



Empowering Urban Transitions – Smart cities and smart grids

Vida Rozite

IEA Experts Group on R&D Priority-setting and Evaluation (EGRD) Technologies and innovations for the climate-neutral city, Vienna, May 2025

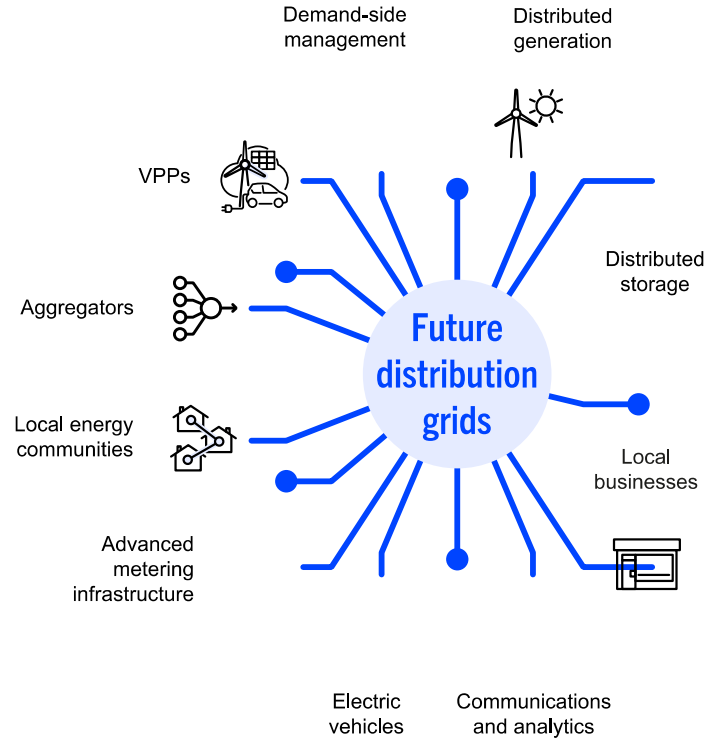
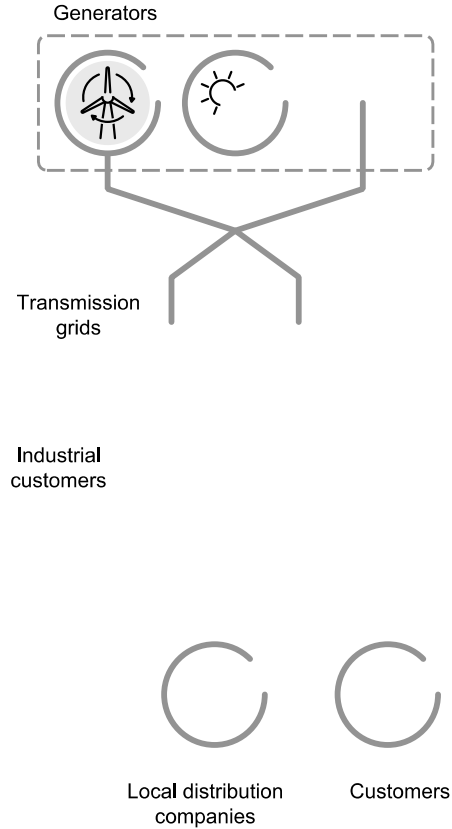
Digital Demand Driven Electricity Networks (3DEN) initiative

A partnership between the IEA, the Government of Italy, and UNEP, the **Digital Demand-Driven Electricity Networks (3DEN)** has led to a broad range of actions to accelerate progress on power system modernisation and effective use of distributed energy resources:

