

SolarEV City concept: Building future urban power and mobility systems

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Cities have become the focus of global climate mitigation efforts because as they are responsible for 60 to 70% of energy-related CO₂ emissions. As the world is increasingly urbanized, it is crucial to identify cost-effective pathways to decarbonize and enhance the resilience of cities, which ensure the well-being of their dwellers. In this study, we propose a SolarEV City concept, in which integrated systems of cities'

roof-top photovoltaics and electric vehicles (EVs) supply affordable and dispatchable CO₂-free electricity to urban dwellers.

The SolarEV City assumes that 70% of roof tops in cities at maximum are used for PV and all passenger vehicles are converted to EV in cities being used as batteries for PV electricity. We conducted technoeconomic analyses to evaluate the concept in terms of CO₂ emission reduction, cost savings, energy sufficiency, [self-sufficiency](#), self-consumption for nine Japanese urban areas (Kyoto City, Hiroshima City, Korimaya City, Okayama City, Sapporo City, Sendai City, Niigata City, Kawasaki City, Special districts of Tokyo).

Our analyses indicate that implementations of the concept can meet 53 to 95 % of electricity demands in nine major Japanese urban areas by 2030 with the use of 70% of roof-top area in the cities. CO₂ emission from vehicle use and electricity generation in these areas can be reduced by 54 to 95% with potential [cost savings](#) of 26-41%. High cost-effectiveness and seasonally stable insolation in low latitudes may imply that the concept may be more effective to decarbonize urban environments in emerging economies in low latitudes.

Among several factors, governmental interventions will play a crucial role in realizing such systems, particularly in legislating regulations that enhance penetration of the integrated system of PV and EV and enable formation of decentralized power systems. As bottom-up processes are critical, [policy makers](#), communities, industries and researchers should work together to build such systems overcoming social and regulatory barriers.

More information: Takuro Kobashi et al, SolarEV City concept: Building the next urban power and mobility systems, *Environmental Research Letters* (2020). [DOI: 10.1088/1748-9326/abd430](https://doi.org/10.1088/1748-9326/abd430)

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