

Chapter 9. BUILDING DESIGN AND MANAGEMENT

I. Introduction

A. Background

1. “Buildings account for one-sixth of the world’s freshwater withdrawals, one-quarter of its wood harvest and two-fifths of its material and energy flows.”¹ Forty percent of the world’s energy consumption results from construction and operation of buildings. A high percentage of the resources that enter the global economy end up in the form of buildings or structures. Such utilization of resources strikes at the very core of the global effort towards sustainability.
2. Designing buildings and maintenance systems to be sustainable, green or ecological means maximizing available resources such as lighting and ventilation, reducing energy and water consumption and using materials that are renewable and reduce harmful effects to the environment.
3. The need for sustainable buildings or ‘green buildings’ is in direct conjunction with the need for sustainable urbanization. Green building is a growing practice in the US, Europe and other regions, beginning with the first EcoHomes constructed nearly two decades ago, to today’s “environment cities”. Increasingly being applied around the world, the move towards green buildings is not just a trend, but part of a greater realization that designing without regard for sustainability results in significant waste generation and rapid loss of limited resources.
4. The adoption of a “green” approach to building design and management entails concerted efforts of the government, business community and civil society. Institutional, social, economic and cultural foundations should be in place for green building and management to succeed.
5. In the Philippines, active collaboration is necessary at the local and national levels. Republic Act No. 7160, or the Local Government Code of 1991, has given local government units (LGUs) the authority to impose regulatory functions that impact on sustainability, such as the enforcement of the National Building Code, the approval of subdivision plans, etc.
6. As the first step in achieving sustainability, a national roadmap for establishing a program for sustainable design and management of buildings is needed. The roadmap should focus on developing markets for green buildings by developing institutions that foster sustainability, providing new technological solutions, scaling up existing proven technologies and developing new business models. It should promote strategic local and international partnerships.
7. To be able to design and manage green buildings, information dissemination and market encouragement is a must. In this regard, the role of LGUs is crucial.

¹ *Sustainable Technical Manual: Green Building Design, Construction and Operation*. Public Technology, Inc., U.S. Green Building Council, 1996.

B. Objectives

8. This chapter aims to:
- provide LGUs with a know-how on sustainable building design and management;
 - identify issues and opportunities for green building design and management;
 - present various case studies from countries practicing sustainable building design and management;
 - suggest possible programs, projects and initiatives that can facilitate the adoption of sustainable building design and management in the Philippines.

C. Scope and Limitations

9. This chapter focuses on how LGUs can attain sustainability through building design and management. It emphasizes on green buildings as a way to achieve the vision of sustainable development.
10. Due to limited data on green building design and management in the Philippines, this chapter shall be guided by foreign practice applied in the Philippine context.

D. Significance

11. This chapter is useful to all parties concerned with the design, construction and management of buildings. It can be a timely guide in the assessment of building design and management.
12. Of particular interest is the development of criteria for sustainable buildings, in view of the scarcity of resources, and the environmental deterioration caused by rapid urbanization and unplanned development.
13. It will lead to the implementation of sustainable building design and management as a means to attaining the vision of sustainable Philippine cities 2030.

II. Green Building Basics

14. This section describes the elements for a sustainable building design and management. It answers the questions: “What makes buildings green?” and “Why design and manage green buildings?” It includes definitions, benefits, and elements of green buildings.

A. Definition of Green Buildings

15. *“Green” or “sustainable” building involves an integrated and multi-disciplinary approach to a building project and its components and designs by analyzing the building on a full life-cycle basis. It is a “cradle to grave” approach that encompasses a building’s total economic and environmental impact and performance, from material extraction, product manufacture and product transportation, building design, construction and maintenance, building reuse or disposal.*

B. Benefits

16. ***Environmental.*** Using environmentally sound practices, green buildings provide direct environmental benefits to people. Green buildings counteract pollution, and provide proper management of waste, thereby ensuring sustainability of finite resources for future generations.