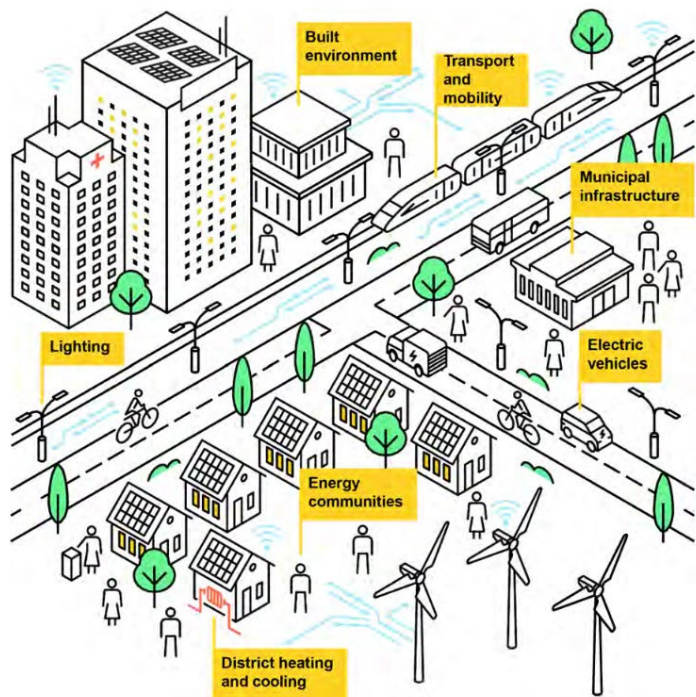
- **Analysis:**
 - Contribution to 70+ IEA reports with digitalisation-related content, improvement of IEA models.
- **Capacity Building:**
 - **Events:** 3DEN has organised or participated in 100+ meetings, webinars and events.
 - **Training:** course on smart and efficient cities, peer-to-peer knowledge exchanges, establishment of communities of practice.
 - **High-level dialogue:** collaboration with international initiatives, co-creation of key messages to ministers, inputs for COP, G20, G7 and CEM.
- **Implementation:**
 - A smart grid pilot programme administered by UNEP with projects in Brazil, Colombia, India and Morocco providing insights and data towards achieving scale. & [new phase II call open](#)



Power systems are changing



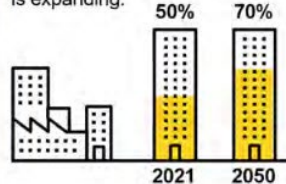
Why a focus on cities



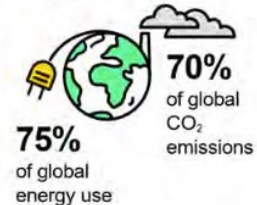
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Key facts

The percentage of the global population living in cities is expanding.



Cities account for:



