

# Renewable Energy Policies for Cities

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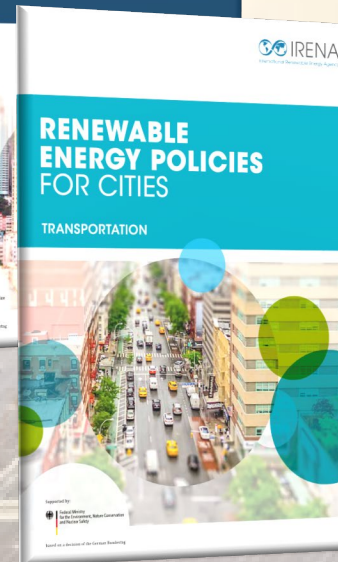
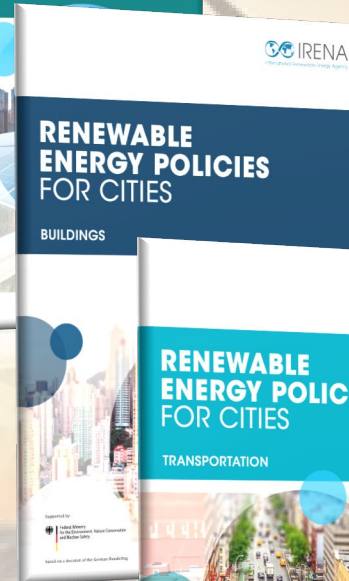
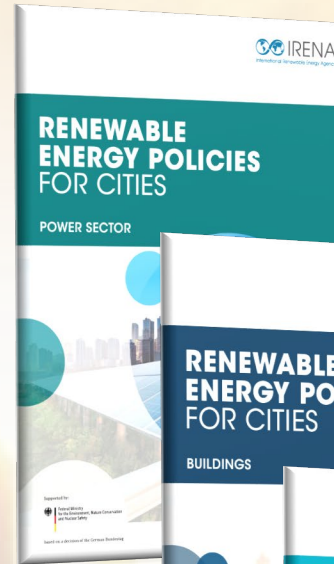
# RENEWABLE ENERGY POLICIES FOR CITIES

EXPERIENCES IN CHINA, UGANDA AND COSTA RICA

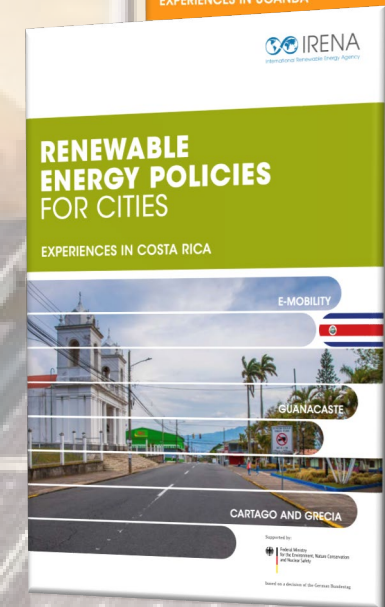


Full report | Summary for Policy-makers

Online 'Decision-trees' for municipal policy-makers



Sectoral Briefs:  
**Power; Buildings; Transport**



Case Studies in:  
**China; Uganda; Costa Rica**

**Cities are engines of the economy, major energy users and GHG emitters, but also suffer from air pollution and rising climate impacts**