17. ***Health.*** Health and comfort are among the primary concerns of sustainable building design and management. Studies have shown that green buildings which use natural lighting, minimal chemicals, and other green elements have positive impact on the health and comfort of the occupants. For instance, the use of environmentally friendly, non-toxic construction materials and the reduction of harmful refrigerants help minimize the incidence of asthma and other toxin-induced illnesses.

18. Consequently, health- and comfort-related benefits derived from green buildings lead to higher productivity of employees in such buildings. As such, private companies are guaranteed higher profitability while public service agencies are ensured of faster and more efficient delivery of essential services.

19. ***Economic.*** Sustainable building practices allows for more rational and prudent use of resources such as money, materials and labor. Known to be of high quality, green buildings entail relatively minimal operations and maintenance costs.

20. Viewed over a 30-year period, initial building costs account for approximately 2% of the total, compared to 6% for operations and maintenance costs. Green building measures taken during construction or renovation can result in significant building operational savings.²

21. Furthermore, green buildings offer the following advantages:

- local economic development opportunities (i.e. new jobs for green building consultants, manufacturers, etc);
- increase in consumer choice;
- increase in value to consumers of companies and professionals that use green building practices and technologies;
- competitive advantage;
- higher market value;
- reduced capital and operating costs;
- garner free press and differentiating one's product in the market;
- the ability to stay ahead of the curve on government and industry regulations;
- new business opportunities;
- enhancement of the community;
- satisfaction in doing the right thing

C. Elements of Green Buildings

22. ***Siting.*** Green buildings are oriented on the lot to maximize natural lighting and natural ventilation, and to minimize heat. Locating projects near transportation lines and catchment areas minimize energy use.

² Rose, Jonathan. Urban Land Magazine, pp. 68-80. June 2005.

23. **Energy Efficiency.** All possible measures are taken to ensure that the building's use of energy is minimal. Cooling and lighting systems use methods and products that conserve or eliminate energy use.

24. **Material Efficiency.** All possible measures are taken to use building materials and products that minimize destruction of the global environment. Wood is selected based on non-destructive forestry practices. Other materials and products are to be considered based on the toxic waste output of production.

25. **Water Efficiency.** Water saving is important since fresh water resources in many areas are being rapidly depleted by development, reservoirs are shrinking and aquifer depths are dropping. Thus, it is important to lower water consumption through low-flush toilets, low-flow showerheads and faucets, and washing machines that have "water-miser" features

26. **Indoor Environmental Quality.** The most important part of a structure is its indoor space because it is here where the interaction of the inhabitants and his physical shell interact. The materials used and the orientation of the structure with regards to its environment affects significantly the indoor environmental quality of a green building.

27. **Waste Reduction and Recycling.** Waste management is given great importance and has the element of recycling. Used water (called gray water) is used for flushing toilets and irrigation. Construction materials and furniture are reused or recycled.

28. **Culture-Oriented.** It is also important to consider the behavior and values of its inhabitants in the design of the green building. In the Philippine context, values are reflected most in the family and the community.

III. Green Building Toolbox

29. This section covers pre-design and design stages of green building, environmentally sound construction methods, renovations, retrofitting, operation and maintenance.

A. Pre-Design Phase

30. This is the first step in the building design process, where:

- green project goals are established;
- processes to achieve these goals are defined;
- clear understandings of the expected results are developed.

31. An "integrated building design" is a cornerstone for developing sustainable buildings:

- Building designers can obtain the most effective results by designing various building systems and components as interdependent parts of the entire structure.
- The team approach to design and construction ensures the development and construction of an integrated green building process.
- All parties on the design team must commit themselves to the sustainable goals of the project.
- To achieve a multi-disciplinary approach:
 - Team members should be made aware of the benefits.
 - Team members should look beyond their own disciplines.

