Smart Energy for Margarita Island, Venezuela

Isabella Perez

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Problem: Rising Energy Demand

- Near 90% of population expected to live in cities by 2050
- Correlation between energy and growth
- Technology is engine that moves the urban system in its development, but without energy, technology is completely useless
- To achieve sustainability new renewable energy sources, energy optimizing technology, and energy management policies are required.

Source: https://www.fccco.com

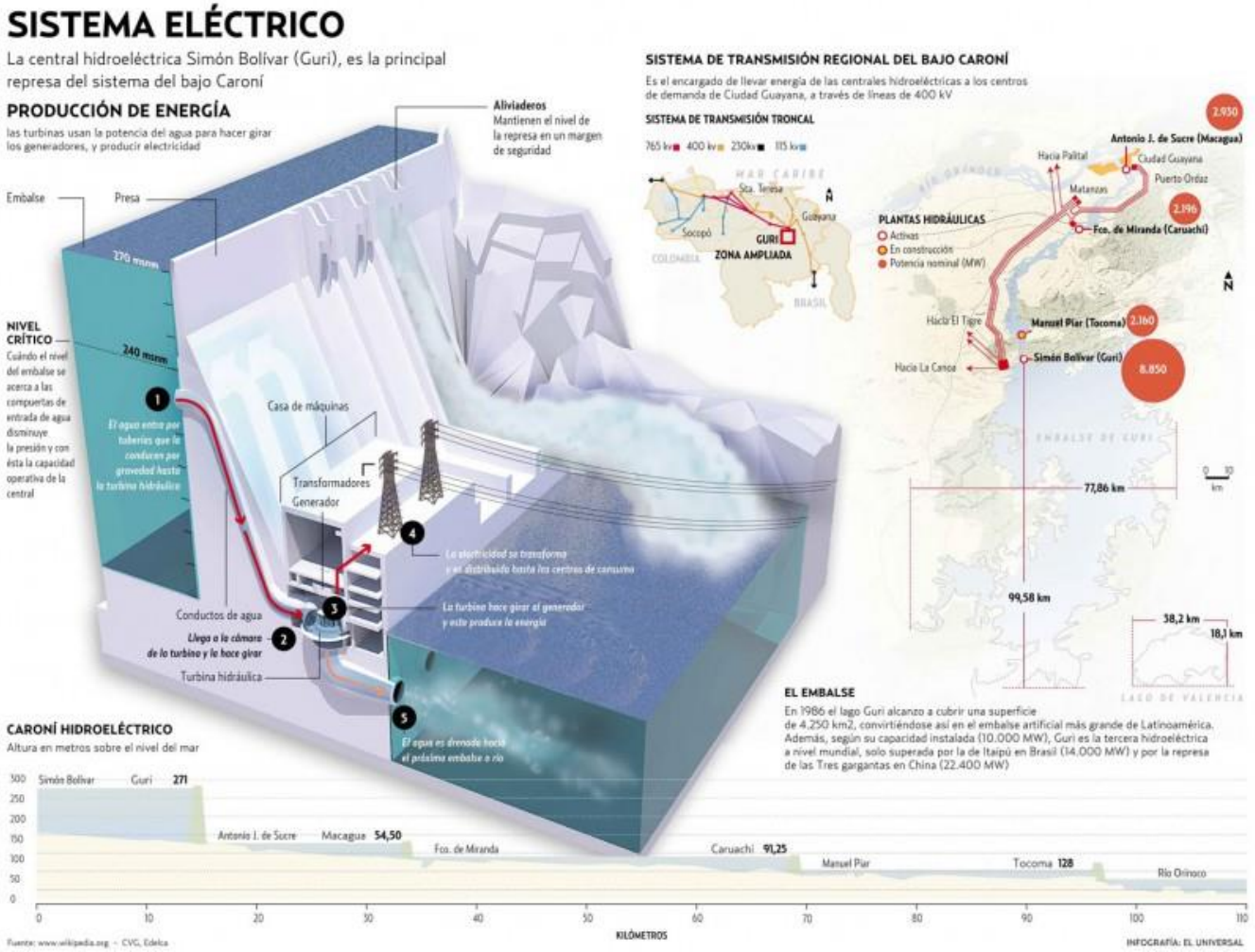
Problem: Rising Energy Demand

- Energy demand in Latin America expected to double by 2040
- Highest energy consumption per capita
- 5 Times more energy demand than Europe despite having only 3/5 of its population
- Energy production (hydroelectric) is vulnerable to effects of climate change, alternative affordable solutions are required

Source: www.elpais.com

Problem Failing Energy System

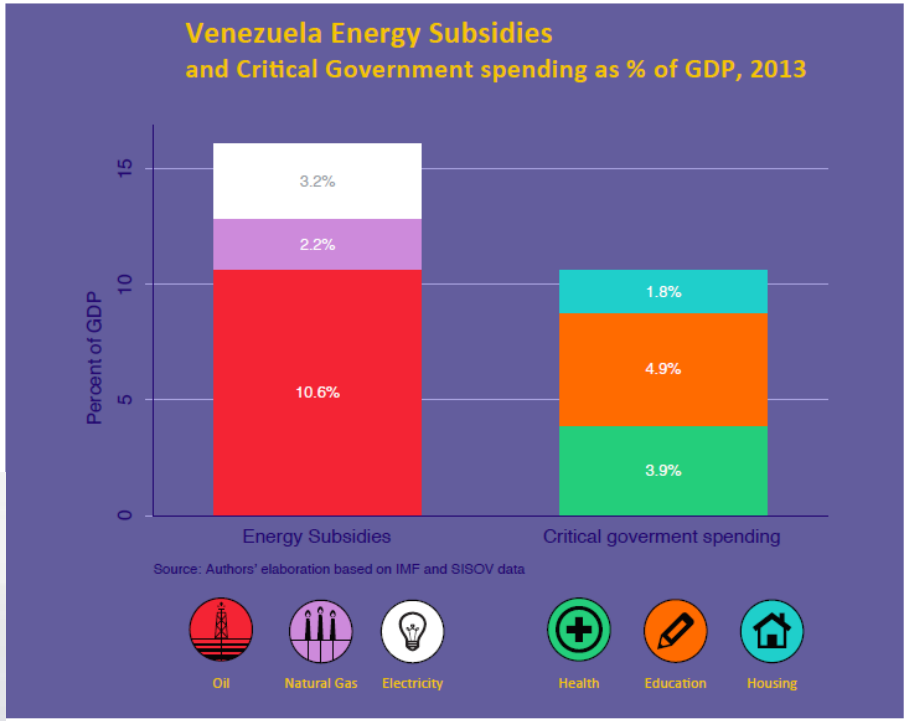
- Despite being an oil producing country, 70% of energy consumed in Venezuela is hydroelectric
- Decreasing water levels, in addition to higher energy demand and poor maintenance of old infrastructure has prompted an energy crisis

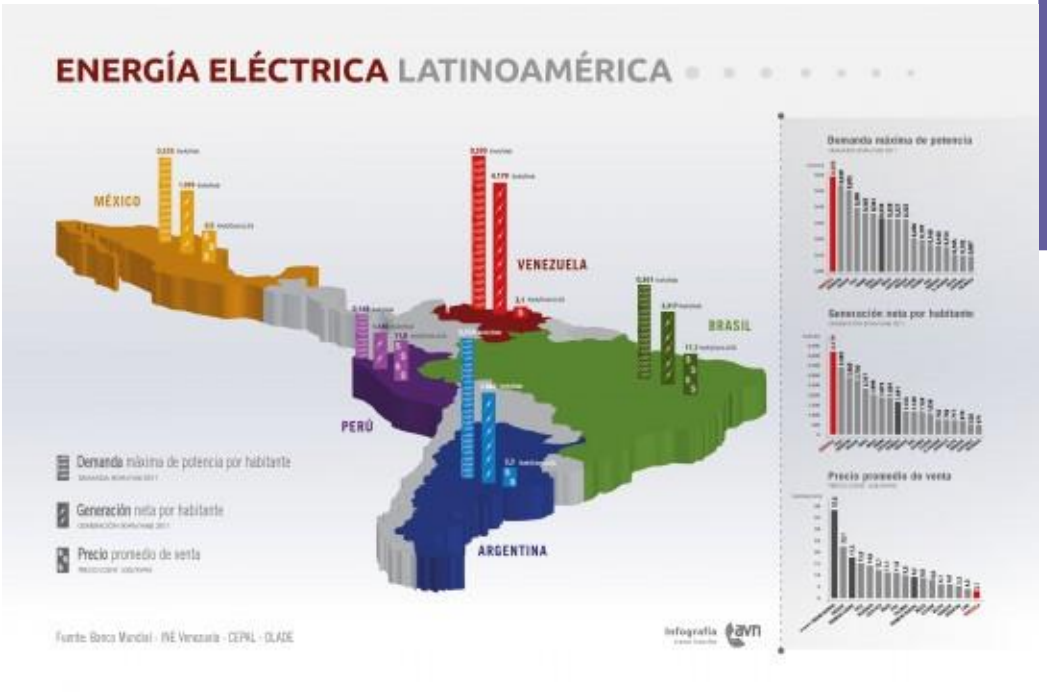


Source: www.eluniversal.com

Problem Failing Energy System

- Centralization under only one producer, no market for energy
- Subsidized prices mean customers have little incentive to save energy to reduce costs

