Hackathon 2023

USMART SOLUTIONS

Our Team

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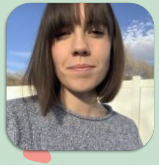

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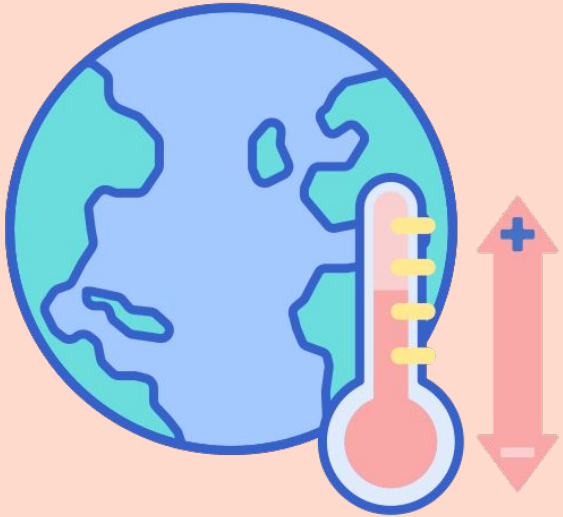
UTAH SMART ENERGY LAB

Effects of global warming are moving in next door...

- Communities worldwide are facing the effects of accumulated greenhouse gas emissions that are altering the weather in dangerous ways.
- Bigger cities with dark pavements and less vegetation are particularly sensitive to the increased heat.
- While technologies to ensure comfortable indoor temperatures are available, ironically these devices are increasing the heat emissions in already overheated environments, causing side effects such as heat island effects.



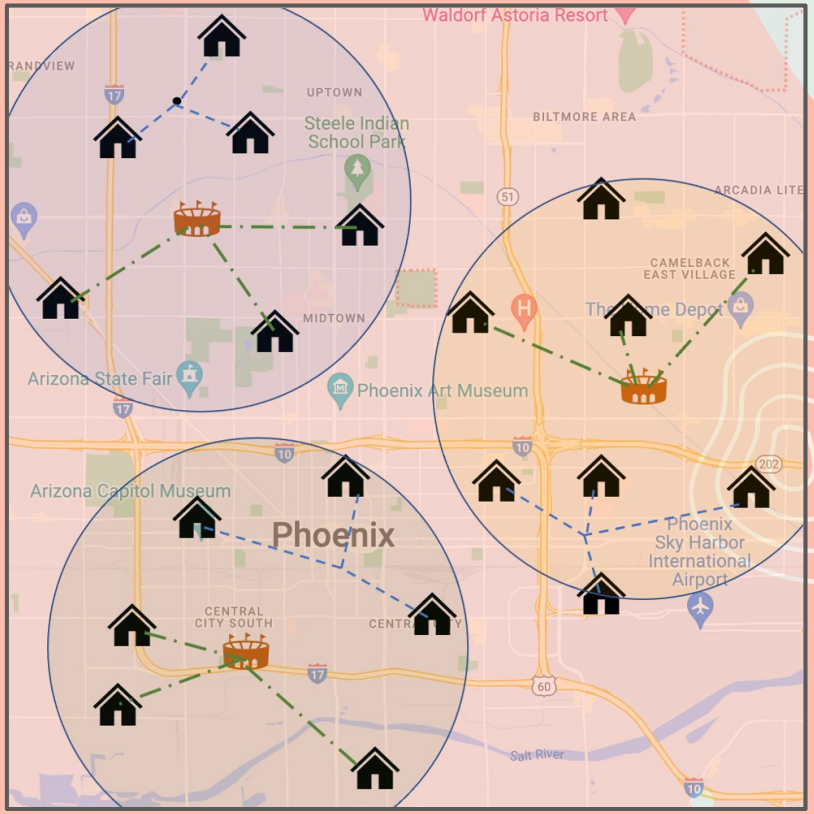
Some are more bothered by it than others

- Extreme heat is considered one of the most deadly climate-change induced weather effects around the world.
- Effect of increased urban heat reach individuals throughout the world, though its impact is not equitably felt among different community members within cities.
- Lower-income households, older adults, and people with heat-sensitive health conditions usually face the worst of these consequences.

Here's what we can do to change that

We propose a **community-engaging** three-part solution to provide **equitable access to cooling** during summertime and heat waves and **incentivize the efficient use of cooling systems**.

