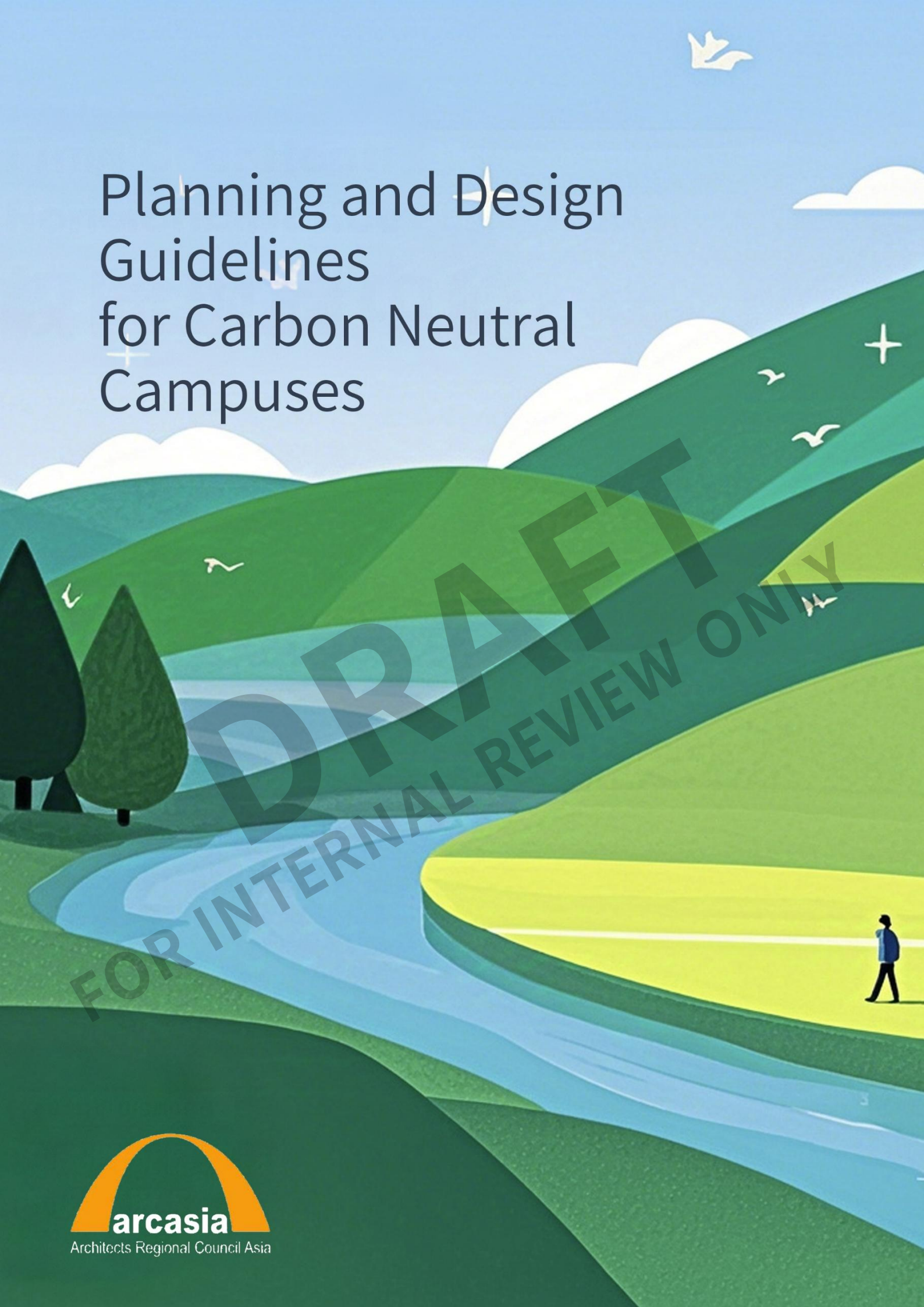
Planning and Design Guidelines for Carbon Neutral Campuses



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Architects Regional Council Asia

Planning and Design Guidelines for Carbon Neutral Campuses

Framework

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Background

Climate change is one of the greatest threats the world has ever faced. Under the Paris Agreement, countries have reached a consensus that the global warming must be limited within 1.5 ° C. To achieve this goal, greenhouse gas (GHG) emissions need to be substantially reduced. CO2 emissions would have to decline by 45% before 2030 and renewable energy will need to supply 59%-97% of the electricity by 2050[1].

Universities are incubators of knowledge, innovation, and leadership, and therefore should take the responsibility and serve as role models in implementing sustainable practices. In this process, universities can subsequently enjoy a host of co-benefits, such as increased energy resiliency, reduced operational costs, and valuable educational and research opportunities.

However, the practices towards carbon neutral campuses have always been accompanied by various challenges like legitimate hurdles, limited resources and external roadblocks.

[1] IPCC Special Report on the Impacts of Global Warming of 1.5 °C. 2018.