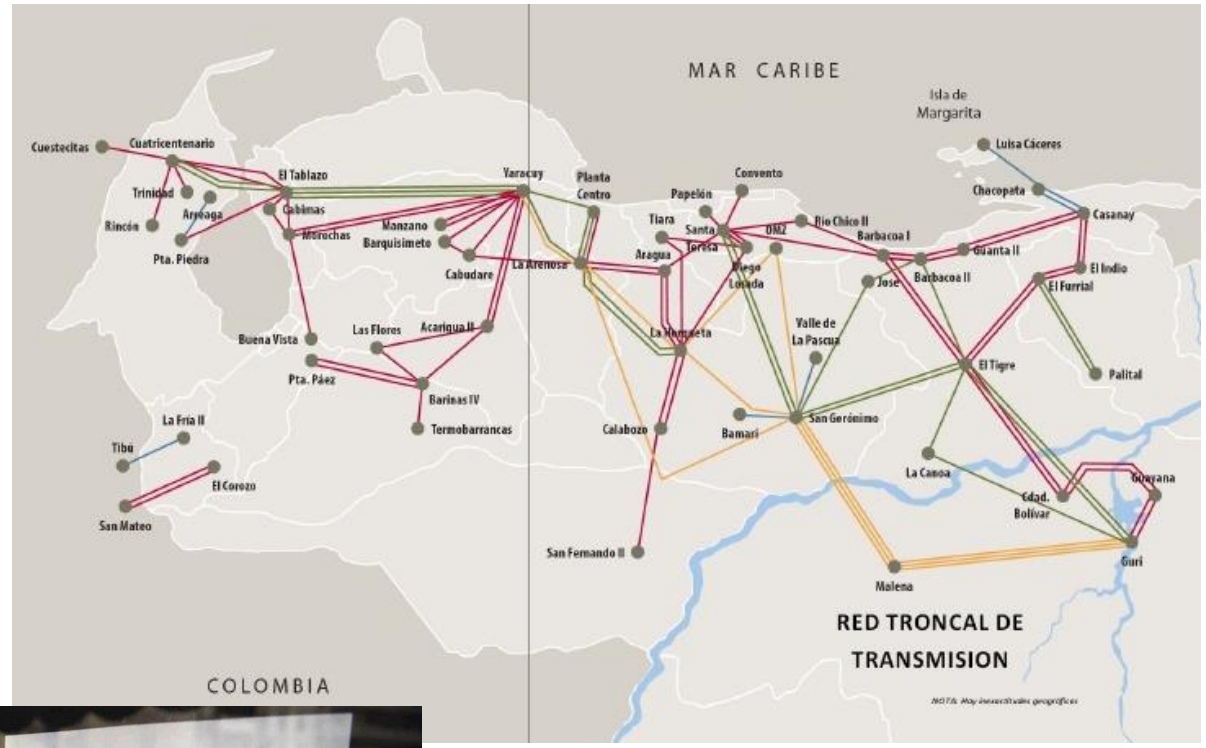




Source: CEPAL

Problem Failing Energy System

- Great distance between production plant and consumption
- Regions outside the Capital and Central area most badly affected by power outages and programmed power cuts
- Dramatic consequences for economic sector, as well as education and health



Source: www.eluniversal.com

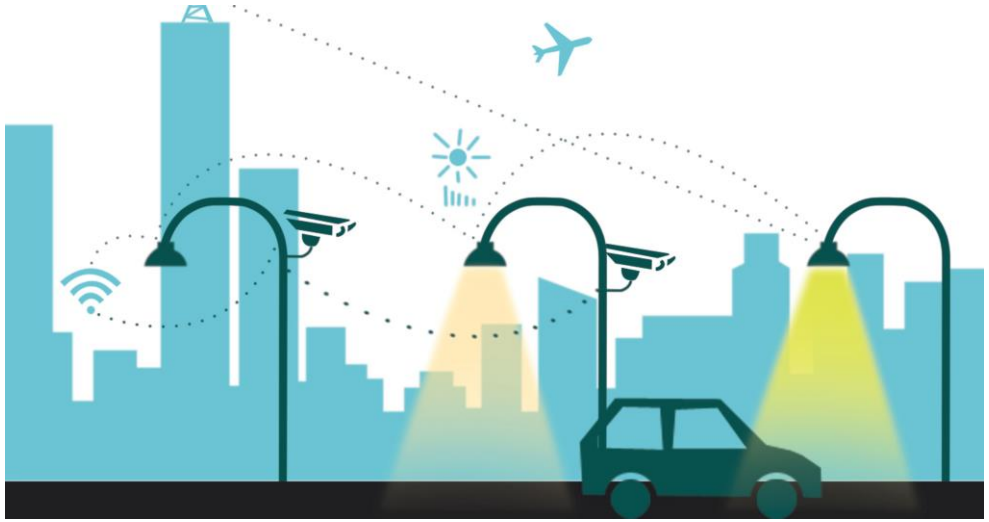
Problem Failing Energy System

- Margarita Island, one of the regions most affected by electric power crisis
- Submarine cable connection to mainland is only source of power
- Unreliable energy has affected development of new projects, and has a direct negative impact on tourism
- Local community has expressed need to adopt independent, renewable energy based system
- Some have adopted diesel generators as source of power, but they rely on fuel and not everyone can afford them

Source: Google Image

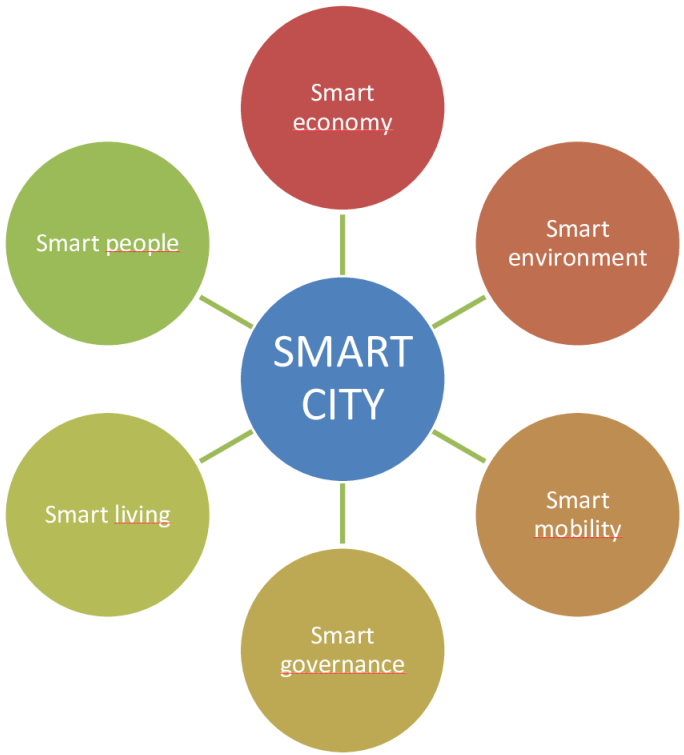
Idea: Smart Integrated Approach

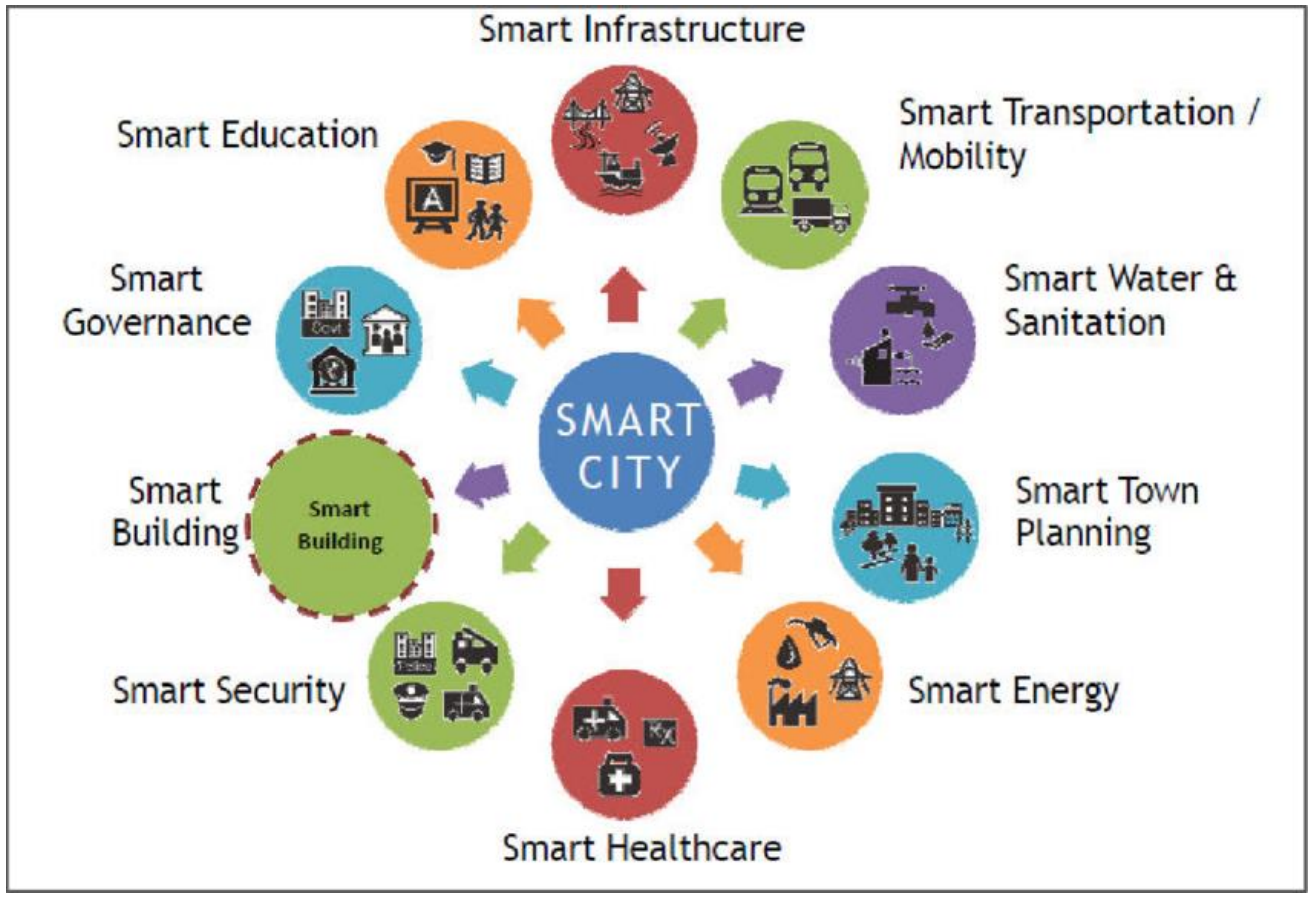
Not only energy efficient technologies but…



