

Interdisciplinary Energy Analytics for Society Research Lab



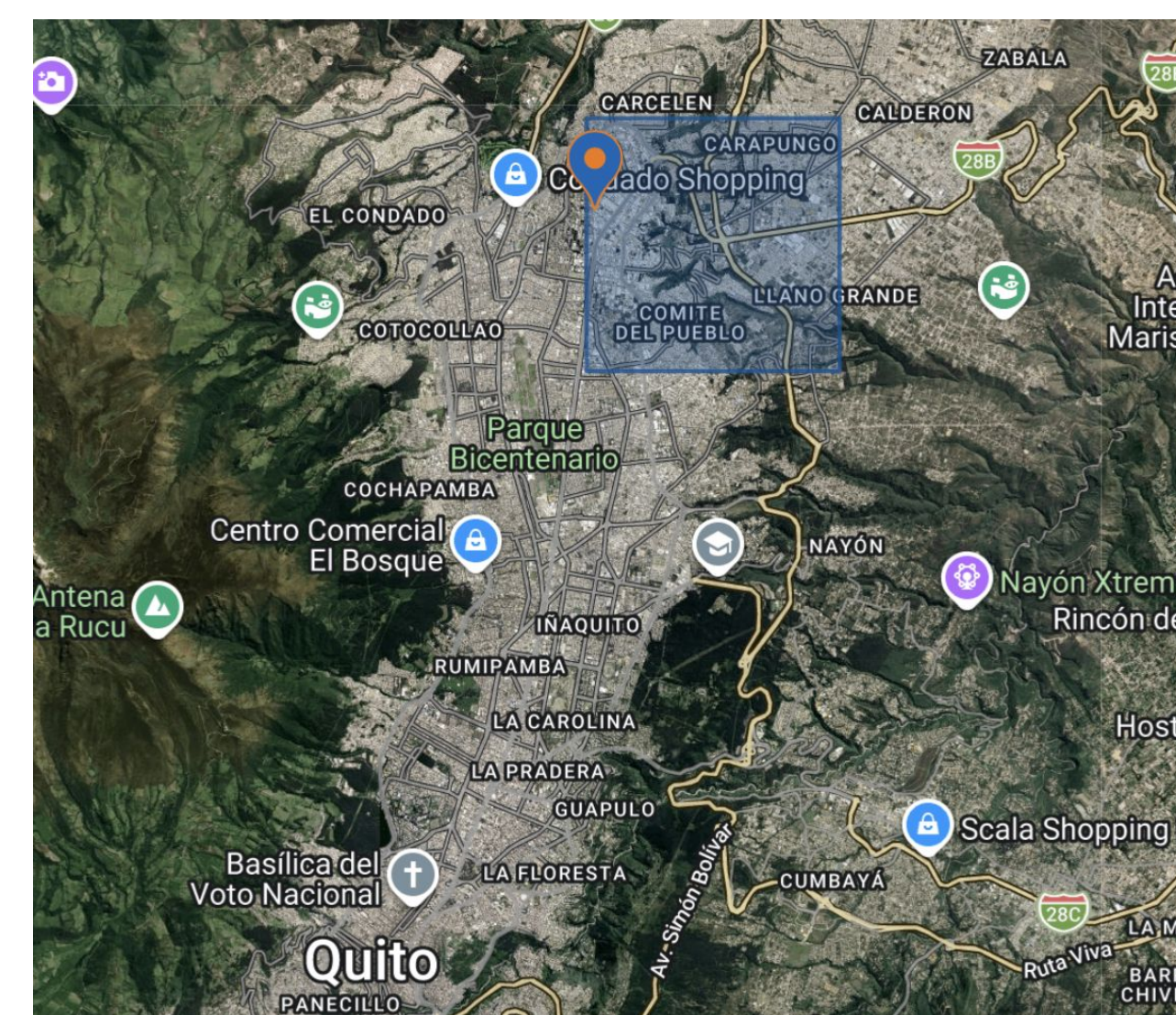
We work at the intersection of climate, energy, and development to support communities and policymakers in driving **just, community-centered energy transitions**. Through innovative research and data-driven insights, **we integrate technical solutions with socio-economic perspectives** to help shape resilient and inclusive energy futures.