- This may exist as part of a building owner’s operating policies or may be developed for a particular construction project.
32. There is a need to develop environmental design guidelines, which include:
- vision and goals;
 - green design criteria
 - prioritization in the context of the project’s budget and scheduling constraints;
 - justification of green measures by using the projected financial savings.
33. Green building requirements take the following into account:
- a clear understanding of client’s expectations of the building;
 - a general and a room-by-room description of the project;
 - a consideration of the broader community context of the building and strive to reflect local design as influenced by cultural and climatic factors
34. The project and building construction budget should include:
- relevant design fees and construction costs;
 - doing life-cycle cost analysis;
 - seeking advice of architects, engineers and other consultants who practice or specialize in green architecture, systems and technologies;
 - providing budget contingencies for additional research and analysis of options.
35. When selecting the design team:
- The design and construction team to be put up should use the “Whole - Building Integrated Design Approach”.
 - Their scope of work should be determined and their qualifications obtained.
 - There should be an appropriate method for contractor selection – pre-qualifying on the basis of interest and experience in green building.
 - A partnership-oriented process between the client and design team should be implemented.

B. Design Phase

36. In the design phase of the project, the following have to be taken into consideration.
37. SITING
- Maximize natural daylight and minimize heating by orientation to the sun.
 - Utilize existing infrastructure (utilities and transportation).
 - Minimize impervious areas on-site to reduce run-off.
 - Reduce heat island effect through landscaping.
 - Encourage infill and mixed use development.
 - Avoid use of pesticides and other chemicals for soil treatment that may leach into the groundwater.
 - Situate a building to benefit from vegetation.
 - Protect trees and topsoil during sitework.
 - Provide responsible on-site water management.

38. WATER EFFICIENCY

- Use low flow, water efficient fixtures, waterless urinals, dual flush toilets, low flush toilets, etc (About 75% of water households use in their homes is used in the bathroom).³
- Check and repair leaks.
- Use native plants to eliminate/reduce irrigation needs.
- Catchment of rain water for landscaping, toilets, etc.
- Collect rain water for rock garden.

39. ENERGY EFFICIENCY

- Use renewable energy (e.g. solar, wind, geothermal).
- Use energy efficient fixtures.
- Use insulating materials, glazing, etc, effectively.
- Use energy modeling to optimize heating/cooling systems.
- Use biogas digester instead of septic tank. This will reduce waste and produce fertilizer and methane gas for cooking.

40. MATERIALS EFFICIENCY

- Use local materials.
- Use recycled materials.
- Reduce and reuse construction waste.
- Store and collect recyclables.
- Use durable materials.
- Reuse existing building shell.
- Use energy-efficient fluorescent lamps.
- Use light-colored roofs.
- Use green roofs (organic roof with plants on top of it).

41. INDOOR ENVIRONMENTAL QUALITY

Indoor environmental quality increases occupant productivity and satisfaction. It can be achieved through the following:

- use of low-emitting materials (adhesives, sealants, paints, carpets, composite wood products);
- maximized percent of daylighted spaces;
- maximized ventilation performance;
- management of indoor air quality during construction
- monitoring of carbon dioxide emissions (use plants to reduce carbon dioxide);
- use of high ceilings and air purifiers;
- use of natural materials like stones and wood that do not have VOCs;
- use of shades for coolness of the interior;
- provision of wide enough eaves that provide permanent shade especially in the west windows and walls;

³ Charles E. Buban. "Creating Low-Energy Homes", Philippine Daily Inquirer, August 16, 2006.

- minimizing windows on west walls to prevent low morning and afternoon sun heating up the house

42. WASTE MANAGEMENT

- Stormwater management
 - Sidewalks, driveways and parking lots should be sloped toward open space, where water can infiltrate into the ground rather than go toward drains.
 - Rainwater and graywater can be used for:
 - landscape irrigation systems
 - washing cars
 - cooling towers (largest single user of water in commercial and industrial buildings)
 - toilets
- Wastewater management:
 - water reuse by irrigation and soil absorption systems.
- Issues and opportunities:
 - Communities must revise their regulations/policies regarding wastewater.
 - Who is going to own and operate these cluster wastewater systems?
 - The construction, operation, and maintenance of these publicly owned systems can be paid for by user fees, property taxes, grants, bonds and other special obligation funds.

43. CULTURE-ORIENTATION

- Elements of Filipino architecture like wide windows, the ventanilla under windows and high-pitched roofs are green building design features that reduce energy use by providing natural ventilation and lighting.
- Behavior and values should be taken into account depending on the practices in the locality. (e.g. location of toilet, storage, extended families, etc.)