- Adaptation of community center to serve as a resilience hub
- Program to provide access to portable cooling systems
- Incentive-based program to improve community energy consumption
- Case study: Implementation of solution in downtown Phoenix, AZ



How it works

Resilience Hub

Resilience Hubs are energy-efficient community centers that can be used to shelter community members during natural disasters. Here we propose retrofitting a community center in Phoenix with solar and backup power generation, a green roof, heat reflecting architecture, and enough clean water and air supply to support a community for at least 72 hours.
Benefits:

- Provide shelter for community residence during extreme heat event
- Can operate independently of the grid, thus allowing utility companies to use the hub as a flexible load
- Decreases CO_2 emitting power generation, ultimately helps bring down temperatures

Target: community members with limited access to AC but capable of relocating

Portable cooling Program

Our portable cooling program involves installing infrastructure in the homes of qualifying community members in Phoenix and delivering portable cooling units to their residence in preparation for extreme heat events.
Benefits:

- Provides life saving support to members of the community who are unable to relocate to resilience hubs
- Aids the city in locating vulnerabilities to extreme heat and natural disaster
- Ensures all individuals have access to protection against the effects of urban heating regardless of their living situation

Target: community members with limited access to AC and not capable of relocating

Community Incentives

Households in Phoenix spend a lot on energy. Almost 30% more than the national average. This community incentives program would work in tandem with Arizona Public Service Company to offer residence subsidies for achieving a community energy reduction goal.

Benefits:

- Motivates individuals to work together as a community to mitigate urban heating effects
- Involves community members who don't need support from the hub or the cooling program

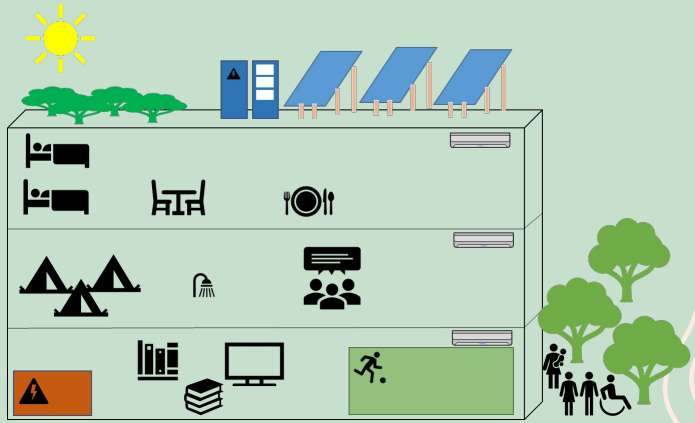
Target: community members with access to AC and no need to use the hub

Part 1: Community Resilience Hub

Resilience Hub Benefits

- While high-income neighbors benefits from air conditioning (AC) technologies to cool homes in heat crisis, despite high electricity prices, community resilience hub provides facilities and cool and comfortable shelter for low-income and heat-sensitive individuals, where they can also participate in different activities.
- Relocating people to community resilience hub means reducing the use of inefficient AC systems, which directly mitigates urban heat caused by ACs.

Floor Area: 74466 sq. ft.
Occupancy Capacity: 11170



Resilient Community Center Hub Features

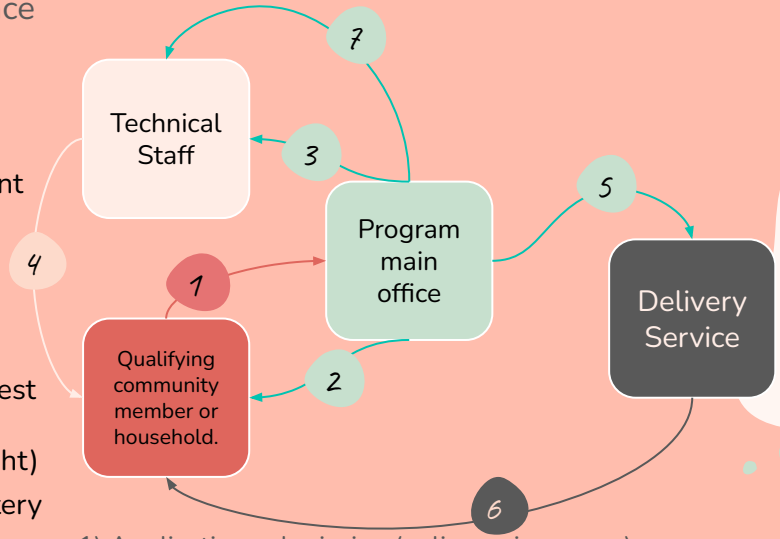
- Resilient Structure and Site
  - Efficient building (Green roof, reflective architecture)
  - Water storage
- Resilient Power (72 hour operation disconnected from grid)
  - Hybrid resilient system
  - Solar PV
  - Energy storage
  - Back up conventional generation (e.g. diesel generator)
- Resilient Communication
  - Network Infrastructure
  - Reliable WIFI system (satellite internet)
  - Operations and maintenance
- Resilient Operation
  - Identify Key Staff and Staff Roles
  - Staff training

Different facilities and activities available in hub

Sports, Libraries, Watching movies, Socializing, Dining, Resting area, Shower, classrooms, Performances, meetings, areas to sleep, etc.

