

The background is a complex, layered collage. It features a blue grid pattern in the top left corner, a green and blue abstract shape with a white circular arrow in the middle left, a black circle containing a 3D cube with three dots in the center, and various other organic and geometric shapes in shades of green, blue, and black. A red rectangular stamp is visible in the bottom left corner.

KUPPASWAMY IYENGAR

SUSTAINABLE ARCHITECTURAL DESIGN

AN OVERVIEW

Sustainable Architectural Design

An Overview

Kuppaswamy Iyengar

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Sustainable Architectural Design

This book is a guide to a sustainable design process that moves from theory, to site and energy use, to building systems, and finally to evaluation and case studies, so you can integrate design and technology for effective sustainable building. Kuppaswamy Iyengar shows you how to get it right the first time, use free energy systems, and utilize technologies that minimize fossil fuel use. Each chapter has a sustainable design overview, technical details and strategies marked by clear sections, a summary, and further resources. Heavily illustrated with charts, tables, drawings, photographs, and case studies, the book shows technologies and concepts integrated into cohesive project types, from small and large office spaces to single and multi-use residences, hospitals, schools, restaurants, and warehouses to demonstrate implementing your designs to meet clients' needs now and for the future.

This book includes an overview of alternative assessment and evaluation systems such as BREEAM, CASBEE, GBTool, and Green Globes, alongside

LEED®, ECOTECT™, energy 10, HEED, and eQuest simulation programs. The guide reveals the importance of the building envelope – walls, superstructure, insulation, windows, floors, roofs, and building materials – for the environmental impact of a building, and has a section on site systems examining site selection, landscape design, thermal impact, and building placement.

Kuppaswamy Iyengar is an Associate Professor, Associate Director, and Regents Lecturer in the architecture program at the University of New Mexico. Professor Iyengar is a highly skilled teacher and technical consultant, combining his degrees in civil and structural engineering and architecture with over fifty years' practical experience. In addition to developing academic courses of study, he has designed and presented over 50 seminars in professional settings, bringing his expertise to students in academic, governmental, and commercial locations in India, Barbados, the USA, England, Canada, Australia, the Philippines, and Thailand.

This book is dedicated to my beloved wife, Lalitha.

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Introduction

Current Approaches to Sustainable Design and Resource Efficiency

Sustainable Architectural Design: An Overview aims to assist teachers and designers to plan and create buildings that meet the needs of the present without compromising the ability of future generations to meet their own needs [1]. This notion of preserving the planet for present and future generations poses several fundamental issues. Of primary concern is the interaction between natural systems (the regenerative capacity of the Earth's biosphere) and human demands for natural resources. We humans are acting as though fresh resources will be discovered to satisfy our inexhaustible need, as if there is a second Earth waiting to provide for us when we run out of supplies. History reveals multiple examples alerting us that civilizations vanish when they out-strip their resources. Now we may be approaching just such a moment on a planetary level.

What is the response of the building and construction industry to these issues? Will the industry continue to contribute approximately 50 percent of greenhouse gas (GHG) emissions through its buildings as architect Edward Mazria contends [2]? Or will educators help designers learn how to make key sustainable decisions in the early stages of their projects, resolving to use passive and active green technologies to produce the least amount of carbon dioxide and other gases?

Specifically, as a teacher, I am writing this book as a tool to meet challenges of my students to relate technical information to the studio design process, all within the context of sustainability. For designing sustainable (Net Zero or Net Plus) architectural buildings I recommend a three-step approach: (1) *do it right first time* through awareness of cultural and formal aesthetics, environmentally sound practices



Figure I.1 Jean Marie Tjibaou Cultural Center for Kanak Population, New Caledonia.
(Source: © ADCK – Centre Culturel Tjibaou/RPBW/Architects.)