44. CONSTRUCTION/RENOVATIONS/RETROFITTING

- Staging plan for the project should be made.
- Isolate construction sites.
- Schedule noxious work to maximize time and reduce waste.
- Efficient use of energy in construction sites.
- Efficient use of water.
- Recycle construction debris.
- Test and inspect for potential contaminants.
- Use of recycled products.
- Track actual waste production

45. POST-CONSTRUCTION/OPERATIONS/MAINTENANCE/OCCUPANCY

- building inspection;
- building monitoring;
- water treatment;
- integrated waste management program;
- pest control;

- avoid asbestos, lead paints, PCB in the lighting ballast, PCB transformer fluid, mercury-containing fluorescent lamps;
- green housekeeping;
- regular cleaning;
- continuous education of staff and other users of the building.

IV. Rating Tools and Performance Standards

46. This section enumerates and discusses the various sustainability rating tools used abroad.

- These tools are necessary to enable environmental effects of urban and building schemes to be demonstrated or compared.
- They permits planning authorities to choose from options, set targets and establish goals.
- They use diverse technologies – makes adoption of any one scheme difficult; no single one can apply to all circumstances.

A. LEED (*Leadership in Energy and Environmental Design*)

47. This is a voluntary, consensus-based national (US) standard for developing high performance, sustainable buildings. The rationale for its creation is as follows:

- to define "green building" by establishing a common standard of measurement;
- to promote integrated, whole-building design practices;
- to recognize environmental leadership in the building industry;
- to stimulate green competition;
- to raise consumer awareness of green building benefits;
- to transform the building market.

48. LEED provides a complete framework for assessing building performance and meeting sustainability goals. Points are awarded for each area of performance:

- sustainable sites, including site selection, transportation, site disturbance, stormwater management and landscape issues;
- water efficiency, including landscape and wastewater issues;
- energy and atmosphere, including energy performance and renewable energy use issues;
- materials and resources, including reuse of materials, waste management and recycling;
- indoor environmental quality, including air quality, comfort and daylight issues;
- innovation and design process.

49. The total score corresponds to a rating in a scale of CERTIFIED, SILVER, GOLD or PLATINUM.

50. Standards include:

- LEED-NC: new commercial construction and major renovation projects
- LEED-EB: existing buildings

- LEED-CI: commercial interiors
- LEED-CS: core and shell construction
- LEED-H: homes
- LEED-ND: neighborhood development

51. There are some issues with LEED:

- Credits do not relate to a verified measured impact.
- There are inconsistencies in value weighting between categories.
- The process is long.
- Different buildings require different guidelines.

B. BREEAM (*BRE's Environmental Assessment Method*)

52. BREEAM assesses the environmental performance of both new and existing buildings. It is used by UK's construction and property sectors as the measure of best practice in environmental design and management.

53. Performance of buildings are assessed in the following areas:

- Management – overall management policy, commissioning site management and procedural issues
- Energy use – operational energy and carbon dioxide issues
- Health and well-being – indoor and external issues affecting health and well-being
- Pollution – air and water pollution issues
- Transport – transport-related CO₂ (carbon dioxide) and location-related factors
- Land use – greenfield and brownfield sites
- Ecology – ecological value conservation and enhancement of the site
- Materials – environmental implication of building materials, including life-cycle impacts
- Water – consumption and water efficiency

54. Credits are awarded in each area according to performance and added to produce an overall score corresponds to a rating, such as PASS, GOOD, VERY GOOD or EXCELLENT.

55. Coverage:

- Offices
- Homes (ecohomes)
- Industrial units
- Retail units
- Schools
- Other building types (leisure centers, laboratories, etc)

56. Issues with regards BREEAM:

- Complex nature, many variations
- Includes useful, tabulated checklist
- Must be carried out by a qualified assessor

C. Green Building Challenge: GBTool

57. GBTool is a spreadsheet-based assessment method not yet intended for end users are still under study.

D. Australian Building Greenhouse Rating Scheme

58. This scheme is aimed at arriving at greenhouse gas emission in terms of normalized CO₂ emissions per square meter of building floor area. It is administered by official assessors. A version is available for initial personal evaluation. Rating is from 1 to 5 stars.