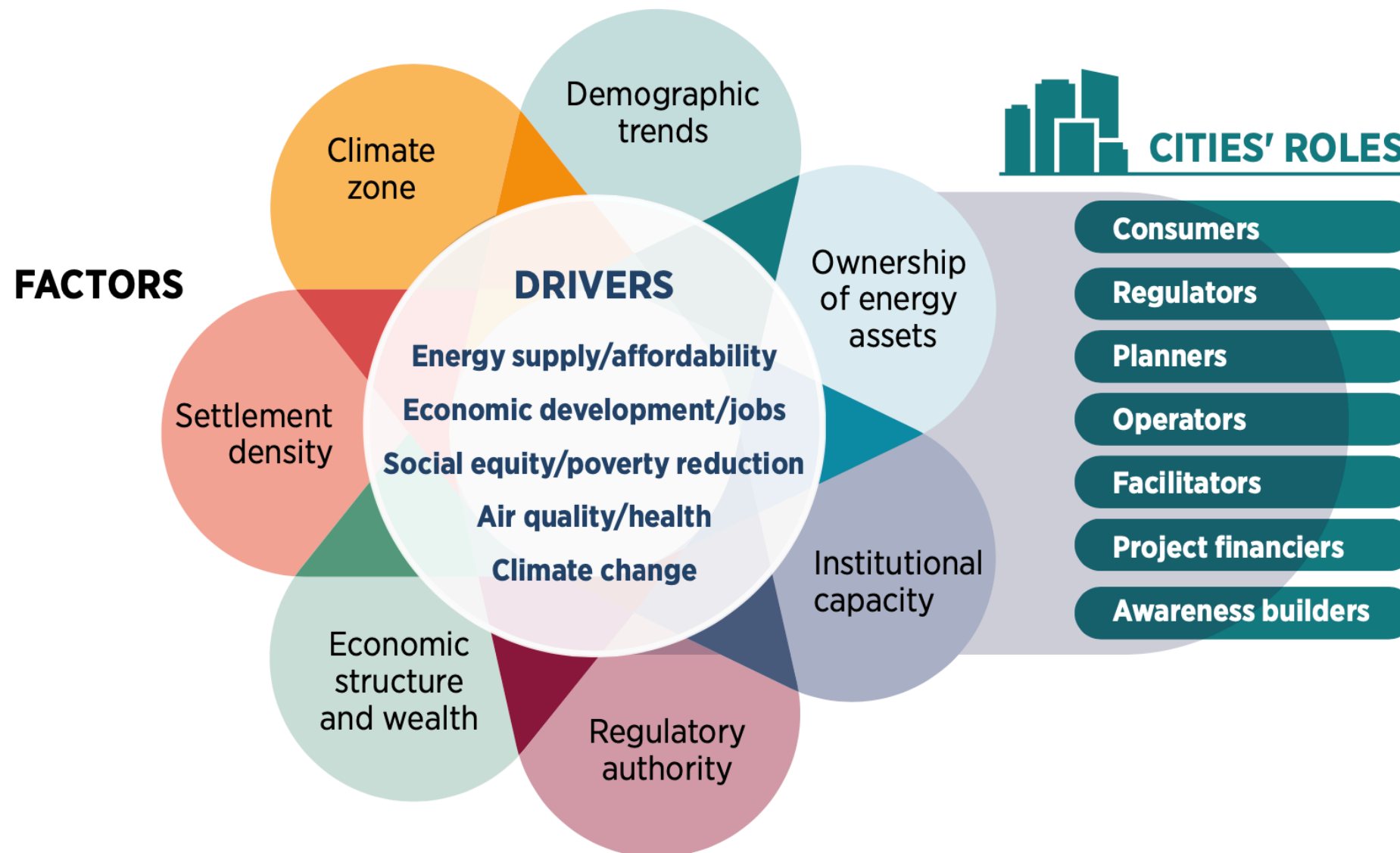
**They must be key actors in the energy transition**, through technology and policy innovations.

- ❑ *Holistic* planning approaches are key
- ❑ Evaluating the *technical potential* for renewables:
  - electrification,
  - integration of RE into heating and cooling,
  - cleaner transport fuels
- ❑ Measures and tools to maximize *RE deployment* in cities
- ❑ Understanding the *diverse* social, economic, demographic, and environmental *conditions* in cities around the world
- ❑ Ensuring that *all urban residents can benefit*

**55%** of the total population are in cities

**70%** of global energy related GHG emissions come from cities

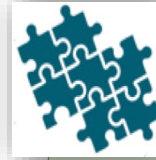
**75%** of global primary energy is consumed in urban areas.





