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Urban Energy Technical Note

Energy and Resource Efficiency Checklist

The best opportunities for energy efficiency in buildings are at the design stage. Designing for energy efficiency reduces the overall demand for resources to generate energy. This checklist will help to identify key design issues that will demonstrate whether the proposed design will be energy efficient.

Energy Efficiency				Rating		
			**Site planning**			
			• Has the surrounding neighbourhood been considered in the design? • Is the site properly dimensioned showing with boundaries shown? • Is the direction of true north indicated on the site plan? • Building footprint: – Has the building adhered to the site location's plot ratio and plot coverage? – Has the site design taken into account natural or artificial drainage? – Does the site design optimise natural features and open spaces to enhance bio-diversity? • Does the site planning respond to the: – topography; – prevailing wind (to provide well ventilated streets and open spaces); – sun path (to provide sun shading in the streets); – access to natural light, (other buildings not blocking access to natural lighting); – streetscape; – microclimate? • Is the vegetation appropriately located according to the climate? – Hot and humid zones: High trees to provide sun shading but allowing natural ventilation and grass floors to avoid heat islands; – Semi-arid / savannah zones: High and low trees and grass floors to avoid heat islands; – Hot and arid zones: High and low trees and grass floors to avoid heat islands and provide natural cooling; – Highlands zones: High trees to provide sun shading but allowing sun gains in the cold season; – Lakes region zones: High trees to provide sun shading but allowing natural ventilation and grass floors to avoid heat islands. • In urban planning developments: – Is it a mixed land use plan with at least 40% of the floor space allocated for economic use? – Is there adequate space for streets and an efficient street network? – Does the street network occupy at least 30% of the land and 18 Km of the street length per Km2? Is it a high density neighbourhood? – Are there are at least 15,000 people/Km^2 (61 people /acre)? – Is there limited land-use specialization? – Are single function blocks less than 10% of the neighbourhood? – Is it a neighbourhood with a social mix? – Is 20-50% of the residential floor dedicated to low cost housing? – Is the neighbourhood / building connected to adequate public transport services?			

Energy Efficiency				Rating		
			**Building Orientation**			
			• Is the building elongated along the east-west axis? • Is the building oriented to take advantage of the prevailing wind direction? • Are the main façades and windows facing north and south?			
			Natural ventilation			
			• Does the building layout utilize the prevailing wind conditions to achieve adequate cross ventilation? – Hot and humid zones: open and isolated buildings; – Semi-arid / savannah zones: Semi-open; – Hot and arid zones: compact / closed; – Highland zones: compact; – Lakes region zones: open and isolated buildings. • Are all habitable spaces provided with operable windows for adequate natural ventilation? • Are the openings located in opposite or adjacent external walls for cross ventilation? • Are the sizes of the openings according to the prevailing climate? – Hot and humid zones: large openings; – Semi-arid / savannah zones: medium openings; – Hot and arid zones: small openings; – Highlands zones: sized to balance between solar heat gains and heat losses; – Lakes region zones: large openings. • Is the roof ventilated? (Roof vents, ridge vents, ventilated air chamber, covered terrace) • Are common areas naturally ventilated? (lift lobbies and corridors, staircases, toilets, atriums, car parks etc.) • Are there other strategies to provide natural ventilation? (Stack effect, clerestory windows, solar chimneys)			
			Natural heating and cooling			
			• Are there passive cooling strategies in the design? – Hot and humid zones: maximization of ventilation; – Semi-arid / savannah zones: evaporative cooling; – Hot and arid zones: evaporative cooling; – Lake region zones: maximization of ventilation during daytime. • Are there passive heating strategies in the design? – Highland zones: use of high thermal mass materials, allowing heat gains during the cold season; – Lake region zones: medium to high thermal mass materials.			
			Daylighting			
			• Are all habitable spaces provided with windows? • Are all the common areas naturally lit? (toilets, staircases, corridors, lift lobbies, atriums, car parks etc.) • Are the windows and skylights oriented to maximise natural light without glare or overheating? (Maximised on north/south windows and minimized on east/west windows) • Has the optimum window to wall ratio (WWR) optimum rate of 25% for natural day lighting been achieved? • Are the interior walls, ceilings and floors finished in a light colour? (Light colours maximize the reflection of natural light) • Has the design incorporated the use of interior light distribution features such as light shelves, diffusers, or reflective surfaces?			

Energy Efficiency				Rating		
			**Shading**			
			• Are the main windows located in the north and south facing elevations? Are there minimal windows in the east and west elevations? • Are all glazed areas shaded? • Have any external shading devices been incorporated? (Horizontal devices and roof overhangs for north/south façades, vertical for east/west façades) • Has the building been designed to shade itself? (Use of deeply recessed windows, use of cantilevered floors, use of inclined glass etc.) • Does the design use trees or other vegetation to shade the building? (Green roofs, landscaping elements, green façades etc.)			
			Renewable energy generation			
			• Has on site renewable energy generation been incorporated into the design? (Solar photovoltaic panels, solar water heaters, small-scale wind generation systems, biogas tanks, etc.)			
			Building materials			
			• Are the thermal properties of the proposed building materials suitable for the site's prevailing climate? – Hot and humid zones: lightweight building materials; – Semi-arid / savannah zones: medium weight building materials; – Hot and arid zones: heavy weight building materials; – Highlands zones: medium weight building materials; – Lakes region zones: medium to heavy weight building materials. • Are the materials locally available? • Are the materials recyclable and reusable? • Have the building materials been harvested / produced in a sustainable way?			
			Water efficiency			
			• Have water efficient fixtures been specified? (Dual-flush toilets, waterless urinals and toilets, composting toilets, low-flow shower heads, taps and toilets etc.)			
			Water conservation and treatment systems			
			• Does the design incorporate rain water collection components? (Gutters, down spouts etc.) • Is there provision for rain water collection points? (Cisterns, underground storage tanks, ponds etc.) • Are there any water recycling initiatives that will reduce potable water consumption? (Dual plumbing systems, grey water treatment system) • Is there provision of systems that utilize rainwater or recycled water for irrigation?			
			Environmental protection			
			Storm water Management • Is there drainage in place? • Is there provision for storm water management facilities for infiltration and treatment? • Are there measures to mitigate storm water / rainwater run-off? (Permeable paving, rain gardens, soakaways, ponds, swales etc.)			

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			**Sewerage disposal**			
			• Are there any environmentally friendly alternative sanitation options? (Composting toilets, reed bed systems, biogas digesters, oxidation ponds etc.)			
			Site and Landscaping			
			• Does the design accommodate shaded outdoor living spaces? (Use of vegetation, timber pergolas, reflective materials etc.) • Is the exposed hardscape made of lightly coloured and permeable materials? • Does the site design have the appropriate infrastructure for walking and cycling? • Are the plants and trees specified in the design adapted to the local climate? (Require minimal irrigation) • Have existing trees been incorporated in the design?			

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The purpose of this Technical Note is to assist municipal councils in identifying energy efficient building initiatives during building plans approval. It is meant to provide a basis for advising building owners on energy efficiency matters. The contents of this document are not final or exhaustive. For more information, contact the Urban Energy Unit. Prepared by Vincent Kitio, Goodman Kazoora, Jerusha Ngungui and Zeltia Blanco.

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