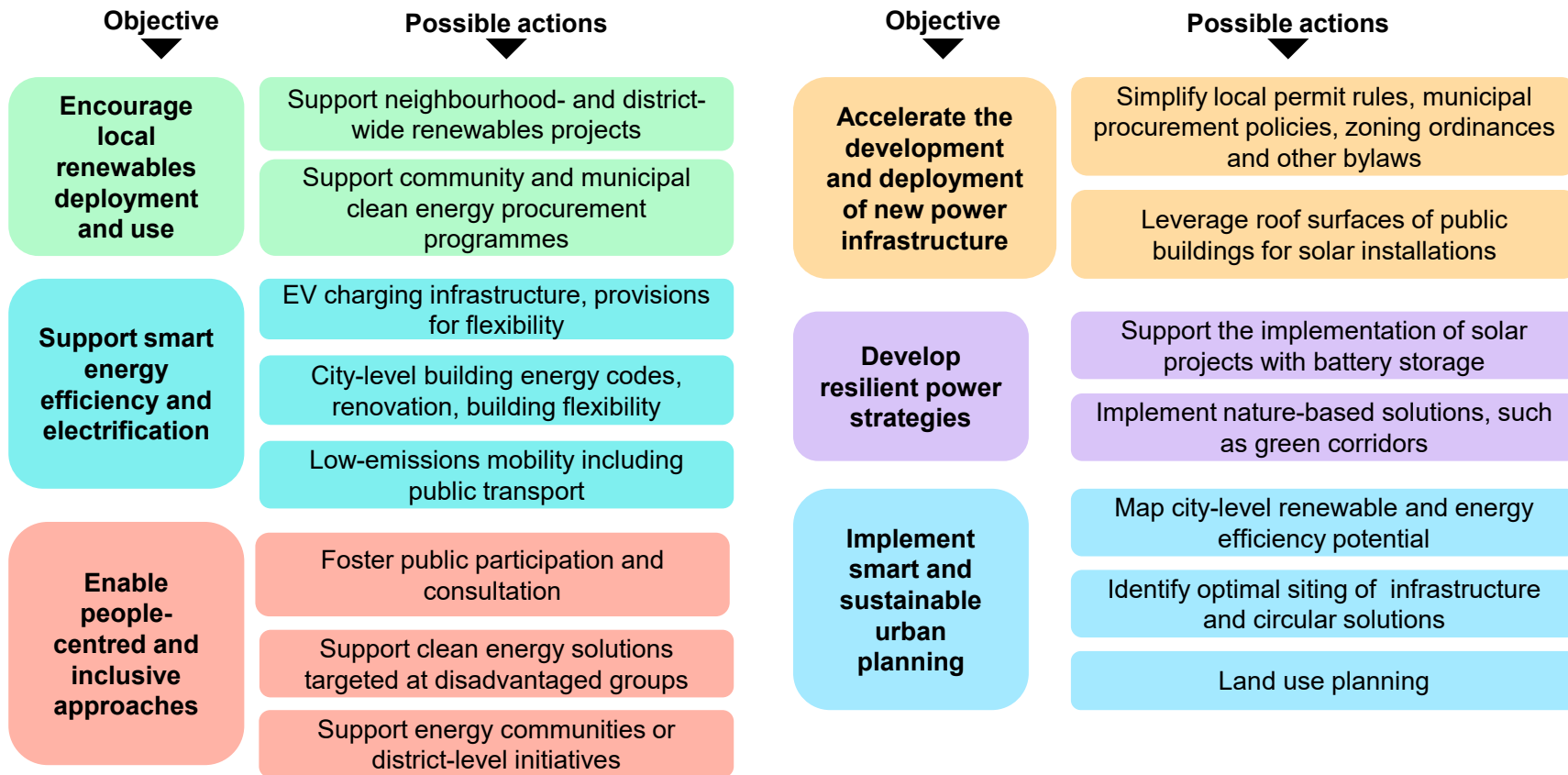
But they also constitute a global economic engine and **key opportunity** for progress towards climate goals



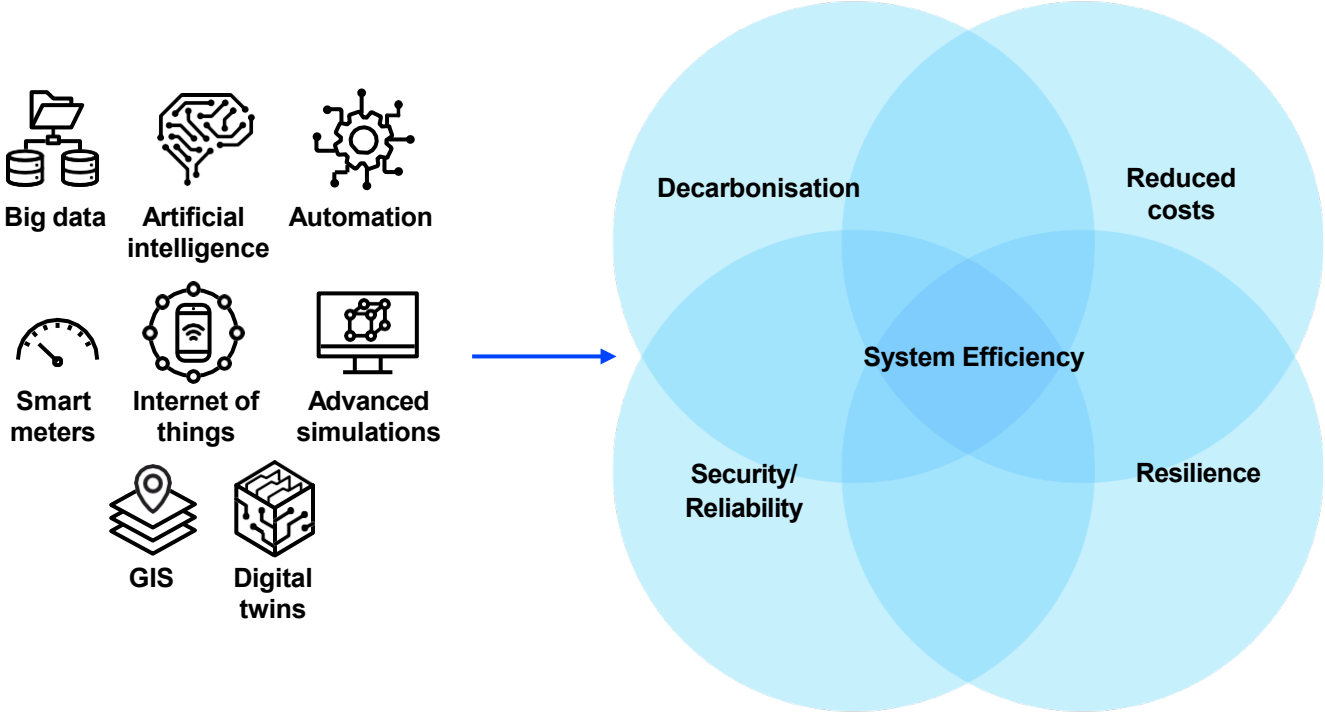
To reach net-zero emissions by 2050 clean energy investment will need to triple in the next ten years

