







# 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
			
<b>Site planning</b> <ul style="list-style-type: none"> <li>• Has the surrounding neighbourhood been considered in the design?</li> <li>• Is the site properly dimensioned showing boundaries?</li> <li>• Is the direction of the True North indicated on the site plan?</li> <li>• Building footprint:                             <ul style="list-style-type: none"> <li>– Has the building adhered to the site location’s plot ratio and plot coverage?</li> <li>– Has the site design taken into account natural or artificial drainage?</li> <li>– Does the site design optimise natural features and open spaces to enhance bio-diversity?</li> </ul> </li> <li>• Does the site planning respond to the:                             <ul style="list-style-type: none"> <li>– topography,</li> <li>– prevailing wind (to provide well ventilated streets and open spaces)</li> <li>– sun path (to provide sun shading to the streets),</li> <li>– access to natural light, (other buildings don’t block access to natural lighting)</li> <li>– streetscape,</li> <li>– microclimate,</li> </ul> </li> <li>• Is the vegetation appropriately located according to the climate?                             <ul style="list-style-type: none"> <li>– Hot and Humid zones: High trees to provide sun shading but allowing natural ventilation and grass floors to avoid heat islands</li> <li>– Semi-arid / Savannah zones: High and low trees and grass floors to avoid heat islands</li> <li>– Hot and arid zones: High and low trees and grass floors to avoid heat islands and provide natural cooling</li> <li>– Highlands zones: High trees to provide sun shading but allowing sun gains in the cold season</li> <li>– Lakes region zones: High trees to provide sun shading but allowing natural ventilation and grass floors to avoid heat islands</li> </ul> </li> <li>• In case of urban planning developments:                             <ul style="list-style-type: none"> <li>– Is it a mixed land use planning with at least 40% of the floor space allocated for economic use?</li> <li>– Is there adequate space for streets and efficient street network?                                     <ul style="list-style-type: none"> <li>– Meaning that the street network occupy at least 30% of the land and 18 Km of the street length per Km2?</li> <li>– Is it a high density neighbourhood?</li> <li>– Meaning that there are at least 15,000 people/Km2 (61 people /acre)?</li> </ul> </li> <li>– Is there limited land-use specialization?</li> <li>– Single function blocks less than 10% of the neighbourhood?</li> <li>– Is it a neighbourhood with social mix?</li> <li>– 20-50% of the residential floor dedicated to low cost housing?</li> <li>– Is the neighbourhood / building connected to adequate public transport services?</li> </ul> </li> </ul>			

Energy Efficiency			Rating
			
<b>Building Orientation</b>			
		<ul style="list-style-type: none"> <li>• Is the building elongated along the east-west axis?</li> <li>• Is the building oriented to take advantage of the prevailing wind direction?</li> <li>• Are the main facades and windows facing North and South?</li> </ul>	
<b>Natural ventilation</b>			
		<ul style="list-style-type: none"> <li>• Does the building layout utilize the prevailing wind conditions to achieve adequate cross ventilation?                             <ul style="list-style-type: none"> <li>– Hot and Humid zones: open and isolated buildings?</li> <li>– Semi-arid / Savannah zones: Semi-open?</li> <li>– Hot and arid zones: compact / closed?</li> <li>– Highland zones: compact?</li> <li>– Lakes region zones: open and isolated buildings?</li> </ul> </li> <li>• Are all habitable spaces provided with operable windows for adequate natural ventilation?</li> <li>• Are the openings located in opposite or adjacent external walls for cross ventilation?</li> <li>• Are the sizes of the openings according to the prevailing climate?                             <ul style="list-style-type: none"> <li>– Hot and Humid zones: large openings</li> <li>– Semi-arid / Savannah zones: medium openings</li> <li>– Hot and arid zones: small openings</li> <li>– Highlands zones: sized to balance between solar heat gains and heat losses</li> <li>– Lakes region zones: large openings</li> </ul> </li> <li>• Is the roof ventilated? (Roof vents, ridge vents, ventilated air chamber, covered terrace)</li> <li>• Are common areas naturally ventilated? (lift lobbies and corridors, staircases, toilets, atriums, car parks etc.)</li> <li>• Are there other strategies to provide natural ventilation? (Stack effect, clerestory windows, solar chimneys)</li> </ul>	
<b>Natural heating &amp; cooling</b>			
		<ul style="list-style-type: none"> <li>• Are there passive cooling strategies in the design?                             <ul style="list-style-type: none"> <li>– Hot and Humid zones: Maximization of ventilation</li> <li>– Semi-arid / Savannah zones: Evaporative cooling</li> <li>– Hot and arid zones: Evaporative cooling</li> <li>– Lake region zones: Maximization of ventilation during daytime</li> </ul> </li> <li>• Are there passive heating strategies in the design?                             <ul style="list-style-type: none"> <li>– Highland zones: using high thermal mass materials, allowing heat gains during the cold season</li> <li>– Lake region zones: medium to high thermal mass materials</li> </ul> </li> </ul>	
<b>Daylighting</b>			
		<ul style="list-style-type: none"> <li>• Are all habitable spaces provided with windows?</li> <li>• Are all the common areas naturally lit? (toilets, staircases, corridors, lift lobbies, atriums, car parks etc.)</li> <li>• Are the windows and skylights oriented to maximise natural light without glare or overheating? (Maximise on North/South windows and minimize on East/West windows)</li> <li>• Has the 25% of window to wall ratio (WWR) optimum rate for natural day lighting been achieved?</li> <li>• Are the interior finishes to walls, ceilings and floors specified to a light colour? (Light colours maximize the reflection of natural light)</li> <li>• Has the design incorporated the use of interior light distribution features like light shelves, diffusers, or reflective surfaces?</li> </ul>	