Role of architects

As architects, we have the responsibility to help make choices that contribute to the built environment through better buildings, settlements, landscape architecture and urban planning.

We call on architects worldwide to take action in their own practice and provide strategies for how those barriers can be overcome.

Objectives

The guidelines are formulated to serve as inspirational principles to build on for carbon neutral campuses.

Yet the final goal has never been carbon neutrality itself, but to plan and design sustainable, resilient, inclusive and low-carbon built environments that have positive impacts both locally and globally.

What is a carbon neutral campus?

1. Carbon neutrality is not equivalent to zero-carbon emissions.
2. A campus is carbon neutral when it has reached a balance

between emitting carbon and absorbing carbon from the atmosphere.

3. Carbon neutrality is often referred to as achieving greenhouse gas (GHG) emissions neutrality, which include not only emissions of carbon dioxide but also methane, nitrous oxide, and sulphur hexafluoride.

Roadmap

We will strive to carry out practice on campus from the perspectives of how to power, build, operate and lead.

1. **Power:** Eliminate onsite fossil fuel emissions, accelerate the adoption of renewable energy, reduce energy use and increase energy efficiency.
2. **Build:** Expand and enhance campus green and open spaces, consider reducing building carbon emissions during the design and construction process.
3. **Operate:** Utilise services, products and systems that pollute less, use less energy and produce less waste, and promote implementation through the establishment of policies, regulations, and practices.
4. **Lead:** Incorporate campus carbon neutrality into research and curriculum, promote collaboration and global knowledge

sharing.

To best achieve these campus carbon neutrality goals, we can divide the work of architects into three stages, each with specific key issues:

Ⅰ. Planning and feasibility phase

1. **Evaluation and analysis:** Measure carbon neutrality and explore the threshold effects of its driving factors. Conduct data-based research such as collecting and evaluating data continuously to prioritise initiatives and actions in the most important areas.
2. **Campus planning:** Preserve mature trees where possible, expand the tree inventory and improve access to greenspace on campus. Develop and invest in sustainable modes of transportation, prioritise adaptive reuse instead of constructing new buildings.
3. **Architectural programming:** Always reuse existing built structures first. Ensure that all elements of the built environment up to sustainable design standards. Building resilient buildings that adapt to the extreme phenomena.

Ⅱ. Design and implementation phase

1. **Architectural Design:** Design low-cost on-site renewable energy and natural resources systems. Renovate and

rehabilitate existing buildings to improve energy efficiency whilst meeting user needs.

2. **Building materials:** Transition away from carbon-intensive and energy-intensive materials towards carbon-neutral and renewable materials. Prioritise the procurement of local renewable building materials and short supply chain.
3. **Construction management:** Use renewable energy machinery and equipment during construction. Formulate reasonable construction plans and optimise process arrangements to reduce wastage during the construction.

III. Operational phase

1. **Maintenance and management:** Monitor and manage building energy usage to drive down energy consumption during operations. Develop systems that dynamically adjust the air conditioning settings based on actual occupancy of public rooms.
2. **Post Project Evaluation:** Systematically assess the emission reductions achieved by decarbonizing construction projects. Continuously evaluate and revise data and launch new initiatives and actions on this basis.
3. **Behavioural Guidance:** Implement smart energy management to regulate room usage and reduce energy waste caused by empty offices.

Participation of architects

1. **Appointment:** Identify the objectives and critical issues for campus carbon neutral projects. Determine fees paid by scope of work and types of commission, such as investigation and research, feasibility work, strategic plan, architectural design, etc., based on which an agreement is formulated and signed.
2. **Team composition:** Architects may need to convene sister professions and work collaboratively across disciplines to find innovative solutions.
3. **Ethics:** The solutions proposed by architects should protect the health, safety and welfare of students and faculty, and consider social and environmental impacts while applying low-carbon technologies.
4. **Research and curriculum:** Foster environmental literacy and competence to undergraduate and graduate students of urban design and architecture by supporting the creation of programmes to teach sustainable design skills.
5. **Publicity and influence:** Disseminate best practices and valuable examples of successful architectural projects. Broaden service and outreach nationally and internationally.

Enforcement by architects

1. **Ethics Principles:** Ethics in design encourages transparency and accessibility. By embracing open access to knowledge and resources fosters collaboration among architects, engineers, and community stakeholders. This collective effort allows architects to share best practices, ensuring architectural choices are rooted in carbon neutrality, ultimately leading to projects that are both innovative and environmentally responsible.
2. **Implication Environmental Regulations:** Understanding frameworks like the Global Reporting Initiative (GRI) allows me to develop construction practices that meet international standards while promoting transparency in how buildings impact the environment.

Campus Community Engagement

Engaging the community of campus in the design process is vital for promoting social sustainability in architecture.

To empower campus community members and stakeholders, allowing them to contribute to discussions that shape sustainable spaces tailored to their unique context and challenges.