Source: www.wespeakiot.com, www.greenbiz.com, www.engadget.com

Idea: Smart Integrated Approach





Source: Dorota-Fernandez, C (2018)

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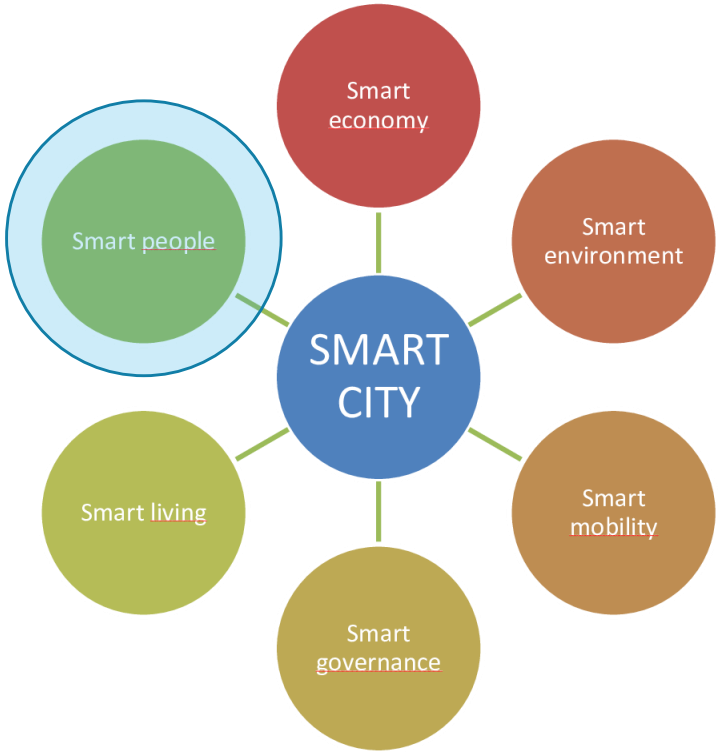