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How cities can help drive change in energy systems



Digitalisation opens opportunities for system-wide efficiency



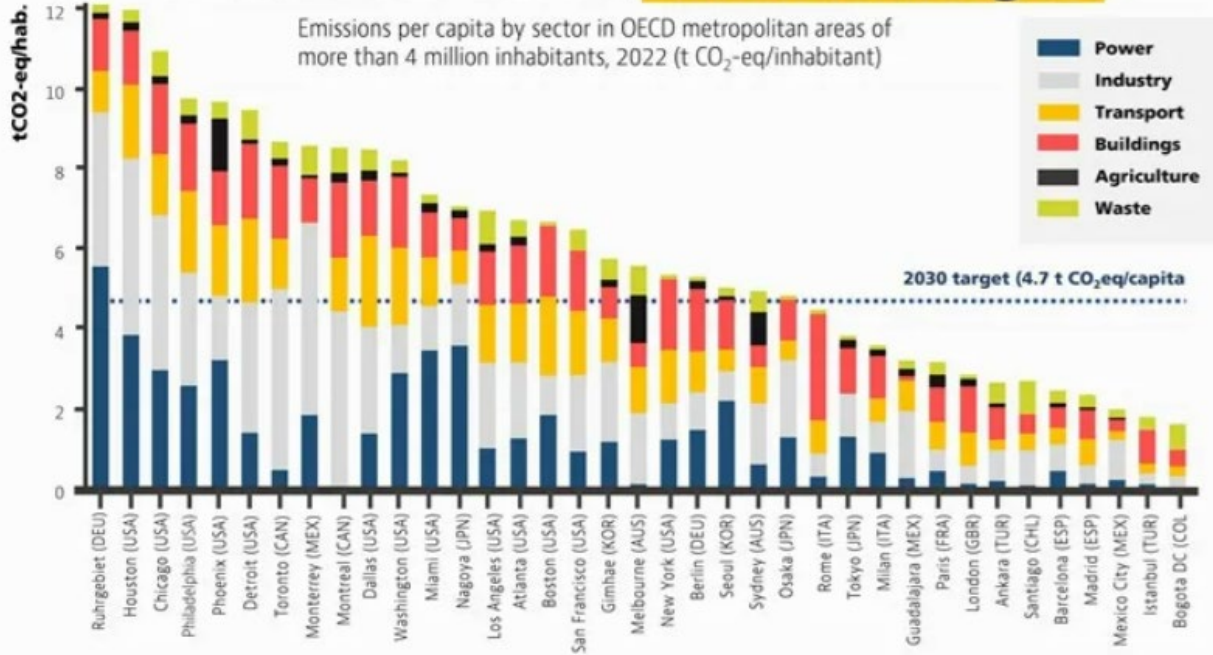
Digitalisation, with the right policies, enables a progression to optimising the efficiency of the whole energy system.