## Policy approaches are diverse:

- Time horizons** of targets vary
- Requirements may be set **selectively** for power, heating & cooling, transport fuels
- Measures may be **applicable** to all urban actors or only to municipally-owned assets
- Measures may be **voluntary** or **mandatory**
- Policy ambition and vision need to be **matched** with appropriate intermediate steps and solid implementation plans



## Policy effectiveness depends on:

- Overall **socio-economic dynamics** in a given city
- Local capacity to act**
  - ✓ Scientific & technical know-how; institutional capacity; financial resources
- Interactions with local and national stakeholders**
  - ✓ Citizens; NGOs; private sector; provincial and national governments; donors
- Collaborative initiatives among cities (peers)**
  - ✓ Data and information-sharing; lessons learned and best practices



# Measures to promote renewable energy in three key sectors

## Power



Solar, wind, biogas

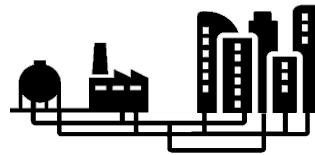
Solar streetlighting, LEDs

Net metering, net billing

Community energy

(Re-)Municipalisation

## Buildings



Building codes, ratings

Rooftop solar PV support

Solar thermal ordinances

RE in social housing

District heating & cooling

## Transport



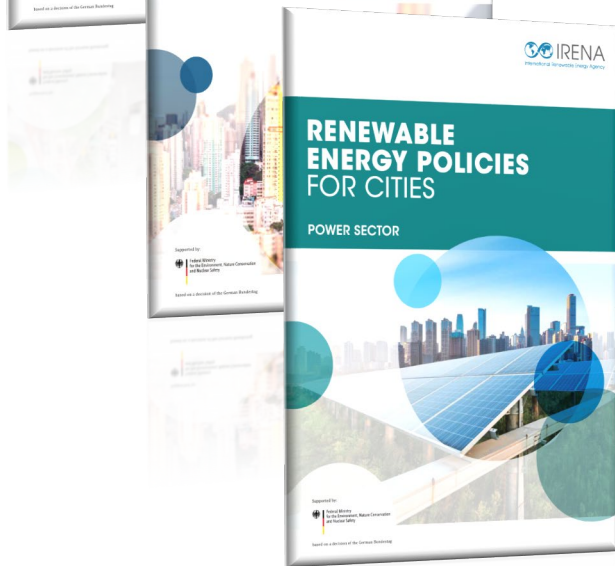
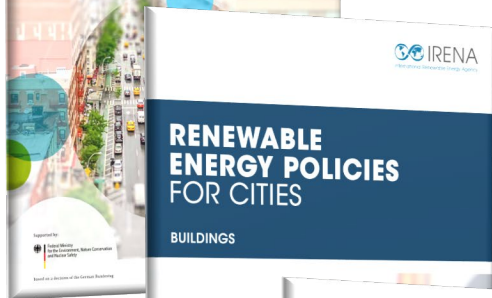
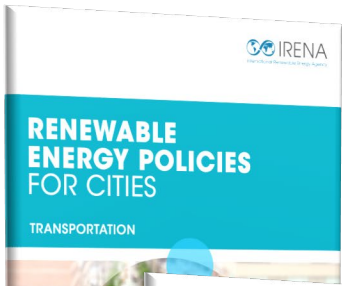
Restrictions on ICE vehicles

Biofuel blending mandates

Biomethane for buses

BRT systems, electric buses

EVs, charging infrastructure

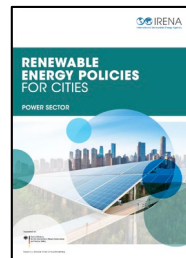


# Sectoral Briefs:

## The role of renewables in the power sector, buildings, and transport



# Measures to promote renewable energy in power generation



Cities can ...