Energy Efficiency			Rating
			<b>Shading</b>
			<ul style="list-style-type: none"> <li>• Are the main windows located on the north and south facing elevations? Minimal windows on the east and west elevations</li> <li>• Are all glazed areas shaded?</li> <li>• Are there any external shading devices been incorporated? (Horizontal, and roof overhangs for North/South facades, Vertical for East/West facades)</li> <li>• Has the building been designed to shade itself? (Use of deeply recessed windows, use of cantilevered floors, use of inclined glass etc.)</li> <li>• Does the design use trees or other vegetation to shade the building? (Green roofs, landscaping elements, green facades etc.)</li> </ul>
			<b>Renewable energy generation</b>
			<ul style="list-style-type: none"> <li>• Is there incorporation of onsite renewable energy generation? (Solar photovoltaic panels, solar water heaters, Small-scale wind generation systems, biogas tanks, etc.)</li> </ul>
			<b>Building materials</b>
			<ul style="list-style-type: none"> <li>• Are the proposed building materials suitable for the site's prevailing climate in terms of the thermal properties?                             <ul style="list-style-type: none"> <li>– Hot and humid zones: lightweight building materials</li> <li>– Semi-arid / Savannah zones: medium weight building materials</li> <li>– Hot and Arid zones: Heavy weight building materials</li> <li>– Highlands zones: medium weight building materials</li> <li>– Lakes region zones: medium to heavy weight building materials</li> </ul> </li> <li>• Are the materials locally available?</li> <li>• Are the materials recyclable and reusable?</li> <li>• Have the building materials been harvested / produced in a sustainable way?</li> </ul>
			<b>Water efficiency</b>
			<ul style="list-style-type: none"> <li>• Water efficient fittings</li> <li>• Have water efficient fixtures been specified? (Dual-flush toilets, waterless urinals and toilets, composting toilets, low-flow shower heads, taps and toilets etc.)</li> </ul>
			<b>Water conservation and treatment systems</b>
			<ul style="list-style-type: none"> <li>• Does the design incorporate rain water collection components? (Gutters, down spouts etc.)</li> <li>• Is there a provision for rain water collection points? (Cisterns, underground storage tanks, ponds etc.)</li> <li>• Are there any water recycling initiatives that will reduce potable water consumption? (Dual plumbing systems, grey water treatment system)</li> <li>• Is there provision of systems that utilize rainwater or recycled water for irrigation?</li> </ul>
			<b>Environmental protection</b>
			<p>Storm water Management</p> <ul style="list-style-type: none"> <li>• Is there drainage in place?</li> <li>• Is there provision for storm water management facilities for infiltration and treatment?</li> <li>• Are there measures to mitigate storm water / rainwater run-off? (Permeable paving, rain gardens, soakaways, ponds, swales etc.)</li> </ul>

Energy Efficiency			Rating
			<b>Sewerage disposal</b>
			<ul style="list-style-type: none"> <li>• Are there any environmentally friendly alternative sanitation options? (Composting toilets, Reed bed systems, Biogas digesters, Oxidation ponds etc.)</li> </ul>
			<b>Site and Landscaping</b>
			<ul style="list-style-type: none"> <li>• Does the design accommodate shaded outdoor living spaces? (Use of vegetation, timber pergolas, reflective materials etc.)</li> <li>• Is the exposed hardscape made of lightly coloured and permeable materials?</li> <li>• Does the site design have the appropriate infrastructure for walking and cycling?</li> <li>• Are specified plants and trees adaptable to the local climate? (Require minimal irrigation)</li> <li>• Have existing trees been incorporated in the design?</li> </ul>

DRAFT

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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.*