Taking stock



There are big disparities in progress to net zero across cities and regions

Emissions per capita by sector in OECD metropolitan areas of more than 4 million inhabitants, 2022 (t CO₂-eq/inhabitant)

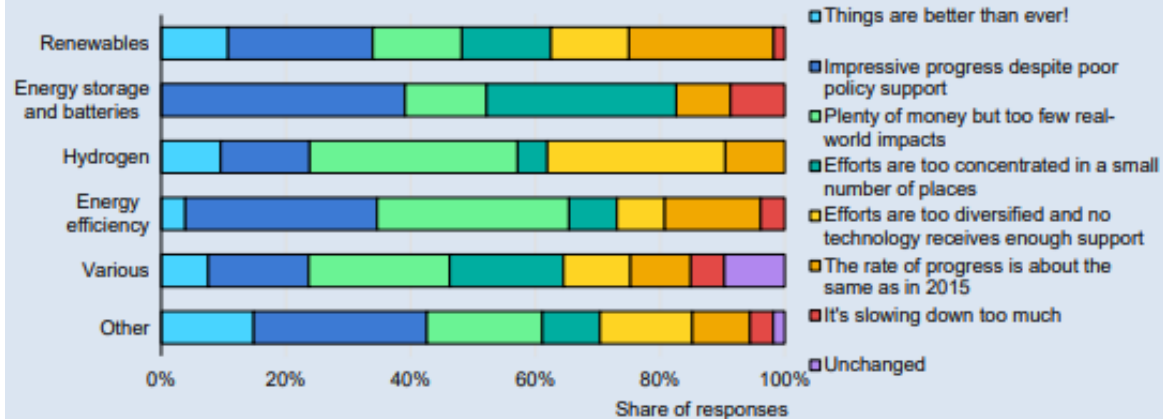


[OECD \(2023\) A Territorial Approach to Climate Action and Resilience](#)

Energy innovation trends

- Public energy R&D investment today stands at just over 0.04% of GDP in IEA member countries – less than half the level seen in the early 1980s despite new energy security and climate challenges
- Venture capital funding declined by more than 20% in 2023 and 2024
- China overtook Japan and the United States in 2021 as the leading country for energy patenting, with over 95% of its patents focused on low-emissions technologies
- Shifts in geopolitics, fragmentation, potential trade conflicts, export restrictions, uncertainty, AI

Survey respondents' perceptions of progress on energy technology innovation in the last decade, by sector in which they work



[State of Energy Innovation, 2025](#)

City and energy system innovation – opportunities & constraints

Geopolitical tensions, trade barriers & supply chain disruptions

Increasing power system complexity & volatility

Significant build-out of infrastructure/ need for upgrades & retrofits

Permitting processes are complex and lengthy

Access to finance

Population growth and urbanisation

Growing challenge of peak demand & system stability

Limited city budgets and resources

Data gaps – not captured, not used, not shared

Access to clean energy benefits is uneven

Rapidly evolving climate risk landscape

Congestion & curtailment

Limited city mandates

Energy and city planning is siloed

Multiple benefits are not systematically tracked

- **Outdated grids:** City power systems aren't built to handle new energy sources like solar or sudden spikes in demand.
- **Hard to connect new tech:** It's still complicated to plug in things like home solar panels, batteries, or electric vehicles.
- **Systems don't talk to each other:** Different parts of the energy system often can't share data or work together smoothly.
- **Not fair for everyone:** New energy tools and services often don't reach people in lower-income communities.
- **Slow rules and planning:** Energy policies and city planning haven't kept up with how fast technology is changing.

Key messages

Programme level suggestions

- Consider cities in the context of the wider energy system
- Call for integrated solutions that meet multiple needs
- Embed plans for upscaling & replication
- Ensure continuity & knowledge sharing
- Use regulatory sandboxes to facilitate innovation
- Consider distributional impacts, access and affordability
- Do not neglect non-technical innovation
- Put in place mechanisms to counteract “pilot prison”

Solutions needed

- Tools for integrated energy & urban planning
- Effective data sharing mechanisms
- Solutions that unlock flexibility & reduce peak demand
- Solutions for local & city-wide resilience and energy security
- Viable business models that enable access and affordability
- Neighbourhood & community projects across end uses and dimensions