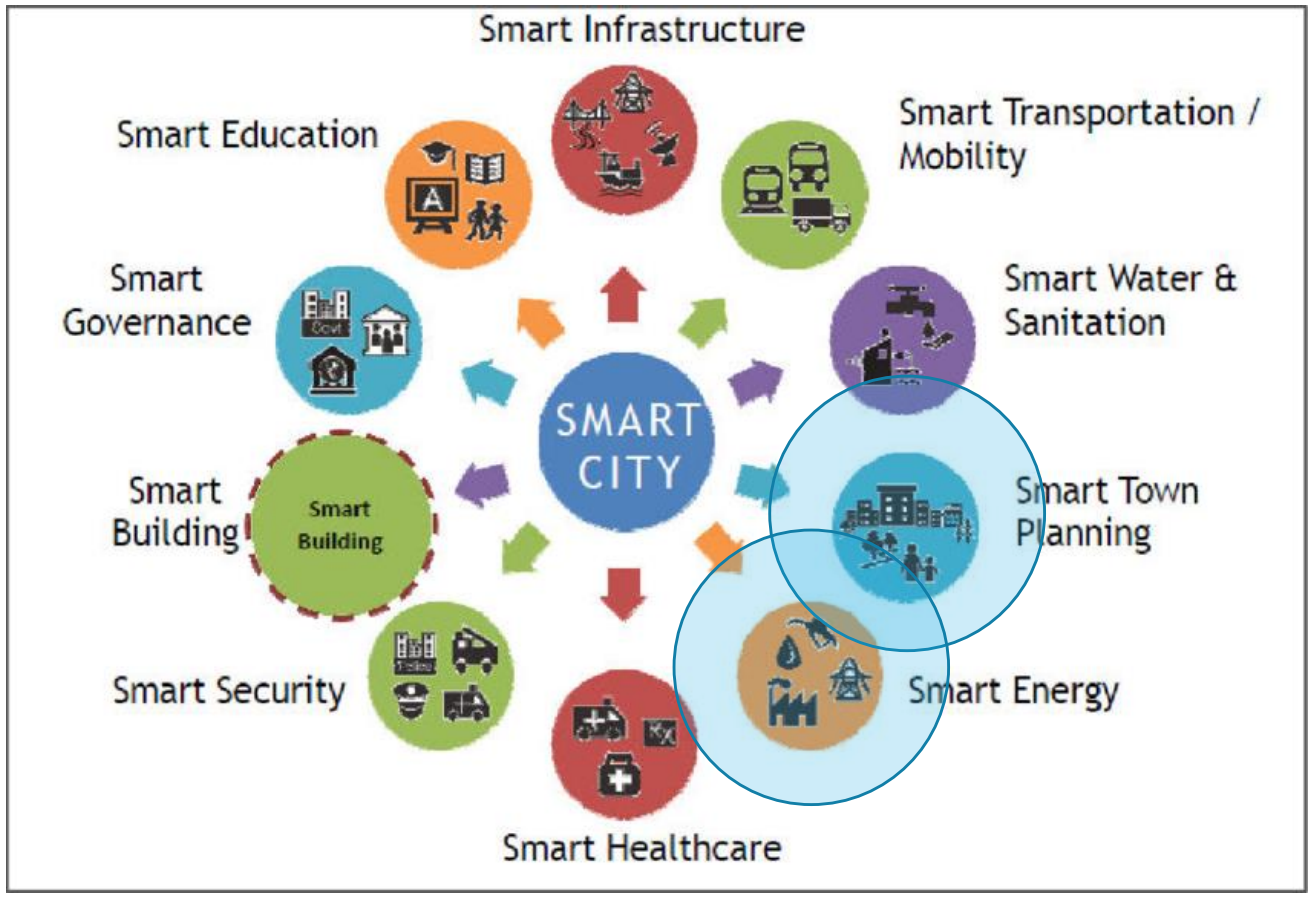

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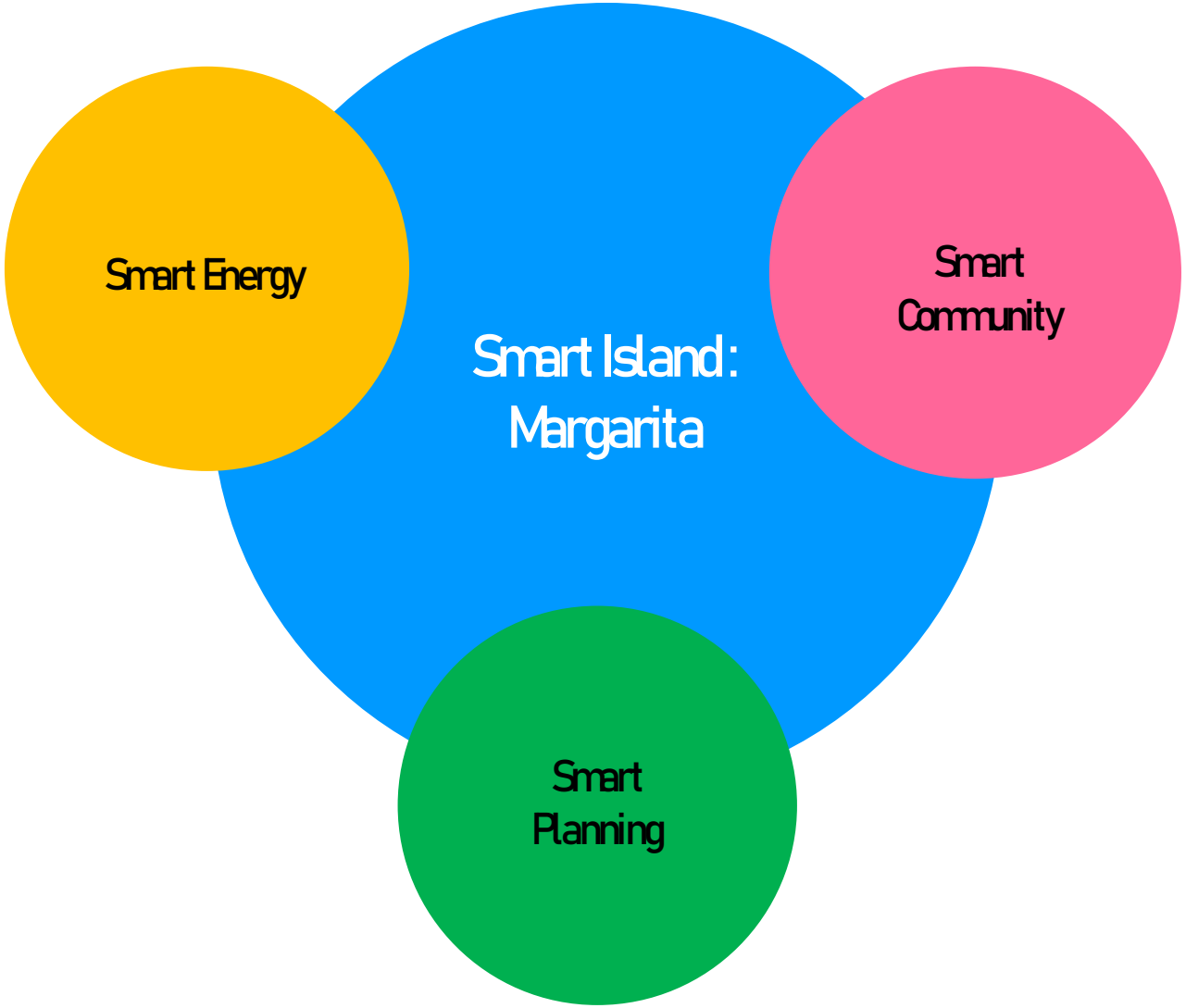
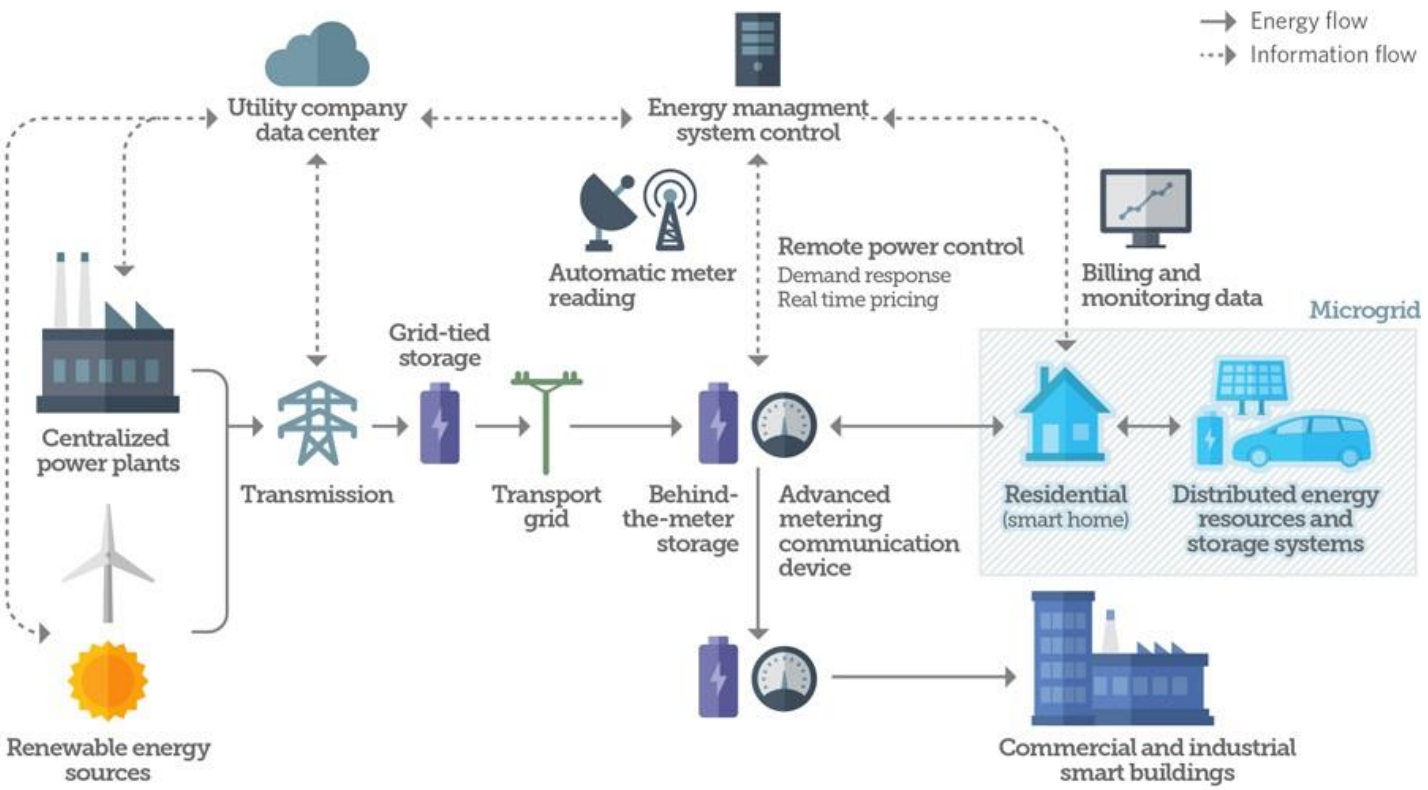


Smart Energy

Idea: Smart Micro-Grid

- Power grid that uses digital communications technology to detect and react to local changes in usage
- Change in energy production, management and consumption
- Two-way communication between the consumer and the utility
- Can integrate alternate energy sources
- More efficient delivery of electricity

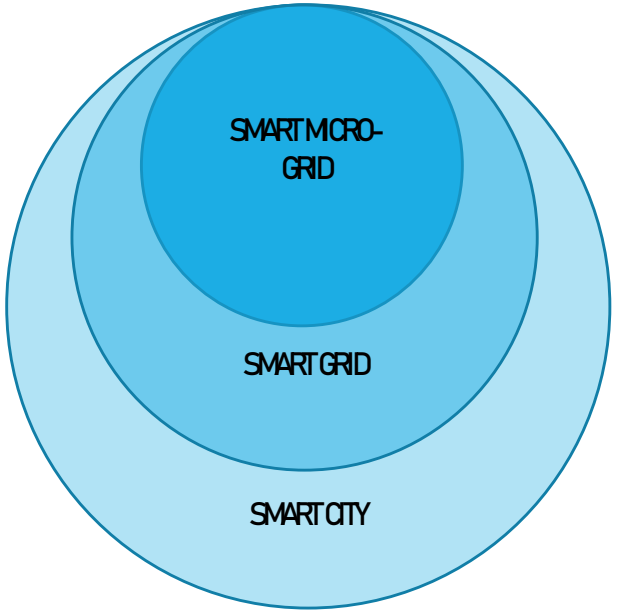


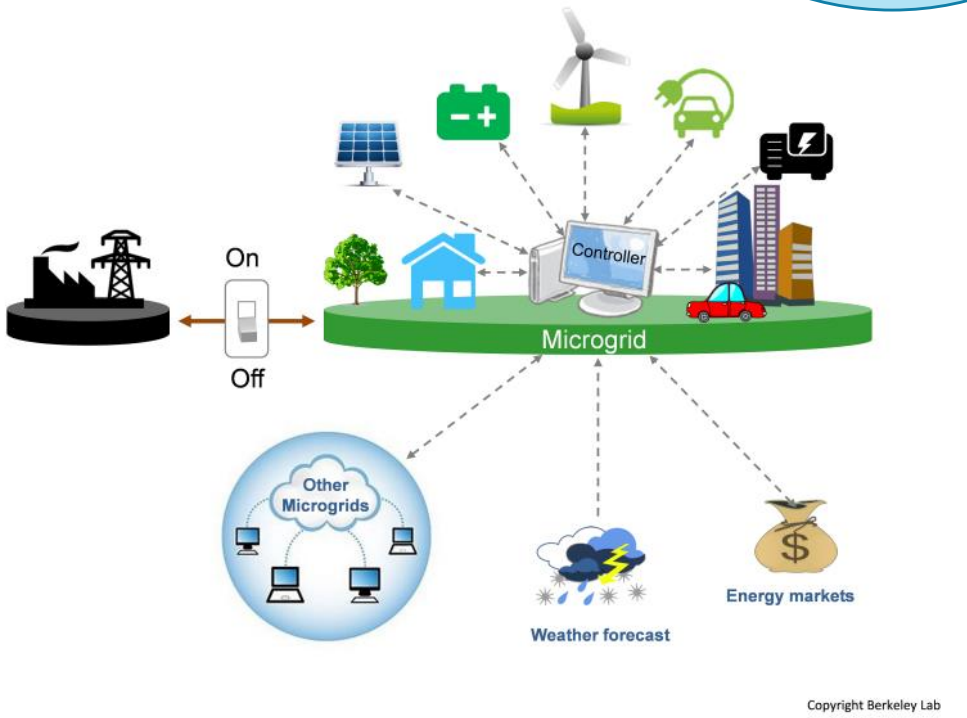
Source: LG CNS

Smart Energy

Idea: Smart Micro-Grid

- A micro-grid is a locally controlled electric system
- It can function both connected to the traditional grid (mega-grid) or as an electrical island (autonomous)
- Improved reliability, efficiency and lower operation costs
- Enhanced grid-customer interaction by use of smart meters





