ENERGY, ARCHITECTURE and the ENVIRONMENT

Architecture’s Role in a Changing World and
What Do We Do About It

Stephen Meder & Eileen Peppard
University of Hawaii Manoa
Office of Physical, Environmental and Long-Range Planning
School of Architecture
Center for Smart Building and Community Design
Climate Change and Sea Level Increase on Oahu

1 meter sea level increase
Airport & Downtown
1 Meter Sea Level Rise
“Unknowingly, the architecture and building community is responsible for almost half of all U.S. greenhouse gas emissions annually. Globally the percentage is even greater.”
Combining the annual energy required to operate residential, commercial, and industrial buildings along with the embodied energy of industry-produced building materials like carpet, tile, glass, and concrete exposes buildings as the largest energy consuming and greenhouse gas emitting sector.

Taken from: Architecture2050.org Source: U.S. Energy Information Administration statistics
The United States will also add 22 million fossil-fuel burning mini-power plants in new buildings over this period. The new buildings we construct each year not only consume electricity produced at a central power plant, but also directly burn oil, natural gas and/or propane in boilers, furnaces and hot water heaters. In fact, 58% of the site-use energy consumed in a building is burned at the site.
To accomplish this we are issuing the “2030 °Challenge” asking the global architecture and building community to adopt the following targets:

That all new buildings and developments be designed to use 1/2 the fossil fuel energy they would typically consume (1/2 the country average for that building type).

That at a minimum, an equal amount of existing building area* be renovated annually to use 1/2 the amount of fossil fuel energy they are currently consuming (through design, purchase of renewable energy and/or the application of renewable technologies).

That the fossil fuel reduction standard for all new buildings be increased to:

60% in 2010
70% in 2015
80% in 2020
90% in 2025
Carbon-neutral by 2030 (using no fossil fuel GHG emitting energy to operate).
TEAM
Sponsors

Vice- Chancellor’s Office for
Administration, Finance, & Operations

Assistant Vice- Chancellor’s Office of
Financial & Physical Management

University of Hawai‘i
School of Architecture

University of Hawai‘i
Sea Grant College Program

Center for Smart Building & Community Design

Developers

School of Architecture
Environmental Research & Design Lab (ERDL)

Advanced network
Computing Library (ANCL)

Geographic Information Systems Research Lab | Botany Dept.
Buildings with classroom spaces
BIM Project | ACA Models in GIS

3D view of classrooms in ArcScene GIS
BIM Project | Room Analysis With Hyperlinks

Hyperlinked to CIS’s webpage with specifics about room of interest.
BIM Project | ACA Models in GIS
Existing Conditions: Classroom Bldg Exterior

Ewa/Makai view from Legacy Path

Diamond Head/Mauka view from Correa Road

KUYKENDALL RENOVATION
CFPB PRESENTATION April 7, 2011

Benjamin Woo Architects
Lawrence Berkeley National Laboratories
Comparison of Three Options

- Existing Building
- Proposed Natural Ventilated Building
- Proposed Mixed Mode Building
- Proposed Fully Conditioned Building

KUYKENDALL RENOVATION
CFPB PRESENTATION April 7, 2011

Benjamin Woo Architects
Lawrence Berkeley National Laboratories
72% of classroom tower is naturally ventilated.
3rd & 4th corridor functions as a “transitional space”.
Dehumidified Air will be supplied over the newly created seating area in corridor. The entire corridor will function as “a transitional area” prior entering classrooms.

Dehumidification at night to minimize the mold growth cycle.
Thermal Comfort Preliminary Results – Natural Ventilation Option

Classroom Wing

33 hours

Office Tower

55 hours

North

South

North

South

more comfortable
comfortable
borderline
more uncomfortable
uncomfortable

KUYKENDALL RENOVATION
CFPB PRESENTATION April 7, 2011

Benjamin Woo Architects
Lawrence Berkeley National Laboratories
Thermal Comfort Preliminary Results – Mixed Mode Option

Classroom Wing

Office Tower

9 hours

0 hour

1 hour

3 hour

North

North

South

South

more comfortable

comfortable

borderline

more uncomfortable

uncomfortable
GIS Solar @ UH Manoa
Kapiolani Community College
Culinary Institute of the Pacific

View from the west
Second floor, view to the east