**Pursue centralised renewable solutions** (solar street lighting, municipal solar rooftops, biogas from municipal landfills / food waste for power generation)

**Support decentralised renewable solutions** (net metering/net billing for residential and commercial solar rooftops), community energy initiatives)

**Procure renewables supplies from private providers** (local or beyond)

**Strengthen or create public utilities, remunicipalise assets**

**Participate in peer networks** (knowledge-sharing, capacity-building)

**SYDNEY** (Australia):  
Thousands of streetlights up-graded to solar-powered LEDs

**DUBAI** (UAE): 30-40 MW solar plant at Dubai Ports Authority

**MILAN** (Italy):  
Collecting food waste for biogas generation

**SEOUL** (R. of Korea): Goal to quintuple rooftop PV from 200 MW to 1 GW

**BANGALORE** (India): PV capacity grew 18-fold with net metering

**CAPE TOWN** (S. Africa):  
Net metering and feed-in tariffs

**BOSTON** (USA): Pooling demand from 20 cities for RE (5.7 terawatt hours)

**FORT COLLINS** (USA): Community choice aggregation, solar PV for low-income residents

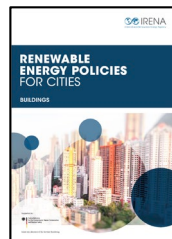
**HAMBURG** (Germany): Remunicipalised; invested in PV and wind

**Global Covenant of Mayors**

**Global District Energy in Cities Initiative**



# Measures to promote renewable energy in buildings



Cities can ...



Set standards (building codes, green ratings, permitting processes)

Integrate RE into buildings (solar PV-ready structures, solar H&C ordinances)

Switch district H&C systems to renewables (solar, geothermal, etc.)

Leverage social housing for renewables (social equity measures)

Partner for effectiveness (local partners, international peer networks)

**COPENHAGEN** (Denmark):  
New buildings required to meet Denmark's Low Energy Class ratings

**BARCELONA** (Spain): First European city to pass a solar thermal ordinance, in 2000

**SAÕ PAULO** (Brazil): Its SWH ordinance inspired many other Brazilian cities to follow suit

**REYKJAVIK** (Iceland): 95% of residences connected to a geothermal-based district heating network

**DUBAI** (UAE): Developed the world's largest district cooling network

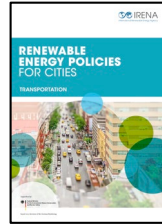
**BRAZIL**: "Minha Casa, Minha Vida" program requires installation of solar water heaters

**CAIRNS** (Australia): Affordable Energy Plan offers no-interest loans to public housing residents for rooftop solar

**RIO** (Brazil): Solar panels installed at day care centres, schools, etc. by Insolar, a local social enterprise.

**BRITTON** (UK): Solar PV co-operatives have created local jobs and training, alleviate fuel poverty

# Measures to promote renewables in transport energy mix



Cities can ...



**DELHI (India):** Metro Rail aiming for 50 MW of solar PV on metro station roofs

**SANTIAGO (Chile):** Metro to soon source 42% of energy needs from PV and wind

**MILAN (Italy):** Congestion charges in city centre prioritise cleaner vehicles

**PITTSBURGH (USA):** Aiming for fossil-free municipal car, motorcycle fleet by 2030

**Urban Electric Mobility Initiative**

Switch from fossil fuels to renewables (biogas for buses, biofuel blending for cars; PV, wind for mass transit systems)

Use urban planning and zoning tools (increase density and make renewably-powered public transit systems feasible)

Restrict or ban internal combustion engine cars from city centers

Support adoption of EVs (charging networks; mandates, enabling measures)

Electrify bus fleets, expand BRT systems, light rail and metros

Participate in peer networks (knowledge-sharing, capacity-building)