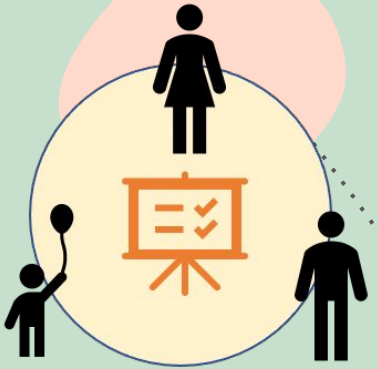
Part 2: Portable Cooling Program

- For individuals and families unable to relocate to a resilience hub during extreme heat events
  - Older adults
  - Children (especially those with special needs)
  - Individuals with specialized medical conditions or equipment
  - Low income households or families with transportation difficulties
- Government program delivers portable cooling units to residence
  - Units have a battery life of 6-8 hours (operates during hottest hours of the day)
  - Programmed to only charge during off-peak hours (overnight)
  - Participants are eligible to receive subsidies for cost of battery charging
  - More info on potential units: portable heat pumps
- Helps cities to identify vulnerabilities

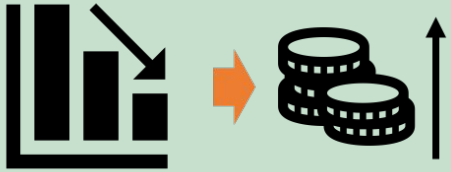


1) Application submission (online or in person)
2) Application approval based on qualifications
3) Technical staff are dispatched
4) Install infrastructure at residence
5) Dispatch delivery before forecasted extreme heating event
6) Cooling unit delivered to residence
7) Regular maintenance scheduled for cooling units

Part 3: Community Incentives



Involves the engagement of multiple community members to achieve an energy efficiency goal set by the local power utility



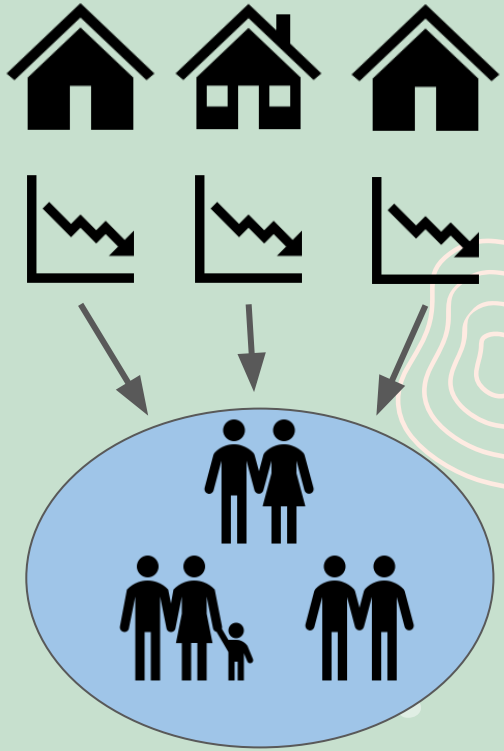
Incentives are given based on the savings resulting from the energy conservation

Community members willing to participate will get support on strategies to achieve the utility goal (e.g., pre-cooling strategies)

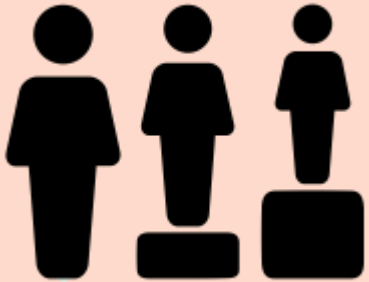
Community Incentives: An Example

The utility defines a goal for daily reduction in electricity consumption of 25 kWh. Air conditioning systems in Phoenix, AZ use between 3000 and 3500 kW of electricity. A customer using their AC system constantly with a fixed desired temperature would normally consume 70.68 kWh. By increasing the desired temperature by a couple of degree in the afternoon, the energy used would drop by 4.2 kWh–6.5% less. If at least 6 customers from the community are engaged, the utility goal is achieved. From that point, any additional energy saving–from each household or with every new addition–represents an incentive for the customer.