E. Sustainability Checklist for Developments

59. The following checklist can also be used to rate sustainability:

- Land use, urban form and design
- Transport
- Energy
- Buildings

F. Philippine Green Building Standards or Code

60. The Philippines currently does not have a code for green buildings. The Department of Energy (DOE) is, however, preparing a manual intended to become a referral code.

V. Material Technologies

61. This section enumerates the construction materials and systems that can be used to design and manage sustainable buildings.

A. Reducing Energy Use

62. Cooling loads can be reduced through:

- building orientation;
- high quality windows;
- insulation.

63. Use of electrical power can be reduced through:

- fluorescent lamps;
- efficient air cooling and airconditioning systems;

64. Following are alternative sources of energy:

- solar;
- wind;
- geothermal.

B. Conserving Water

65. We can conserve water by using:
- dual-flush toilets;
 - under-sink flow restrictors
66. Some ways of cutting down on water consumption:
- native landscaping;
 - drought-tolerant plantings.
67. Following are some products that don't release significant pollutants into the building:
- no VOC paints;
 - formaldehyde-free cabinets;
 - non-toxic caulks, sealers and adhesives;
 - CRI Green Label carpets and pads
68. And here are some products that block the spread or remove indoor pollutants:
- duct mastic;
 - effective ventilation and equipment

C. Conserving Natural Resources

69. We can conserve our natural resources by using products with recycled content:
- carpet, tile, wallboard;
 - wood replacements made from polystyrene.
70. Use products made from agricultural waste material, like rice hulls.
71. Reducing material use also conserve natural resources:
- drywall clips;
 - concrete pigments that turn concrete slabs into finished floors
72. Use products made from renewable materials, like:
- bamboo flooring;
 - natural linoleum;
 - cork and textiles from wool;
 - organic cotton.
73. Use wood products from sustainably managed forests.
- Use lumber from independently certified well-managed forests.
 - Avoid lumber products produced from old-growth timber unless they are certified.
74. Use salvaged products. We can reduce landfill pressure and save natural resources by using salvaged materials: lumber, millwork, certain plumbing fixtures, and hardware, for

example. Make sure these materials are safe (test for lead paint and asbestos), and don't sacrifice energy efficiency or water efficiency by reusing old windows or toilets.

D. Reducing the Building's Impact on the Community

75. Some ways to lessen the building's impact on the community:

- Mitigate effects of stormwater run-off (e.g. green roofs).
- Provide easy access to transportation.
- Do not require chemical pesticides or treatment, like,
 - plastic
 - lumber.
- No PVC.

VI. Incentives

76. This section identifies the ways to promote sustainable building design and management. It enumerates the various approaches to involve various sectors of society.

- National government to provide financial subsidies.
- Sponsor national pilot demonstration projects on Green Building Technologies.
- Orchestrate agreements with building industry that set Sustainable Building targets.
- Recognition through awards and citations

77. An example of awards that recognize sustainable building designs is the ASEAN ENERGY AWARDS. The Association of Southeast Asian Nations or ASEAN and the Department of Energy of each member country have embarked on a ten-year program to increase awareness of energy efficiency in the region. The ASEAN Energy, now on its 7th year, gives recognition to the region's most energy efficient and green buildings. These awards are given in four different categories, namely: New and Existing Buildings; Retrofitted Buildings; Tropical Buildings; and Special Submissions.

VII. Life Cycle Analysis of Design

78. This section provides the process of assessing the cost-effectiveness of sustainable building design and management through the life-cycle cost method.

79. Life Cycle Assessment is a concept and method to evaluate the environmental effects of a product or activity holistically, by analyzing the entire life-cycle of a particular product, process or activity. It seeks to examine and analyze all of a building's life span; its planning, design, construction and operation, reuse and demolition.