Source: Berkeley Lab

Smart Community

Idea: Community engagement

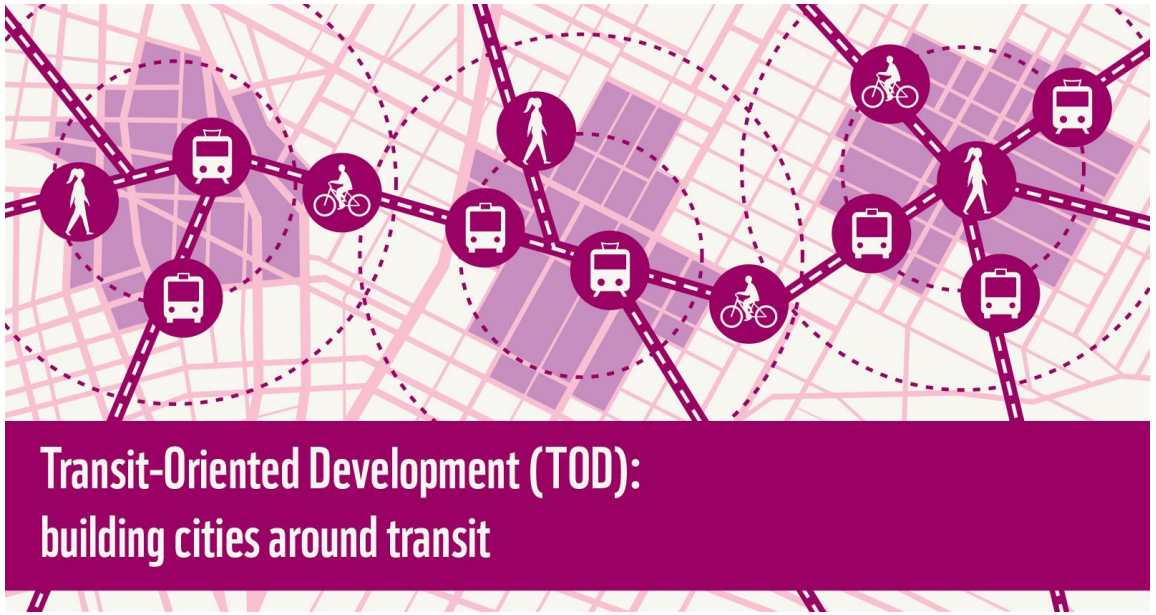
- Community involvement in the development process
- Chance to become prosumers
- Community becomes testers of new technologies
- Adoption of more energy efficient lifestyle
- Interconnected, engaged, resilient community

Source: Google Image

Smart Planning

Idea: Change in planning guidelines

- Guidelines for energy efficient, environment friendly buildings, for both new developments and retrofitting of older ones
- Adoption of a TOD model
- Make sure guidelines are properly adapted to unique social, environmental and technological conditions

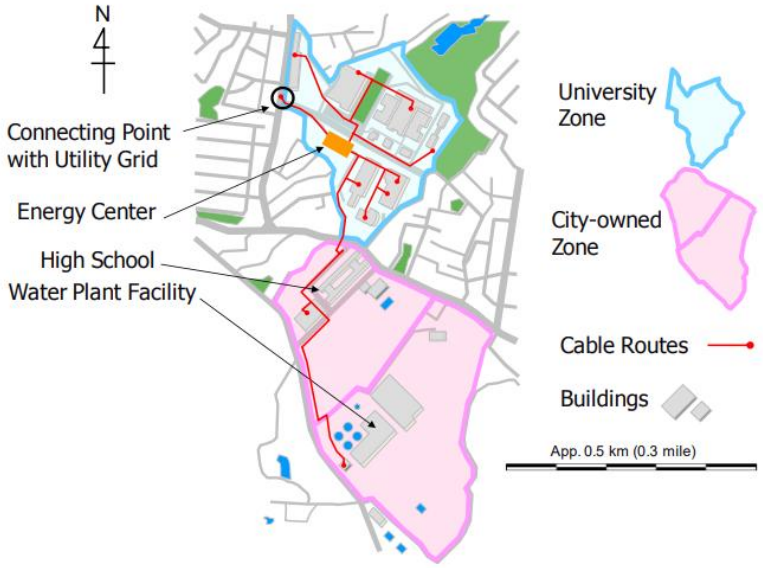


Source: Google Image

Smart Energy

Examples: Sendai Micro-grid, Japan

- Natural Gas plus Solar Power
- Provided energy during 2 say blackout after 2011 Tohoku earthquake



Source: Berkeley Lab

Smart Energy

Smart Planning

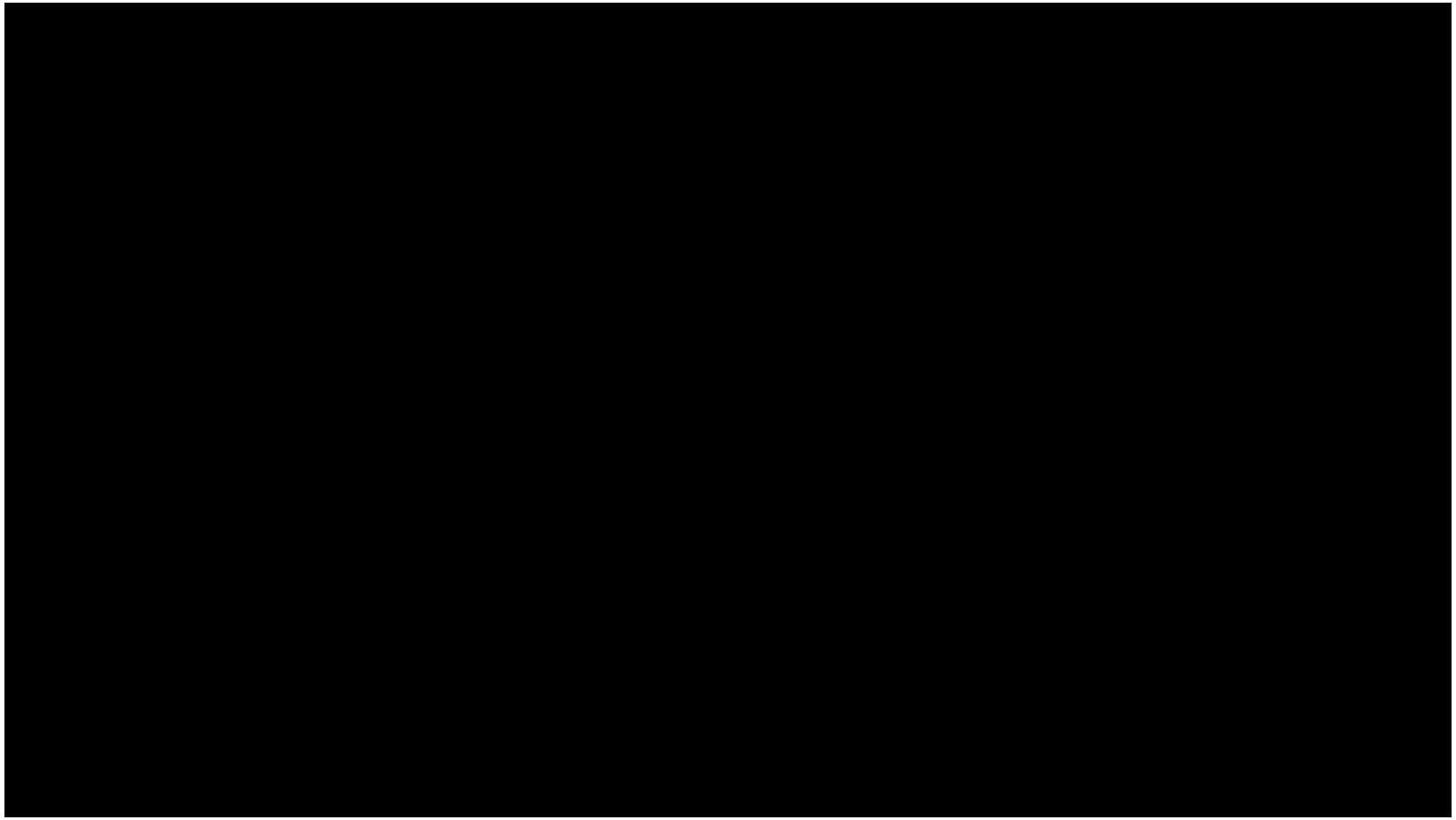
Examples: UCSD Micro-grid, USA

- Supplies electricity, heating, and cooling for 45,000 people campus
- Nearly 100 percent of all suitable rooftops at UCSD are equipped with solar panels

Source: Berkeley Lab

Smart Energy

Examples: Ta'u Island, American Samoa



Source: https://www.youtube.com/watch?v=VZjEvwrDXn0

Smart Energy

Examples: Bornholm, Denmark

- Microgrid able to support population of 28,000
- Mix of diesel generators, steam and wind turbines

