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Framework for Integrated Urban Renewable Energy Planning

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Abstract: As intensive urbanisation occurs, the demand for water and energy generally also increases. These demands are intrinsically linked, as energy is not only needed to provide the required water supply, but also because renewable resources dependent on water are providing inputs into this energy production. This nexus between water and energy is strengthened further by the intermittent nature of renewable energy sources, such as wind and solar, which is changing energy demand patterns and can impact the way water supply systems are operated. Consequently, a key to meeting long-term energy demands in urban centres in this shifting landscape is the adoption of an integrated approach that enables the viability of alternative renewable energy technologies to be assessed under a range of plausible future scenarios of climate change, population growth, land use change and other socio-economic changes. To assist with achieving this goal, the aim of this research is to take the first steps towards developing such an integrated framework, which will provide an improved understanding of the technical, economic and environmental viability of sustainable energy systems incorporating renewable energy resources for meeting long-term urban energy demand under a range of plausible future conditions. Such a framework also provides the basis of a modelling approach for integrated systems analysis of sustainable energy approaches, combining under-utilised biomass resources (e.g. agricultural, environmental, municipal and food waste) and variable renewable energy sources (e.g. wind, solar). This helps to identify the inherent risk and uncertainty within the system and enhances technical capability in providing integrated water-energy-food security and equity.

***Keywords**: Renewable energy; water-energy nexus; integrated assessment framework*