80. Life-cycle cost method is a way of assessing total building cost over time. It consists of:

- initial costs (design and construction);
- operating costs (energy, water/sewage, waste, recycling, and other utilities);
- maintenance, repair, and replacement costs;

- other environmental or social costs/benefits (impacts on transportation, solid waste, water, energy, infrastructure, worker productivity, outdoor air emissions, etc).

81. Life-cycle cost method calculates costs over the useful life of the asset. It is incorporated at the project's conceptual design phase with the assistance of an integrated team of professionals.

82. The integrated systems approach takes into consideration the adaptability of the building to its:

- occupants;
- environment;
- community.

83. The design process should encourage refurbishment, alteration or demolition, recycling and reuse. Life cycle assessments provide the decision makers with the information on alternatives.

84. Life cycle assessment for building materials is a cradle-to-grave systems approach for understanding the environmental consequences of technology choices. It is based on the belief that all stages in the life of a material generate environmental impacts and must, therefore, be analyzed, including raw material extraction, processing, intermediate materials, manufacture, installation, O&M, recycling and waste management.

85. It involves:

- Scoping – what is the purpose? What decision does it mean to support?
- Inventory analysis – identifies and quantifies the environmental inputs and outputs associated with a material
- Impact valuation – synthesizes the environmental impacts by combining them with stakeholder values
- Improvement assessment – identifies and evaluates opportunities for making changes in the product life cycle which improve its cradle-to-grave environmental performance

86. Life-cycle-cost method for building materials:

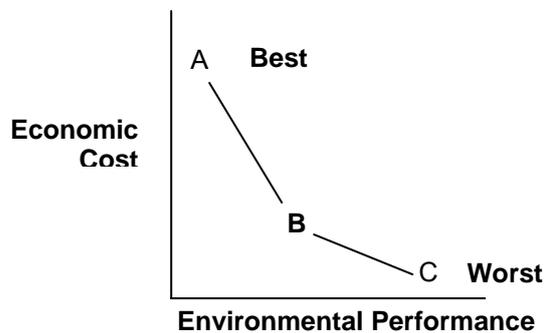
- sums over a given study period the costs of an investment;
- includes the costs of initial investment, replacements, operations, maintenance and repair, and disposal;
- essential to use the same approach for each alternative whose LCCs are to be compared;
- study period varies according to stakeholder perspective.

87. Distinguishing between life cycles using LCA and LCC:

- LCA – environmental life cycle concept: begins with raw materials extraction and ends with recycle, reuse or disposal
- LCC – building life-cycle concept: begins with installation in the building and lasts for the duration of the LCC period

88. Balancing Environmental and Economic Performance

Figure 9.1 Economic Cost and Environmental Performance



89. A 2003 study conducted for the California Sustainable Building Task Force showed that an initial increase in upfront costs of approximately 2% for green design will yield lifecycle savings of more than 10 times the initial investment, or 20% of total construction costs (based on a conservative estimate of a 20-year building life).

VIII. Case Studies

90. This section lists actual green building projects in the U.S., Europe, Africa, and Asia.

A. Southeast Asia

91. Following are some of the winners of the ASEAN Energy Awards:

- Roof of Performing Arts Center (Theater on the Bay), Singapore — 10,000 pieces aluminum and glass, solar studies, building envelope;
- 6750 Ayala, Philippines — Double glazed windows gets sun in without getting heat in;
- RCBC Plaza, Philippines — Chiller selection, lighting fixtures;
- Peninsula Bangkok Hotel, Thailand — Extra low voltage system;

B. Europe

92. In the Netherlands, where ecological building features have become a common practice, significant experimentation with sustainable development projects began in the early 1990s, which are partially funded by the government. The first wave of experimentation included residential projects in Ecolonia (Alphen a/d Rijn), Morra Park (Drachten), and Ecodus (Delft). These projects demonstrated a wide range of ecological building ideas and techniques. These include, among others, greenroofs on some units; solar glass rooms; energy-conserving features; the use of recycled building materials; solar hot water heating units; rainwater collection; appropriate building orientation; etc.