BRIGHT GREEN ISLAND

BORNHOLM

Source: Berkeley Lab

Smart Energy

Smart Community

Examples: Huatacondo, Chile

- Autonomous micro-grid in remote northern Chile
- Mix of solar, wind and thermal power

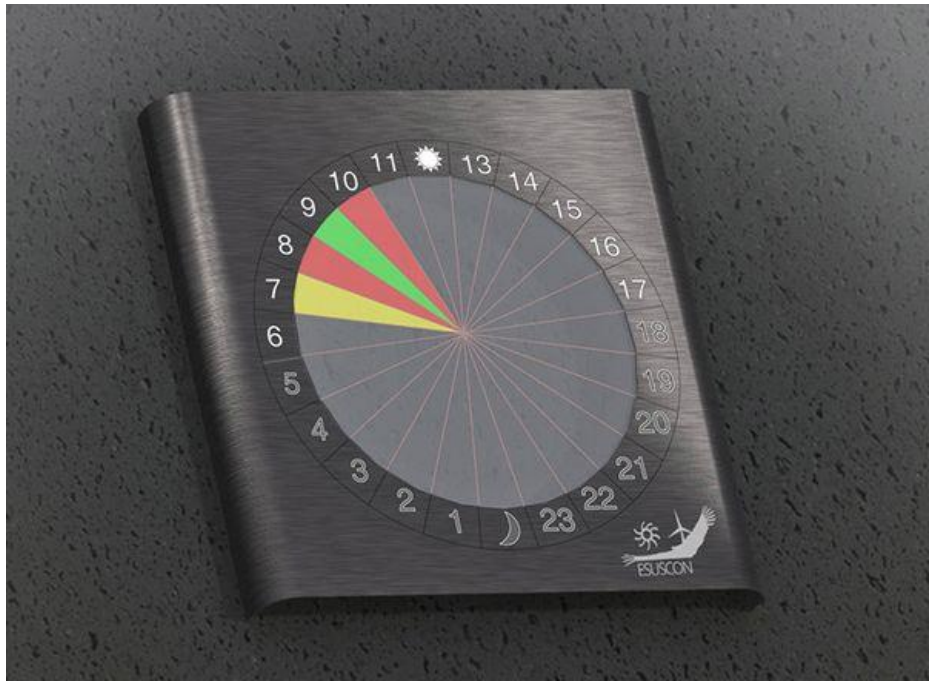
Source: Berkeley Lab

Smart Energy

Smart Community

Examples: Huatacondo, Chile

- Special meters to convey information to users with non-technical background
- Designed in conjunction with community



Source: Lorenzo Reyes, Universidad de Chile

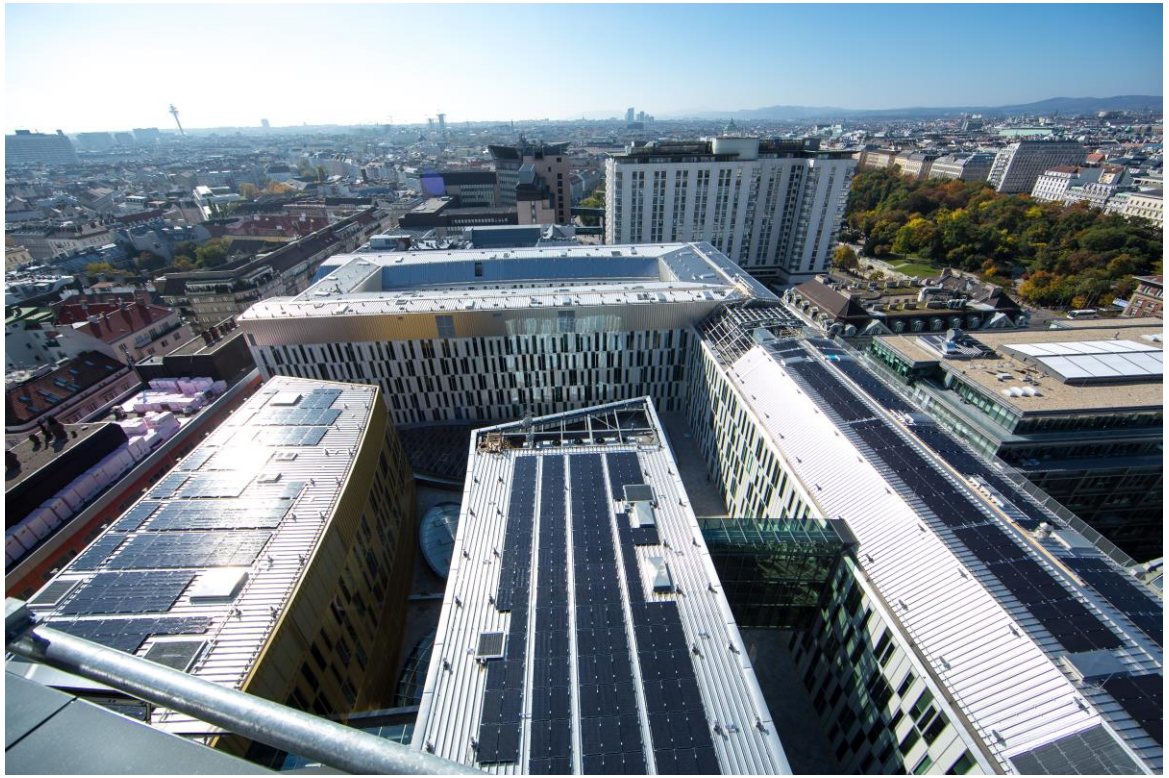
Smart Energy

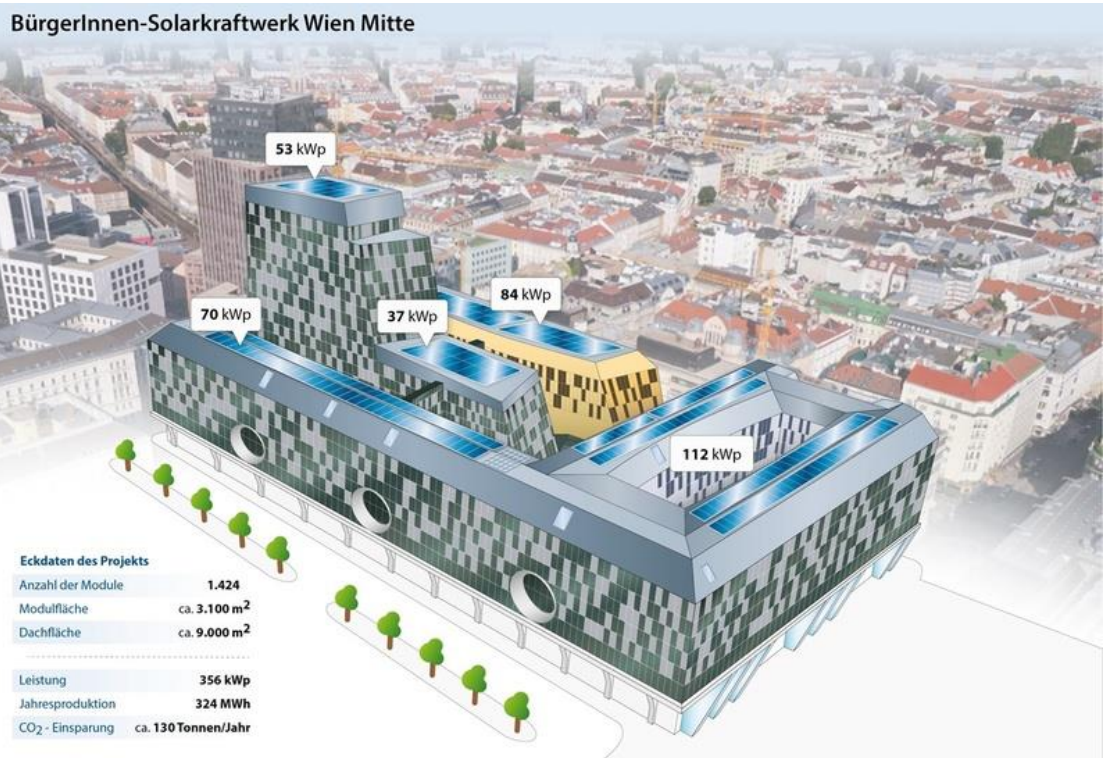
Smart Community

Smart Planning

Examples: Vienna Citizens' Power Plant, Austria

- Crowdfunded model for development of solar power plants





Source: Wien Energie GmbH

Smart Energy

Smart Planning

Examples: Green Building Guidelines

Type of surface	Faktor
Impervious surfacesimpermeable to water and air, no plant establishment. (concrete, asphalt, impenetrable surface)	0,0
Partially impervious surface permeable to water and air, without plant establishment. (paving stones, sand, gravel)	0,3
Half open surfaces permeable to water and air, some plant establishment. (gravel with grass, wooden deck, grass reinforcement)	0,5
Plant surfaces without contact with the underlying groundupper decks (over underground cellars or garages) with less than an 80 cm earth layer	0,5
Plant surfaces without contact with the underlying ground no contact with the ground, more than 80 cm earth layer	0,7
Plant surfaces with ground contact vegetation with ground contact, accessible for development of flora and fauna	1,0
Rainwater infiltration per m² roof area precipitation that infiltrates and regenerates groundwater, infiltration over surfaces with existing vegetation	0,2
Vertical greenery up to 10 m high greenery that covers inner and outer walls without windows, the actual height, up to 10 m, is taken into consideration	0,5
Green roofs extensive and dense plant cover on a roof surface	0,7