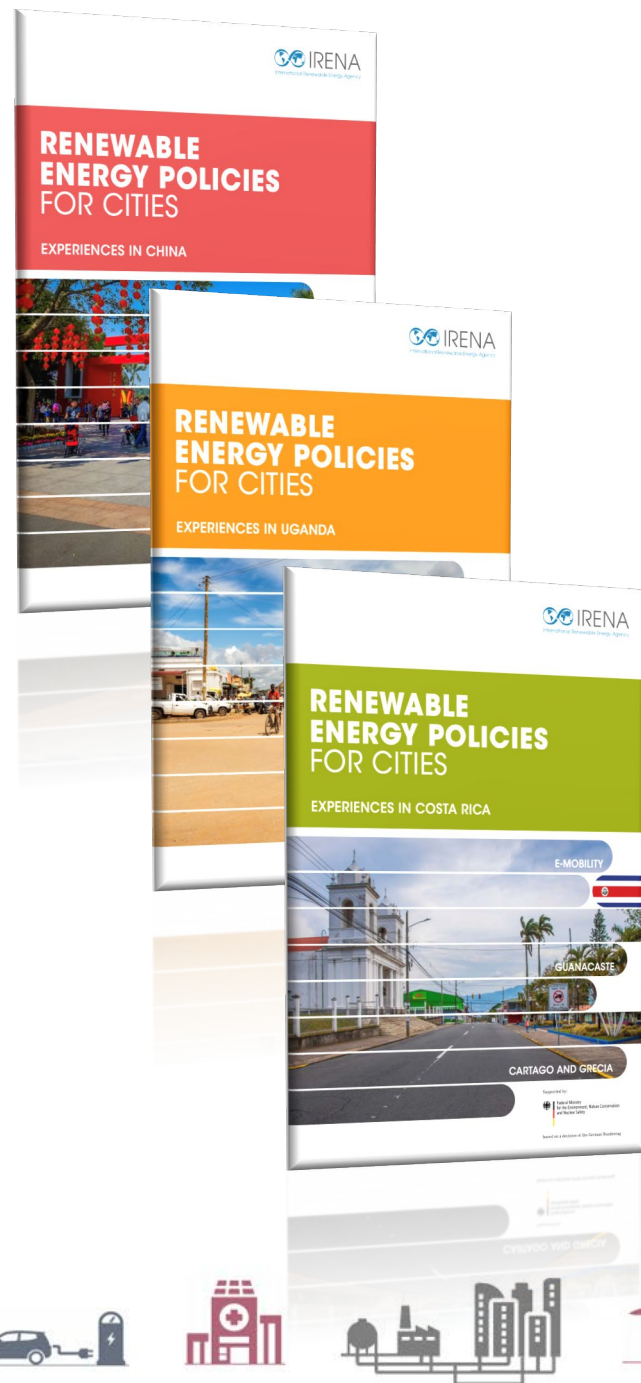
**Zero Emission Vehicle (ZEV) Network**

**LINKÖPING (Sweden):** By 2002, bus fleet was converted to landfill methane

**OSLO (Norway):** Banned cars in the city centre in 2019

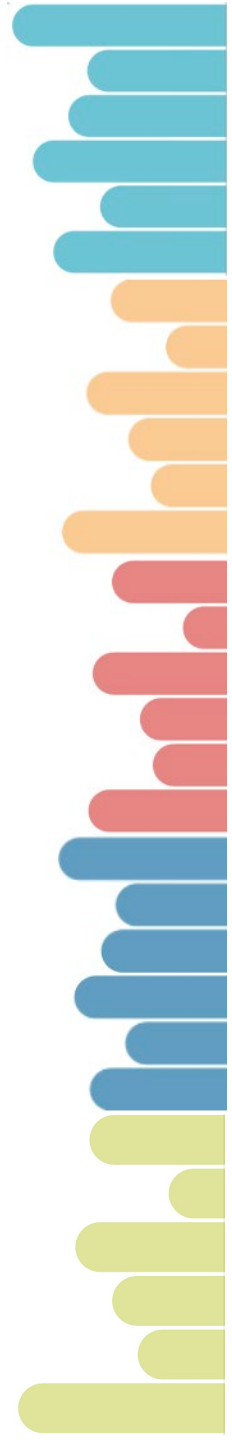
**SHENZHEN (China):** World's first city to electric its entire municipal bus fleet (more than 15,000 buses)