93. Other larger institutional structures designed and built on principles of sustainability exist in Queens Building (in Leicester), the ING-headquarters (in Amsterdam) and SAS-headquarters (in Stockholm). The ING-headquarters' results are spectacular. There has been a dramatic decrease in energy consumption. And since employees enjoy working in

this green structure, employee absenteeism was reduced, thereby increasing productivity. On the other hand, the Queens Building at De Montfort University in Leicester was once branded as “the largest naturally ventilated building in Europe.”

C. Philippines

94. These are some green building projects in the Philippines:

- Alabang Town Center — utilization of passive cooling in some retail areas and the provision of large open spaces;
- Folk Arts Theater — passive cooling.

D. U.S.A.

95. TESCO, the world’s third largest retailer, is investing in environmental technologies that help reduce the amount of energy they use by 50%, compared with 2000 levels, by 2010.

96. At ECOSTORE:

- Cash registers are powered by rooftop wind turbines.
- Skylights reduce the use of light bulbs.
- Photovoltaic solar cells on the roof help power bakery’s oven.
- Toilet water is collected from raindrops outside.

97. Brewery Blocks is a green mixed use project in Portland, Oregon. The 1.7 million-square foot project generates electricity using photovoltaic power then sells it back to the utility when exceeds demand, turning the meter backwards when occupants are away. It is estimated that green elements, which represented about 1% of the total project cost, will pay themselves in about 8.5 years. Among these green elements:

- window glazes;
- non-toxic building materials.

98. At Klamath Falls, Oregon, curved window façade floods the lobby area with natural daylighting.

99. The Montgomery Park Business Center in Baltimore, Maryland has a 20,000-sq.foot extensive green roof.

100. The Philip Merrill Center in Chesapeake, Maryland, uses 90% less water than a conventional office of the same size.

101. The Hearst Corporation Headquarters in Manhattan, New York City is the first office building in New York City to earn a Gold Rating under the Leadership in Energy and Environmental Design (LEED) by the U.S. Green Building Council, which is recognized as the nation’s leading authority on environmentally sensitive design and construction.

102. At the Bank of America Tower in Times Square, New York City:

- Drops of rain will be captured for use.
- Scraps from cafeteria will be fermented in the building to produce methane as a supplementary fuel for a generator intended to produce more than half the building’s electricity.

- The waste heat from the generator will both warm the offices and power a refrigeration plant to cool them.

D. Zimbabwe

103. The cooling system of the Eastgate Complex in Harare, capital of Zimbabwe, is modeled after African termite mounds, in which air is cooled below the earth and then drawn upward through chimneys, forcing out hot air.

IX. Critical Issues, Challenges and Opportunities

104. ECONOMIC/FINANCIAL

- Some aspects of design entails little or no initial cost including site orientation and window and overhang placement.
- "Right sizing" of infrastructure and mechanical systems reduce costs.
- Some benefits are difficult to measure and cannot be predicted accurately.
- Long-lasting nature of sustainability issues and activities demand that time periods over which investments is analyzed are longer.

105. DESIGN APPROACH

- Most buildings are designed as a settlement between the various designers, each defending their own turf.
- Whole Building or Integrated Design Approach should be used.
 - It should be designed as a team and not by different uncoordinated professionals or consultants.
- Greenness of location means:
 - accessibility to basic services;
 - site orientation to maximize natural light and ventilation.

106. SOCIAL ACCEPTABILITY

- Lack of awareness and information
 - lack of information among communities, especially in the provinces.
- Sustainable development has not become the standard practice: Sporadic, disconcerted efforts have failed to mobilize the market.
- There is no well defined institutional setup to support the green building movement: In most developing countries there is little technical support and information available to the professionals engaged in the building industry, and consumers at large.

107. MARKET

- Preoccupation of owners to focus on location as the prime, and sometimes only relative determinant of value.
- Lack of value placed on environmental design quality by purchasers.
- The scale of green building operation limits mainstream market participation: Most of the green building projects are small-scale and limited in scope. To scale up green buildings, it is important to involve the design and construction

industry which understands the business processes behind the scale up, and has the knowledge of the building sector.

