

Assessing the Impact of Urban Block Typologies on Solar and Photovoltaic Potential in the Tropical Urban City of Colombo, Sri Lanka

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The increasing global energy crisis has brought about a shift towards the utilisation of renewable energy, particularly towards building-integrated photovoltaics. When considering the assessment of photovoltaics (PV) in urban regions, previous studies have focused on methods that take into consideration the urban block typologies, urban density, urban compactness indicators, or urban form. However, a requirement still exists to assess how the use of PV in tropical regions can be optimised via the use of facades. Coupled with the fact that semi-transparent PV implemented on windows can perform a dual role in generating electricity whilst minimising building cooling loads, it is imperative to understand how urban block typology can affect PV potential based on the shading effects caused within the block. This paper assesses four different urban block typologies in the urban and climatic context of Colombo, Sri Lanka and how they affect the total and average solar irradiation and the total photovoltaic generation capabilities of opaque and semi-transparent PV installed on building roofs and facades based on their orientation. It was found that although facades are unfavourably inclined towards tropical solar irradiation, they can generate higher amounts of electricity due to the more expansive façade area in high-rise buildings. Further, it was established that the building form in addition to the block typology affects the PV generation, especially when coupled with the building orientation, and that this can have a significant impact on the effectiveness of building envelopes for PV generation.

Keywords: *urban block typology, photovoltaic potential, building form*