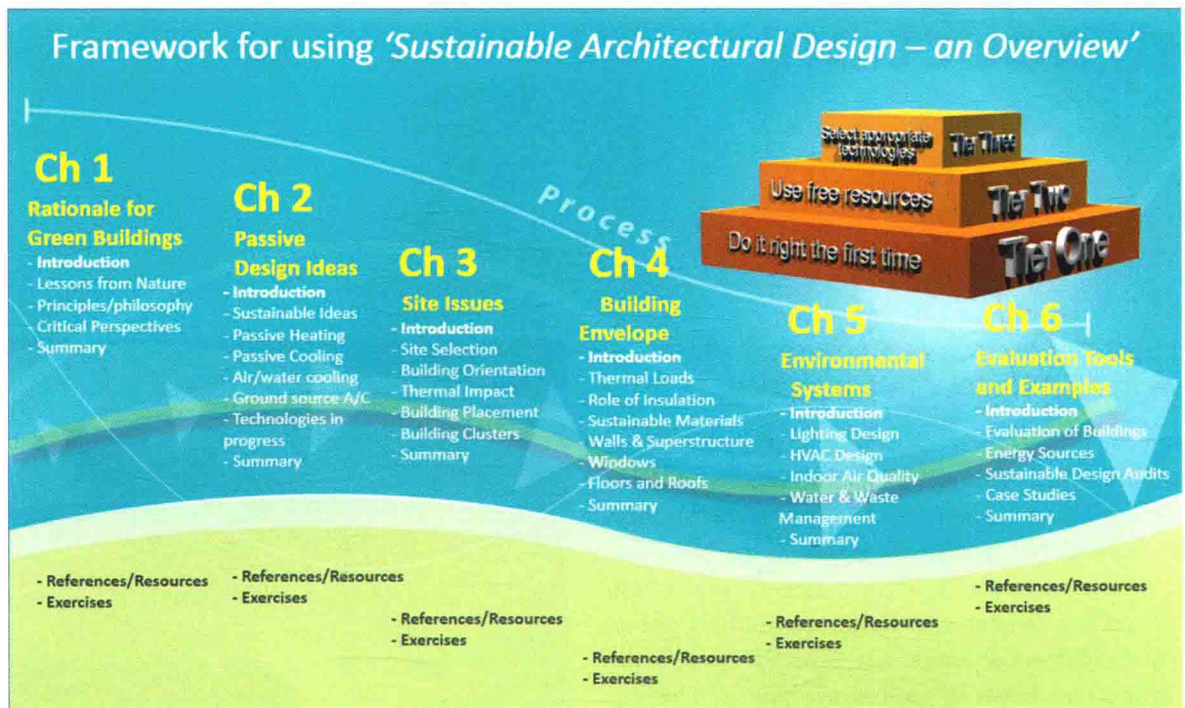


Figure I.2 A framework for using *Sustainable Architectural Design: An Overview*.
(Source: Kuppaswamy Iyengar.)

that take advantage of orientation, capturing the natural assets of the land, wind, and sun; (2) *use free energy* by understanding issues involved in sustainable design – the site, building envelope, materials used, indoor air quality, water management, and minimizing waste following some of the LEED® guidelines; and (3) *minimize fossil fuel energy* by using the most efficient technical systems possible.

The book's organization reflects this overall whole-system thinking design approach and gives students a simple framework for moving through a series of choices while learning to apply their design ideas. The intention of this book is to go beyond merely building sustainable buildings, but also to contribute to an attitude or habit of thought that is responsive to global environmental issues. Educators can use the material in this book to cover one semester as a seminar course in 16 weeks. The content is especially effective when accompanied by a studio design project as part of the learning process. The book's chapters correspond to the three-step approach outlined above.

At the forefront of change is the merging of two trends in sustainable design: *technological innovation* and a *cultural/formal aesthetic*. The resolution of

these movements can be examined in the work of Renzo Piano, who used high-tech innovations while reflecting the Kanak spirit of place in the design of the Jean-Marie Tjibaou Cultural Center, New Caledonia (see Figure I.1). He used high-tech environmental principles to create a center that is a combination of spirit and culture of place, appropriate sustainable passive and active technologies, and suitable use of materials, similar to the three-step approach shown in Figure I.2.

It is hoped that through the above example and many others provided in the text, this book will inspire students to use the tools needed to integrate sustainable technology as an indistinguishable part of *the aesthetic harmony of the built environment*.

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- [1] UN Brundtland Report: http://conspect.nl/pdf/Our_Common_Future-Brundtland_Report_1987.pdf
- [2] Christopher Hawthorne, Turning down the global thermostat, *Metropolis Magazine*, 2003.

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