Berlin Biotope Factor

Seattle Green Factor

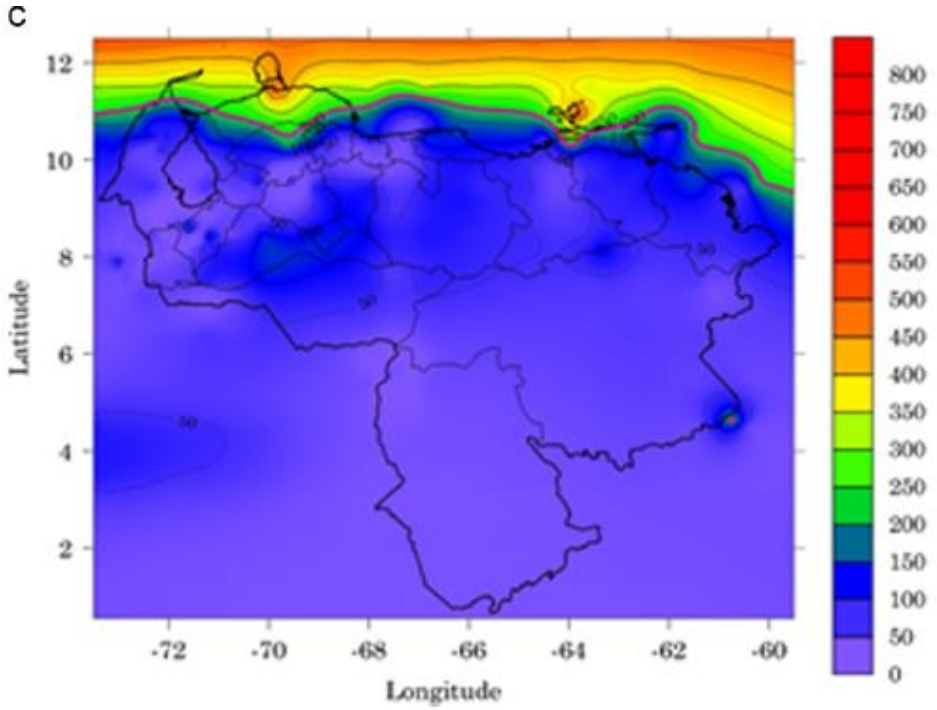
Source: https://www.berlin.de, http://www.seattle.gov

Smart Energy

Smart Community

Implementation: Smart Island Margarita

- Harness wind power



Average wind power, Venezuela

Source: Google Image, F. González-Longatt et al., (2015)

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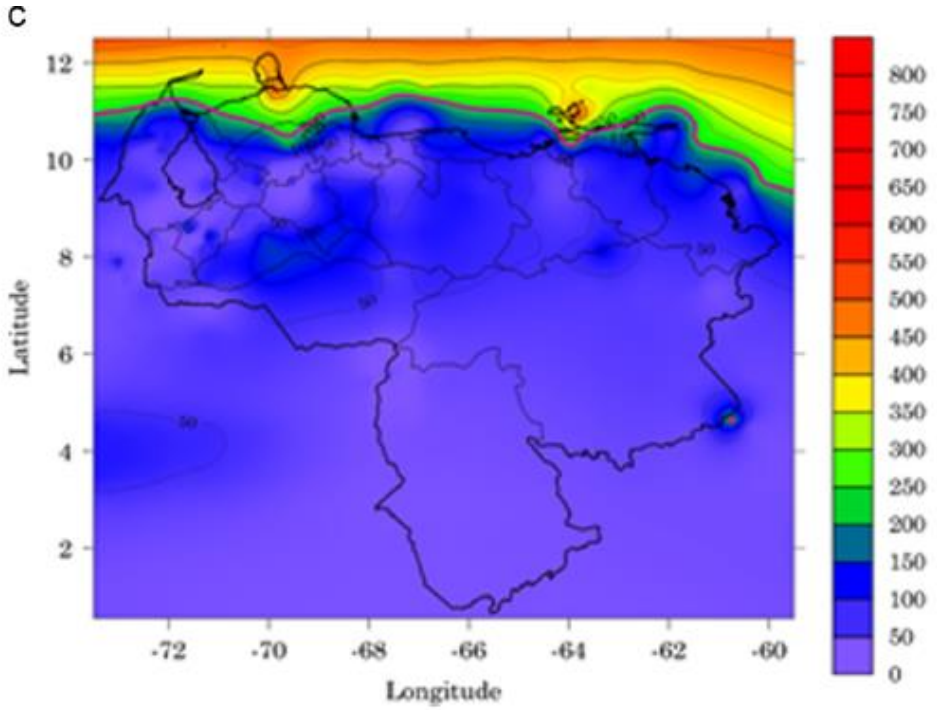

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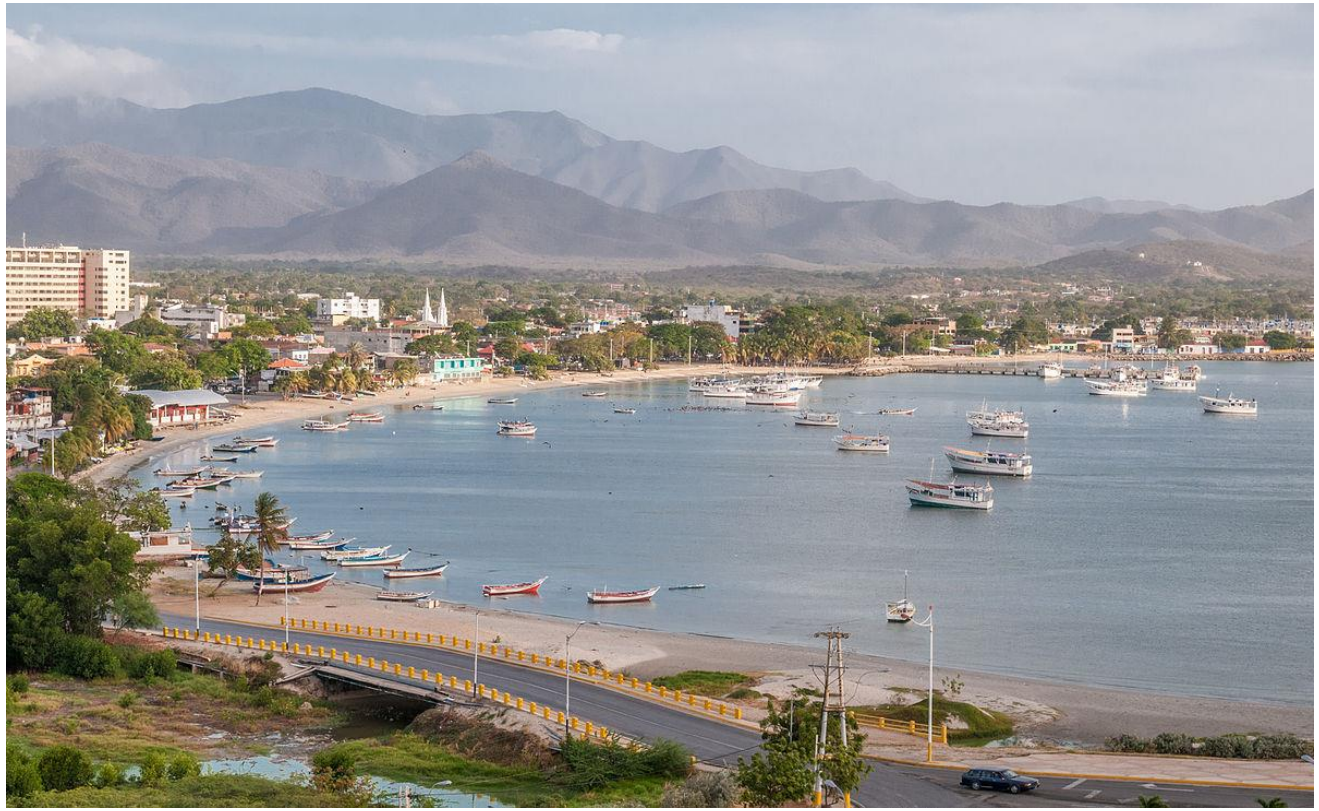