Sizing of solar-plus-storage systems to maximize building resilience under data-scarce conditions

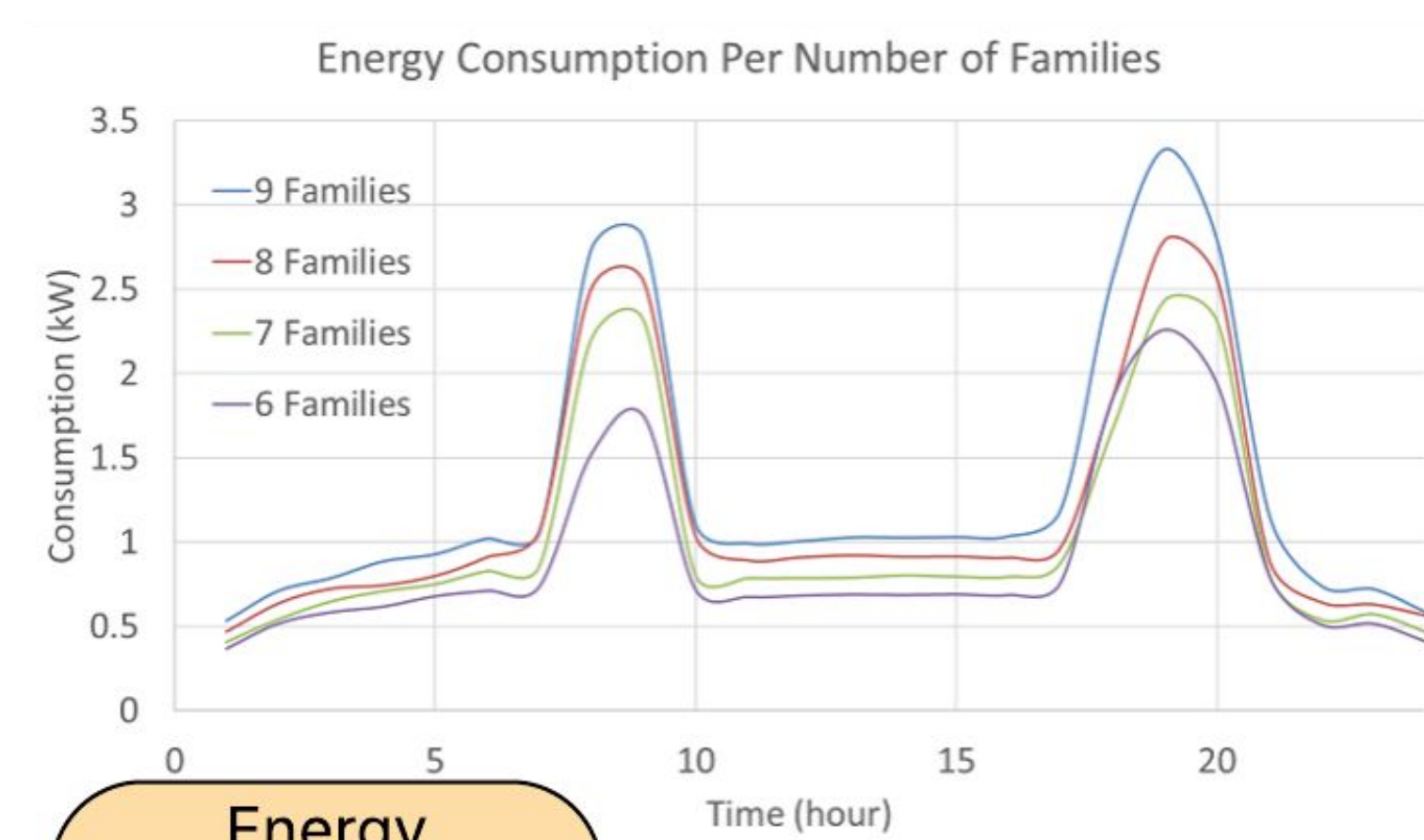
The Cofán people are an Indigenous community in the Amazon region of Ecuador who have long protected their land and autonomy.