**SANTIAGO (Chile):** Regional e-bus pioneer, with 1/3 of all e-buses in Latin America



# City Case Studies:

# Experiences in China, Uganda and Costa Rica



- ✓ Countries and cities with very different socio-economic and demographic dynamics
- ✓ Diverse institutional and governance contexts
- ✓ Diverging sets of challenges and opportunities -- different sets of lessons-learnt and best practices



- RE as a solution to heavy coal dependence and air pollution
- Strong administrative structures and governance hierarchy

**CHINESE CITIES:**  
CHONGLI DISTRICT  
AND TONGLI TOWN



- RE as a solution to energy access and poverty
- Devolution of governance authority, but ltd. local capacities and resources

**UGANDAN CITIES:**  
KASESE AND LUGAZI

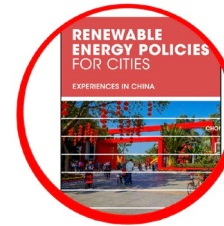
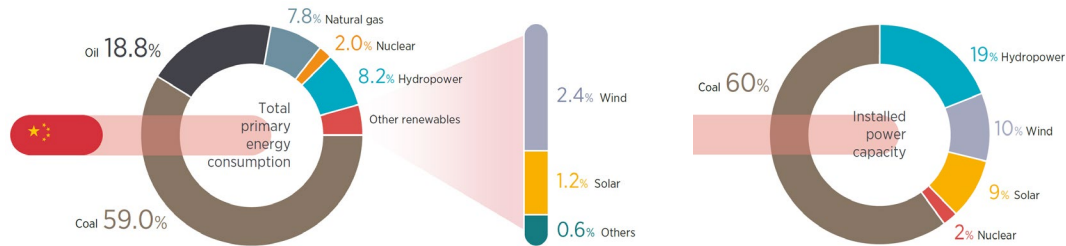


- High share of RE in power sector; electrification of transport as next frontier
- Centralised decision-making, but fragmented municipal admin. structures

**COSTA RICAN CITIES:**  
CENTRALISATION  
AND PROMOTION OF  
E-MOBILITY

# Chinese cities: Chongli District and Tongli Town

Share of RE in TFEC (left) and installed capacity (right), China, 2018



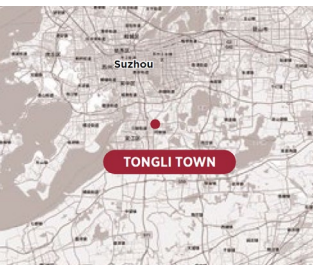
## CHINESE CITIES: CHONGLI DISTRICT AND TONGLI TOWN

Installed wind and solar generation in Chongli District, 2018



	Projects	Capacity (MW)	
On-grid plants	Qing-San-Ying wind power plant	949.4	Wind 1116.8
	Xi-Qiao-Liang wind power plant	147.9	
	Hong-Hua-Liang wind power plant	9.8	Solar 4.5
	Wang-Shan-Ba wind power plant	9.7	
	Village-scale poverty alleviation solar power plants (15 * 300 kW)	4.5	

