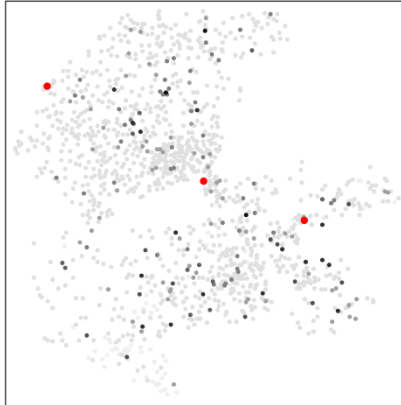


Rich temporal data on timing

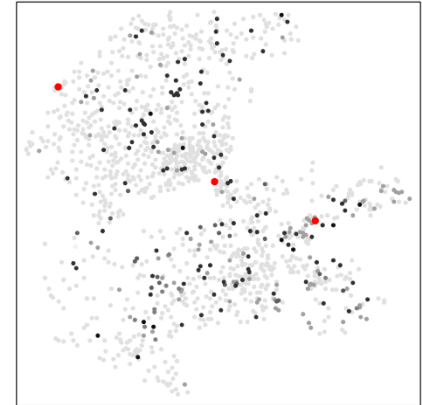
24oct2016



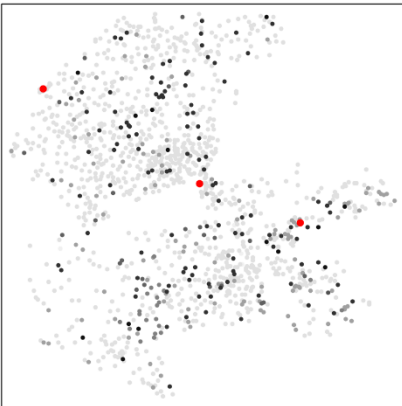
09jan2017



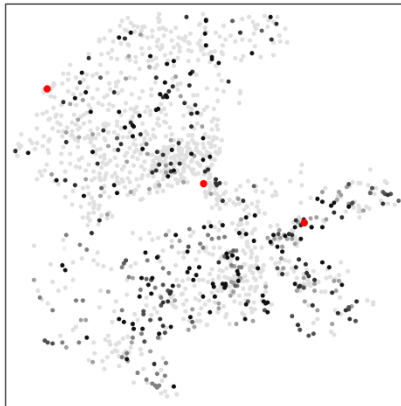
20mar2017



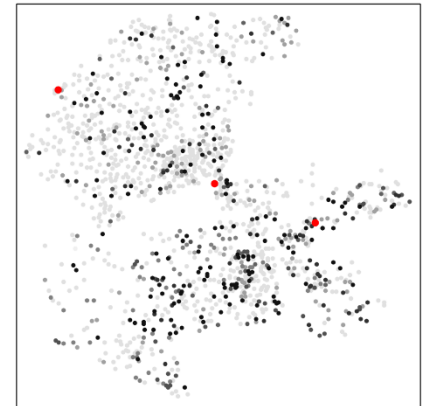