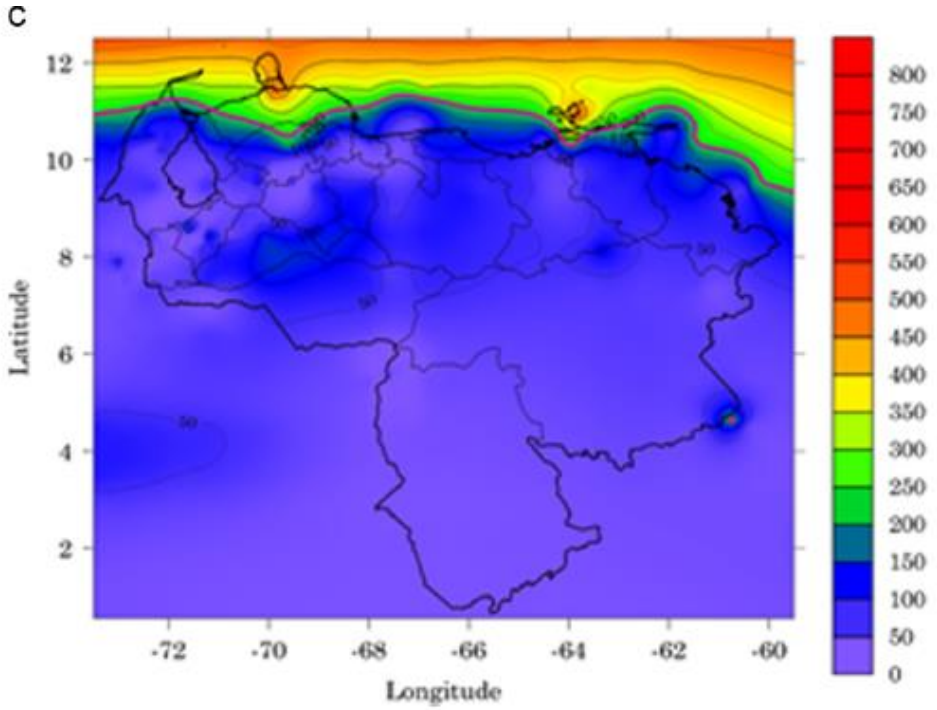

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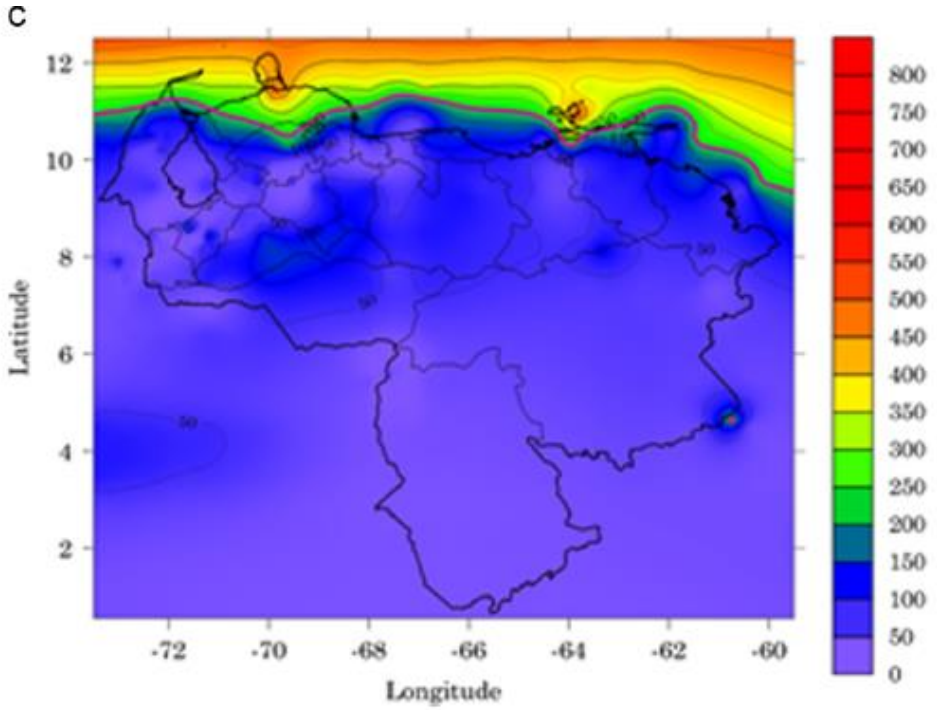

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Implementation: Smart Island Margarita

- Harness solar power

Source: Google Image

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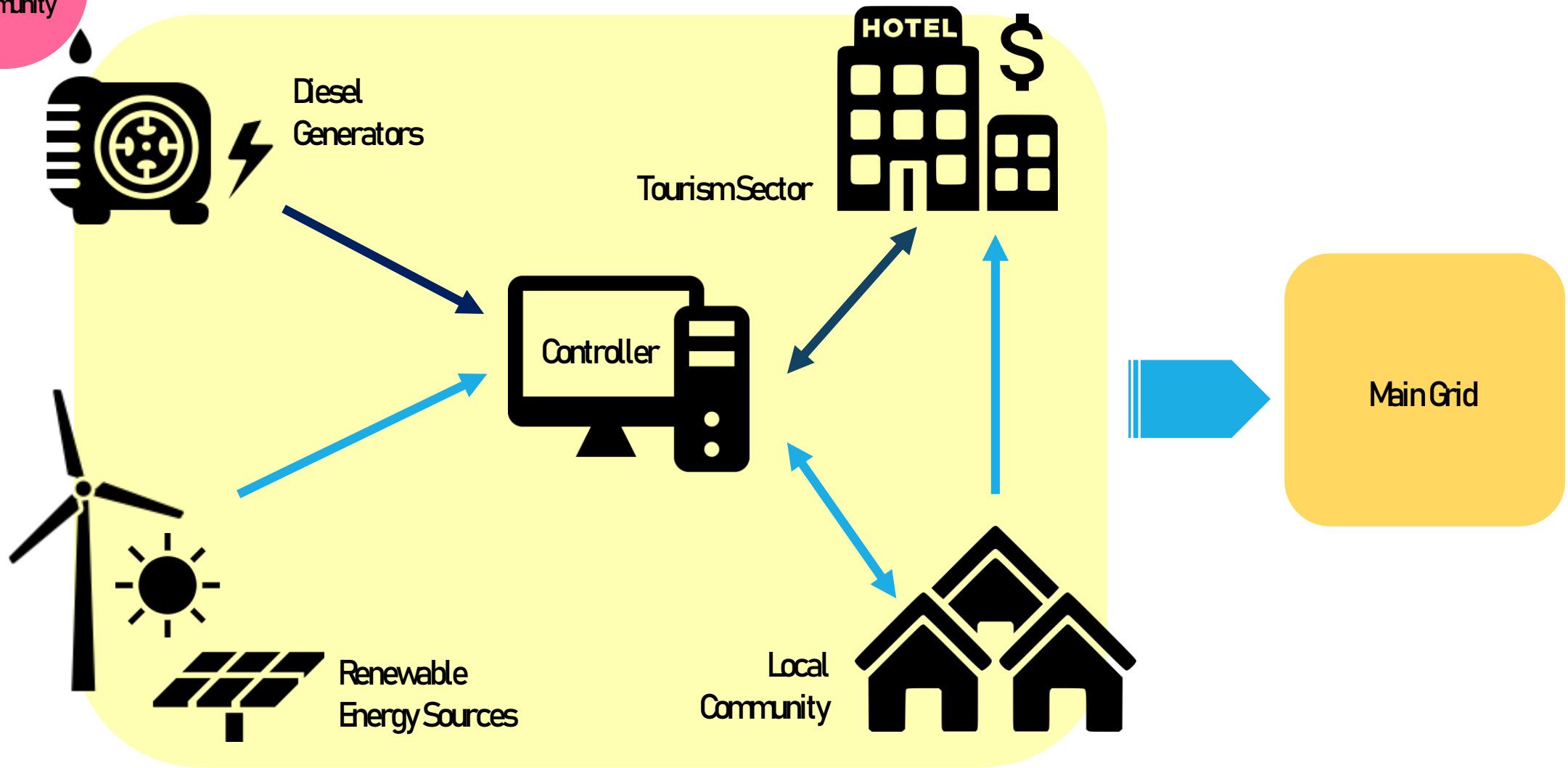

Smart Energy

Smart Planning

Implementation: Smart Island Margarita

- Establish building guidelines appropriate for the island's conditions, with a focus on zero-energy buildings for new developments
- Define planning guidelines with a focus on TOD, consider boat transportation as part of transit network
- Incorporate public transportation modes

Source: Google Image

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Implementation: Smart Island Margarita

Project keys: decentralization / integration of public sector, private sector and communities / integrated spatial planning approach

Phase 1> -Meeting with the community to properly understand energy crisis, define potential alternatives and ensure involvement in the project, both in the production and management of energy

-Secure financial support, possibly from private sector (tourism)

-Conduct necessary studies to determine optimum placement for new renewable energy plants

-Define new energy consumption standards, put in place a system to encourage saving energy instead of unlimited consumption

-Community work to improve environmental awareness, change user's practices to more energy efficient ones

-Establish green building guidelines properly adapted to the island's social, environmental and technological conditions

Smart Energy

Smart Community

Smart Planning

Implementation: Smart Island Margarita

Project keys: decentralization / integration of public sector, private sector and communities / integrated spatial planning approach

Phase 2> -Activate the micro-grid, constant management and revisions necessary to ensure proper maintenance, efficiency and adequate connection to main power grid

-Ensure new constructions follow established guidelines. Adopt an incentive policy for buildings that meet the green standard

-Provide technical and financial assistance to low-income communities in the construction of new developments

-Retrofitting of all architecturally viable buildings, possibly with solar panel roofing

Phase 3> -New large scale developments based on TOD model

-Adoption of energy efficient modes of transportation to reduce use of personal fuel-powered vehicles

-Replicate model in other parts of the country


End

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