Renewable targets in Suzhou city and Tongli town, 2018

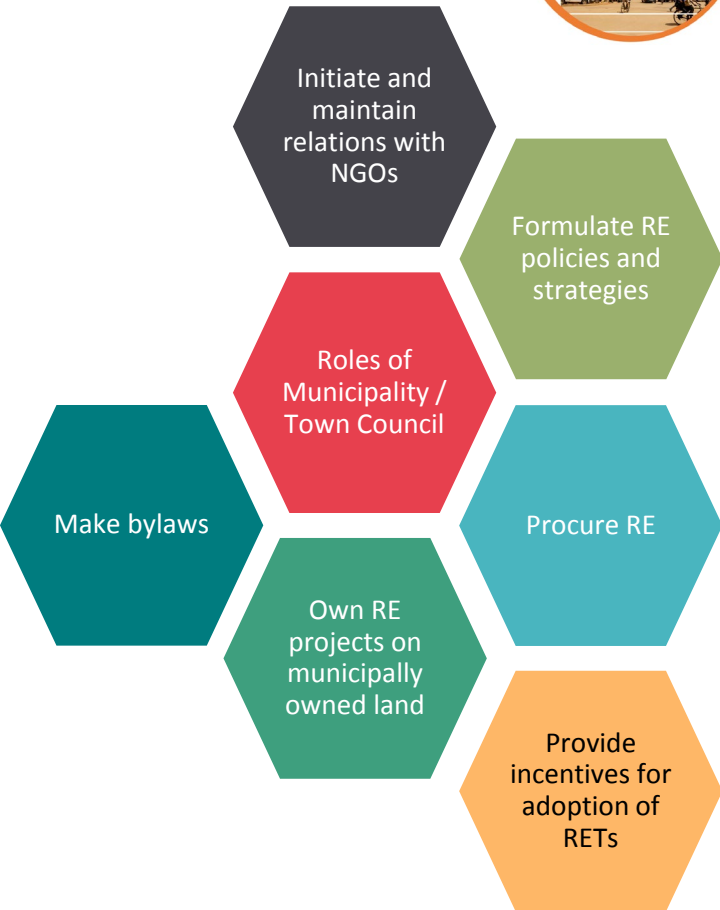


RE in total energy consumption	Electricity in TFEC	RE in electricity consumption	RE in the building sector	Deployed electric vehicles
-	30%	55% derived from hydro	-	5 000
around 20%	-	-	-	-

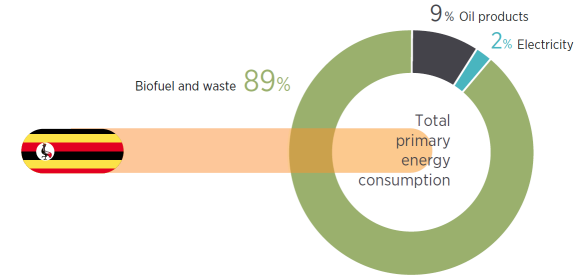
- ✓ Electrification of end-uses including heating and cooling (Chongli) and transport (Tongli) can support the scaling up the renewable energy and improve urban environment
- ✓ Distributed technologies and local manufacturing industries are critical
- ✓ Access to financial resources and cross-governmental collaboration enable rapid action to deploy renewables