08may2017



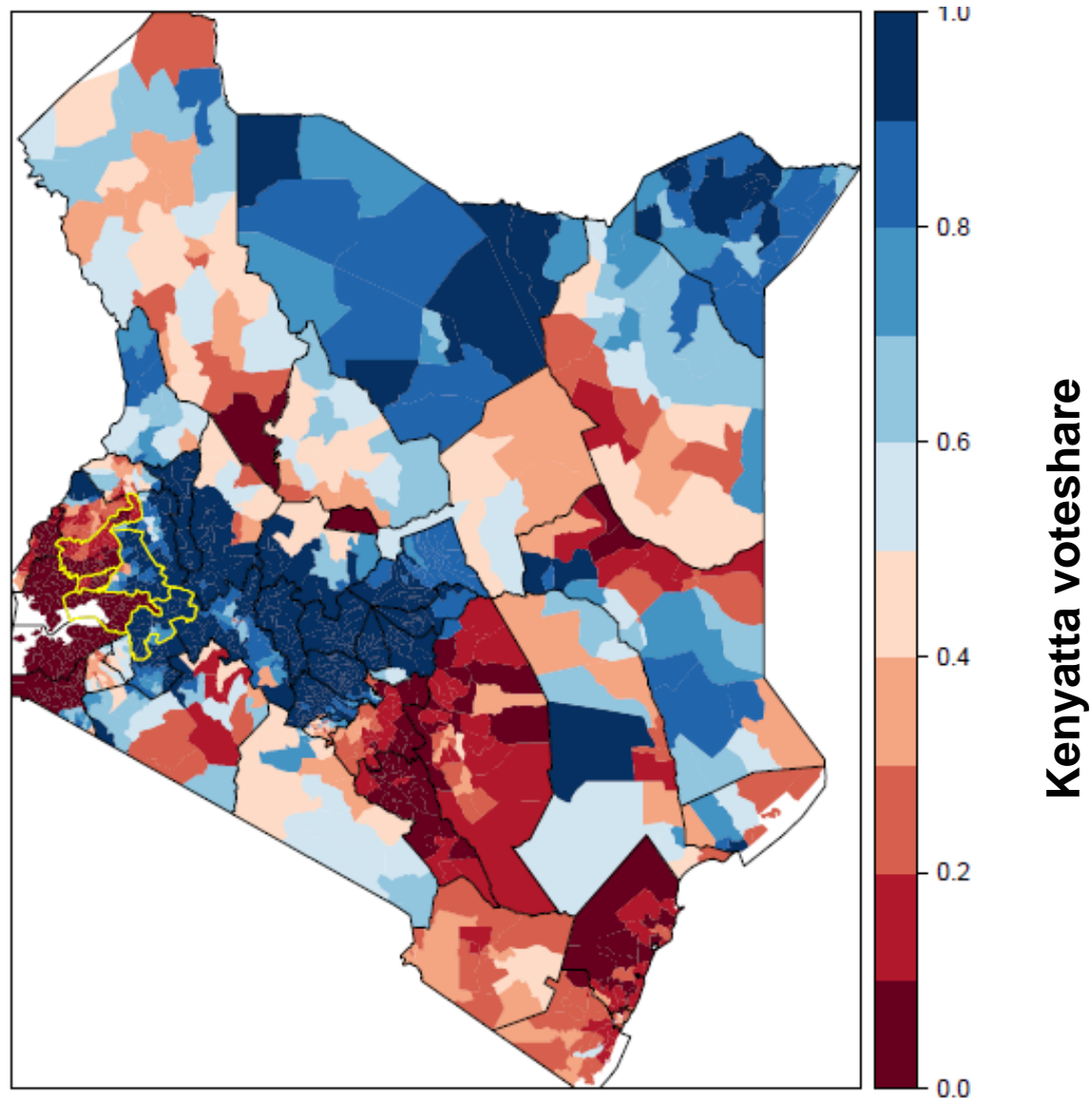
31jul2017



04dec2017

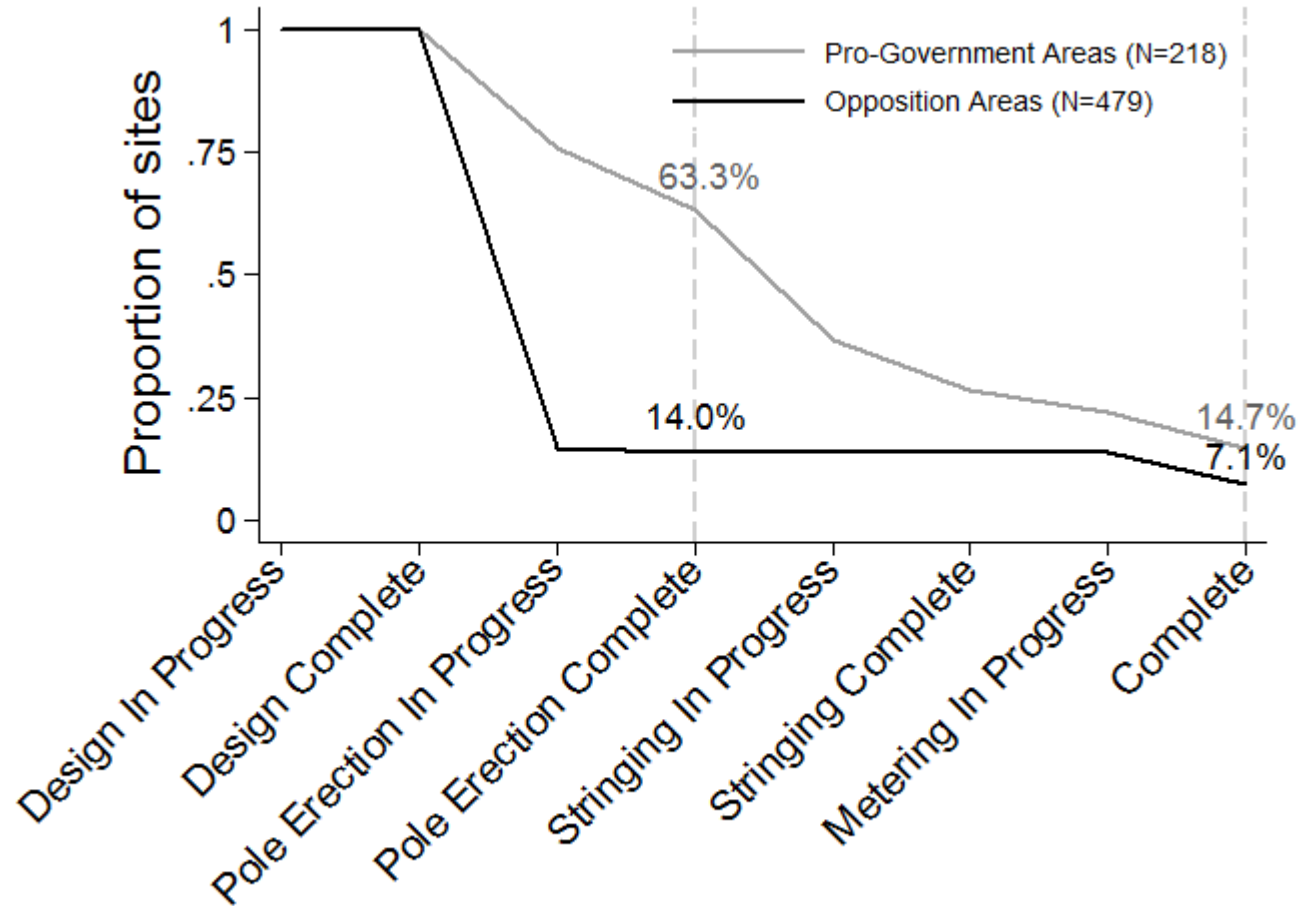


Political variation: August 2017 Election



Preliminary results – politicization

August 2017



Preliminary results – politicization

August 2017