“First, we have our FSC building in Quito. It's tied into the Quito grid, but we're considering installing a solar system. Last year, during all the power outages in Ecuador, our students who live at our FSC headquarters in Quito had a hard time finishing their homework and attending classes. Going solar would also help reduce our electric bill” - Fedrico Borman



- Average monthly building consumption: **700-1100 kWh**.
- However, the building frequently **experiences outages up to 24 hours/day**.
- Building occupancy: **6 families with 1-3 kids each**



Inputs	
Lights.....	5W
Washing Machine.....	500W
TV.....	50W
Laptop.....	100W
Dryer.....	2500W
Microwave.....	1000W

Electricity Demand Analysis

Energy consumption

Optimal Fit

Site Information	
Capital of Ecuador, Quito	
Located on the roof	
1,000 square feet	

Solar Resource Assessment

Solar Potential

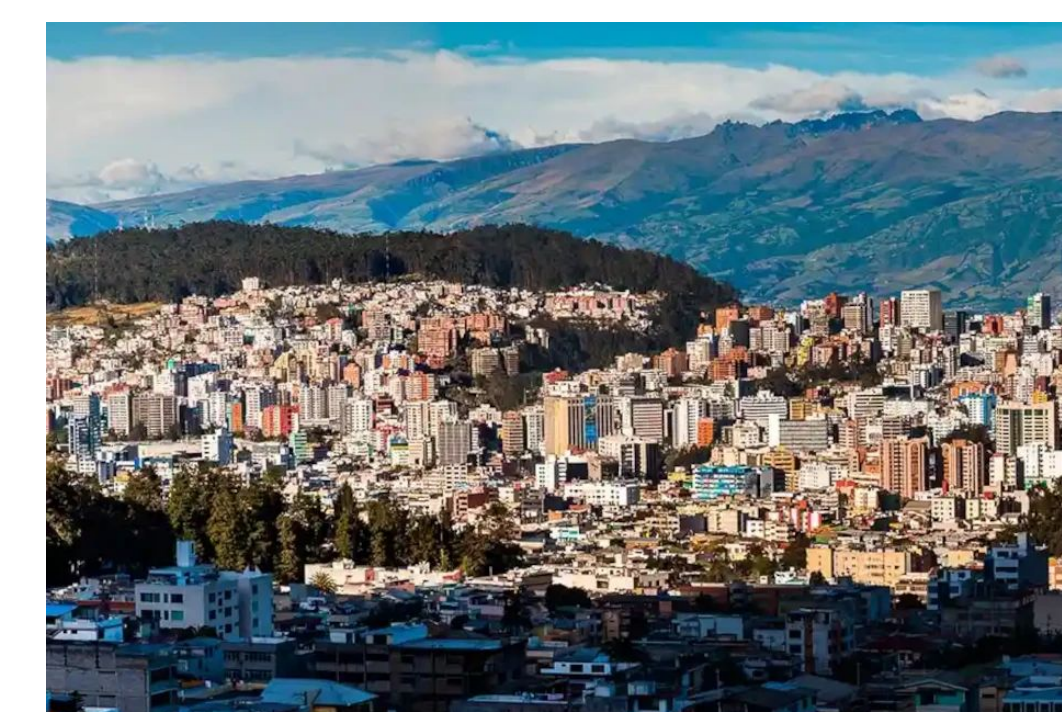


Developing outage scenarios to model complex experiences with energy reliability

Ecuador relies primarily on hydropower, so **outages are impacted by the wet and dry season**. We modeled combinations of solar and battery storage systems and outage patterns to provide a range of design options

Outage Scenarios:

- 24 hr random outage, PV & Battery System
- 24 hr random outage, PV only
- 22 hr dry season outage, PV & Battery System
- 22 hr wet season outage, PV & Battery System



Quito Dry Season: May - Sept



Quito Wet Season: Oct - Apr

22 Hour Dry Season Outage: System Sizing

	6 Families	7 Families	9 Families
PV Size	3 kW	4 kW	7 kW
Battery Size	18 kWh	20 kWh	32 kWh

Co-Developing of Capacity Building & System Management Plan



Developing methods to spread the knowledge about the system to the community.



Hosting webinars to teach community leaders about methods used to conduct research.



Teaching students and facility managers how to operate and maintain the system.

Future Work

Conclusions

- Developed different simulations based on different situations to support their energy resilience goals
- Consultation & feedback sessions with Tribal partners to support assumptions made, scenarios created

Future Work

- Detailed economic **cost-benefit analysis for design options**
- **Final system recommendations** after discussion about system priorities
- **Co-development** of capacity building & system management plan