Double win! Saves money from reduced consumption plus gets a incentive for their participation in the program



Consideration 1: Equity

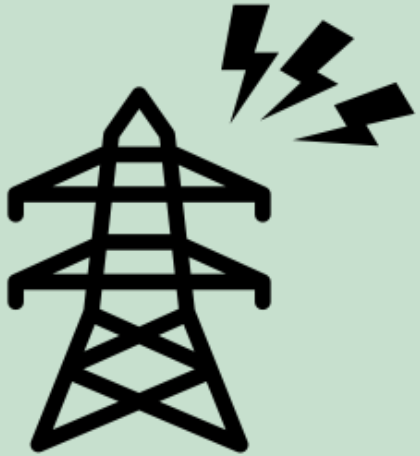


- The impacts of climate change and urban heating do not affect all individuals equitably. Higher income neighborhoods, whose residence can afford to run AC even when electricity prices are high, tend to run cooler than their lower income counterparts. And since AC units push heat outside and contribute to rising temperatures in cities, poorer neighborhoods are left to deal with the consequences of urban heating with little to no resources.
- Our solution considered all community members and seeks to address their individual needs. Through community engagement and government support, it offers an appropriate set of life saving options for those experiencing the effects of urban heating while simultaneously empowering them to make strides towards lowering emissions. Aid and support is offered to all regardless of income, neighborhood, age, ability, etc.

https://www.npr.org/2019/09/03/754044732/as-rising-heat-bakes-u-s-cities-the-poor-often-feel-it-most

Consideration 2: The Grid

- During extreme heat, the massive use of cooling system causes overloading of the electricity grids.
- Excessive use of electricity leads to increased generation from pollutant generation sources, which at the same time increases the electricity costs.
- Also during these overloads, utilities might be forced to prevent damage on the power assets by creating controlled outages that disrupt the electricity supply for sensitive customers



Existing Solutions

Cool Zone Program in Utah

- Cool zones are areas in county and SLC area where public can go there to escape heat, hydrate and learn about programs

Resilient Hub Implementation Partners

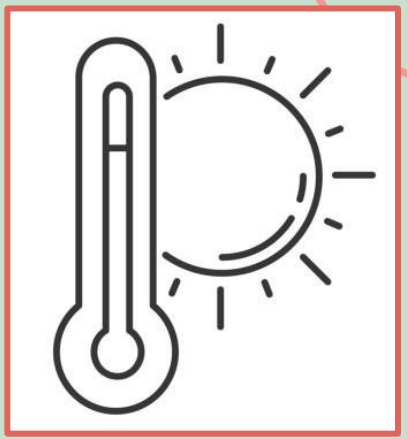
- Climate Resolve in Los Angeles
- Cambridge Community Center in Cambridge, Massachusetts
- Neighborhood Empowerment Network in San Francisco, Bay Area

Demand Side Management Programs

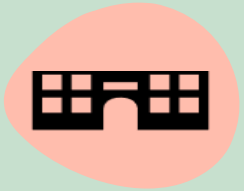
- Demand response programs
- Peak electricity load reduction
- Global temperature adjustment
- Pre-cooling

Why Our Solution is Needed

- The effects of urban heating are detrimental
  - Unaffordable energy prices
  - Rolling outages and blackouts
  - Exacerbating health conditions
  - Hinders children's learning
  - Loss of life
- Living situation dramatically affects your susceptibility to adverse health and living conditions caused by heat
- Existing solutions are helpful but lack:
  - Consideration of communities' individual needs or involvement
  - Bottom up operation platform
  - Distributed opportunities, benefits, and protection for all regardless of living situation and income
  - Attention to individuals' needs and viable support options for all



Cost



Resilience Hub

Expenses will include building retrofitting or construction, Reliable communication systems, and resilient power infrastructure implementation. Based on past building reports, we estimate the hub in phoenix would cost upwards of $3,000,000.

Portable Cooling Program

Costs for the program will include paying employes and the initial cost of buying the portable coolers. Maintenance and transportation costs will also factor into the program's expenses. We imagine its cost will be similar to other government funded programs.

Community Incentives

Expenses will include training. The utility and the households will split the profit. It should be noted that there may be a "comfort" cost associated with the homeowners increasing their thermostat thresholds.

Scalability

Implementing more Local solution

This solution can be implemented in cities across the world. Phoenix alone could set up 10 resilience hubs. It is crucial that it starts local. Specific considerations will differ based on the community. This will require community members participation with utility companies and local lawmakers to determine building and program needs.

Increasing Awareness

Community members awareness can be increased by holding classes and starting programs in neighborhoods. It is important that each community determines their own priorities. Barriers may include building restrictions, lack of community involvement, and conflicting interests between public, private entities, and NFP NGOs. These barriers can be worked through with persistent and open communication when clear goals are set for the community.

Network of hubs is possible to implement

It is extendable to any number of hubs based on the requirement of the region in one state such as Utah, California, or any other heat vulnerable area.

Conclusion

- Community engagement is the engine towards the resilient response to extreme weather events and natural disasters.
- Identifying and acknowledging the heat risk disparities is the key for government and communities to be better prepared and withstand the impending climate change challenge.
- Our three part solution takes into consideration the resources and abilities of community members to provide viable and effective methods of urban heat mitigation for all members of a community

Source: https://philanthropy.washingtonmonthly.com/portfolio_page/chicago-community-trust-bringing-communities-together/