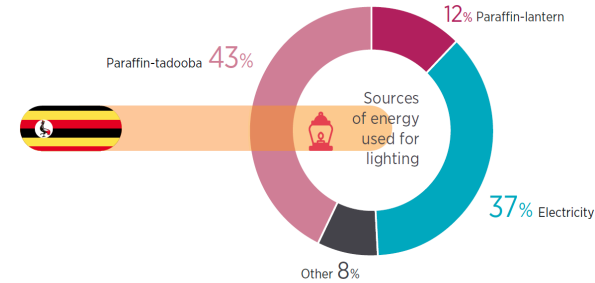
## UGANDAN CITIES: KASESE AND LUGAZI



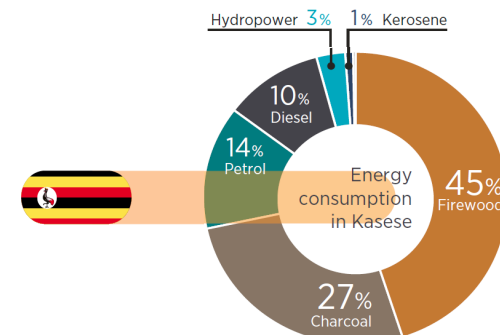
<b>Key National Strategies/ Policies/ Programmes</b>	Vision 2040	National grid access to 80%
	Green Growth Development Strategy 2017/18-2030/31	Increased emphasis on renewable energy investment through biomass energy for electricity
	National Renewable Energy Feed in Tariff (REFIT) program	Feed-in Tariff
	Uganda Biogas Programme	Large-scale biogas for cooking and lighting



Lugazi: Main source of energy for lighting, by number of households, 2014



Kasese: Energy consumption by source, 2018



# Costa Rican cities: Centralisation and promotion of e-mobility

## Costa Rica Decarbonisation Plan 2050

### Cluster 1. Transport and sustainable mobility has three sectoral focus areas:

- Collective transport,
- Fleets and passenger cars, and
- Freight.

### Cluster 2. Energy, green buildings and industry also has three sectoral focus areas:

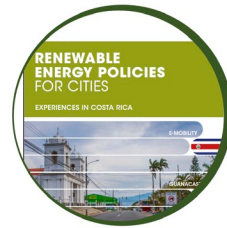
- Power sector,
- Buildings and
- Industry.

### Cluster 3. Integrated waste management has one sectoral focus area:

- Waste management.

### Cluster 4. Agriculture, land-use change and nature-based solutions has, like clusters 1 and 2, three sectoral focus areas:

- Agriculture,
- Livestock and
- Biodiversity.



## COSTA RICAN CITIES: CENTRALISATION AND PROMOTION OF E-MOBILITY



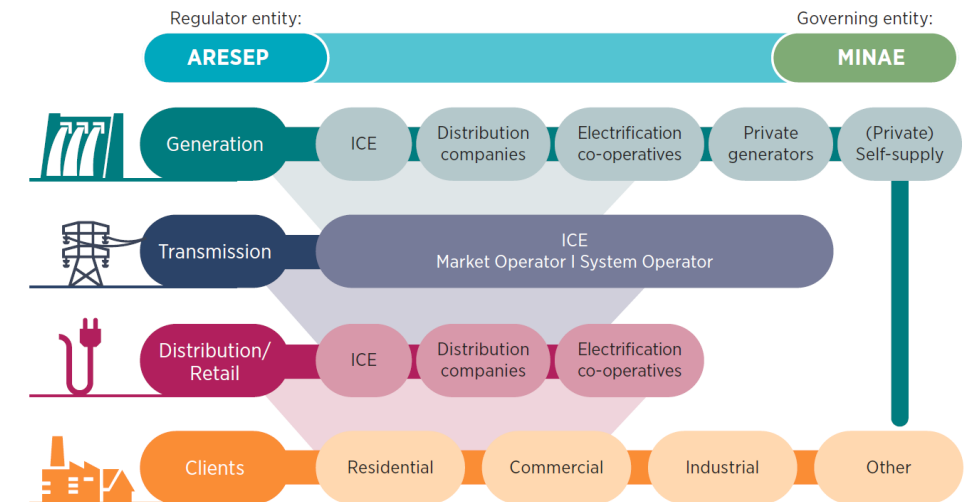
### Cartago and Grecia

- Free EV charging stations
- EV fleet
- Electric bikes
- Fast chargers

### Guanacaste as a “decarbonisation hub”

- Wind energy
- Solar PV
- Geothermal energy
- Hydrogen

## Costa Rica Electricity System



Source: Utgard and Forn, 2016.

# IRENA's work on cities: Policy analysis, case studies, and technical assessments

## POLICY ANALYSIS



## CASE STUDIES



## TECHNICAL ASSESSMENTS & TOOLS







**THANK YOU**



# IRENA Webinar: Renewable Energy Policies for Cities

## Panel discussion



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