108. PRESENCE AND ADAPTABILITY OF TECHNOLOGY

- Green technologies are usually after-thoughts. This leads to bad aesthetics and inefficient performance.
- New technologies require approval by government bodies.

109. IMPLEMENTATION

- To successfully implement green building design and management, a coordinated effort of government and the private sector is needed.

X. Suggested Programs and Initiatives

110. Following are some steps the government can take:

- Make local versions of assessment and rating schemes for new development and redevelopment.
- Provide direct and indirect financial encouragement for green buildings, like:
 - rebates on taxes;
 - grants;
 - low interest rate loans.
- Impose taxes on non-sustainable buildings.
- Fund a partnered program to determine the business benefits from sustainable construction.
- Local government authorities should utilize quality of life indicators to measure social, economic and environmental issues, and use these as a tool to develop community strategies.
- Own and maintain a wide range of buildings and facilities that are energy efficient.
- Provide a variety of administrative, regulatory and financing tools that can help local governments develop and operate building resources in a sustainable manner.
- Create policies for municipal procurement, contract specifications, building performance and building codes regulating community standards; enact resolutions, training and education programs and ordinances.
- Create community boards and commissions to create green buildings.
- Provide economic incentives for green buildings.
- Have capability and experience to create model programs and buildings, which set examples for resource-efficient guidelines.
- Examine local government policies and procurement procedures for inclusion of green building measures.
- Develop a demonstration green building project.
- Require the government building projects to incorporate renewable energy and energy efficient systems, indoor-air-quality guidelines and waste and water efficiency measures.
- Survey and learn from other countries with green building projects,
- Develop a green building awards program; co-sponsor the program.
- Survey and publish the community's green building resources.
- Initiate a conference series,
- Assemble a green building resource library.

111. The business community/private sector, on the other hand, could:

- Publicize benefits of green buildings and initiatives of organizations to promote them. This will lead to public awareness and create demand for green buildings.
- Training programs to educate architects, engineers, contractors, developers regarding practices required of green design and delivery of projects.
- Initiatives that provide global applicable guidelines for reporting sustainability which attempts to bring together economic, environmental and social features.
- The United Architects of the Philippines (UAP), the Philippine Institute of Architects (PIA) and other related organizations should be involved in the efforts with regards to sustainable design and management.
- The construction sector could undertake sustainability accounting to identify, evaluate and manage environmental and social risks.

112. Finally, here are some steps civil society could take:

- Organizations can provide communities, developers, investors and homebuyers with information about building green homes (UL June 2005).
- Best practice procedures could be promoted through
 - guidebooks;
 - factsheets;
 - provision of data on examples of good practice.
- A Guideline for Energy Conserving Design of Buildings should be devised and followed.

XI. Action Agenda

113. We need to have a Green National Building Code. A committee has to work on the adoption of sustainability to building design and maintenance.

114. The existing Architectural Curriculum has to be revamped, to include Integrated Energy Building Design.

115. National Sustainable Building Action Plan: Targets and Incentives

- Sustainable Building Information Center
- Demonstration Projects
- Covenants with Social Housing Associations
- Contracts between municipalities and national government
- National Government Building Agency for Green Buildings to promote sustainable design
 - Adopt a resolution or policy.
 - Institute life-cycle-cost analysis
 - Build local public support.
 - Conduct a sustainable design forum.
 - Establish pre-design green team
 - Conduct an environmental scan.
 - Conduct baseline analysis.
 - Design a sustainability matrix.

REFERENCES

A. Internet Links

- BREEAM (BRE's Environmental Assessment Method): www.breaam.org
- Green Buildings BC: www.greenbuildingsbc.com
- Green Globes – Environmental Assessment for Buildings: www.greenglobes.com
- U.S. Green Building Council: www.usgbc.org

B. Books

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C. Periodicals

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- Charles E. Buban, "Creating Low-Energy Homes", Philippine Daily Inquirer, August 16, 2006.
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D. Product Directories

E. Interviews

Survey: a) NREA
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c) PIA -Philippine Institute of Architects

F. Seminars

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