Road to Energy Efficient and Environmentally Friendly Affordable Construction Systems

المجلس المصري للعمارة الخضراء
EGYPTIAN GREEN BUILDING COUNCIL

EDITORS

Prof. Dr. Moustafa El-Demirdash
Chairman of the Board, HBRC

Prof. Dr. Ayman Mosallam
University of California Irvine, USA

Prof. Dr. Heba Bahnsawy
Vice Chair for Research & Support Staff Affairs, HBRC

Prof. Dr. Sherif Fakhry,
Vice Chair for Research & Studies Affairs, HBRC

Prof. Dr. Khalid El-Zahaby
Coordinator, HBRC



HBRC
المركز القومي لبحوث الإسكان والبناء

UCIrvine



Kickoff Meeting & Round Table on Egyptian Green Building Council (EGBC) Initiation

Cairo, Egypt--January 25-27, 2009



UCIrvine

Egyptian Green Building Council, EGBC

Council Chairman, Minister of Housing, Utilities and Urban Development

EGBC Members

Ministry of Housing, Utilities and Urban Development

HBRC Members

HBRC Chairman
(Vice Council Chairman)

HBRC Vice –Chairman for Member Affairs

HBRC Vice –Chairman for Researches & Studies

-Prof. George Bassili Hanna

-Prof .Khalid El-Zahaby

Egyptian Experts

Prof. Mostafa Tolba,
Former Under –Secretary General Of the United Nations, Executive Director of UNEP

Prof . Amr Ezzat Salama,
Former Minister of Higher Education
Egyptian Representative, AUC

Prof. Abu Zeid Rageh
Former Chairman, HBRC

Prof . Hussein Abbas,
Emeritus Professor and Consultant Engineer
Former Dean of Engineering Al-Azhar Univ.

Prof . Ayman Mosalm,
Professor Civil Engineer and Consultant Engineer

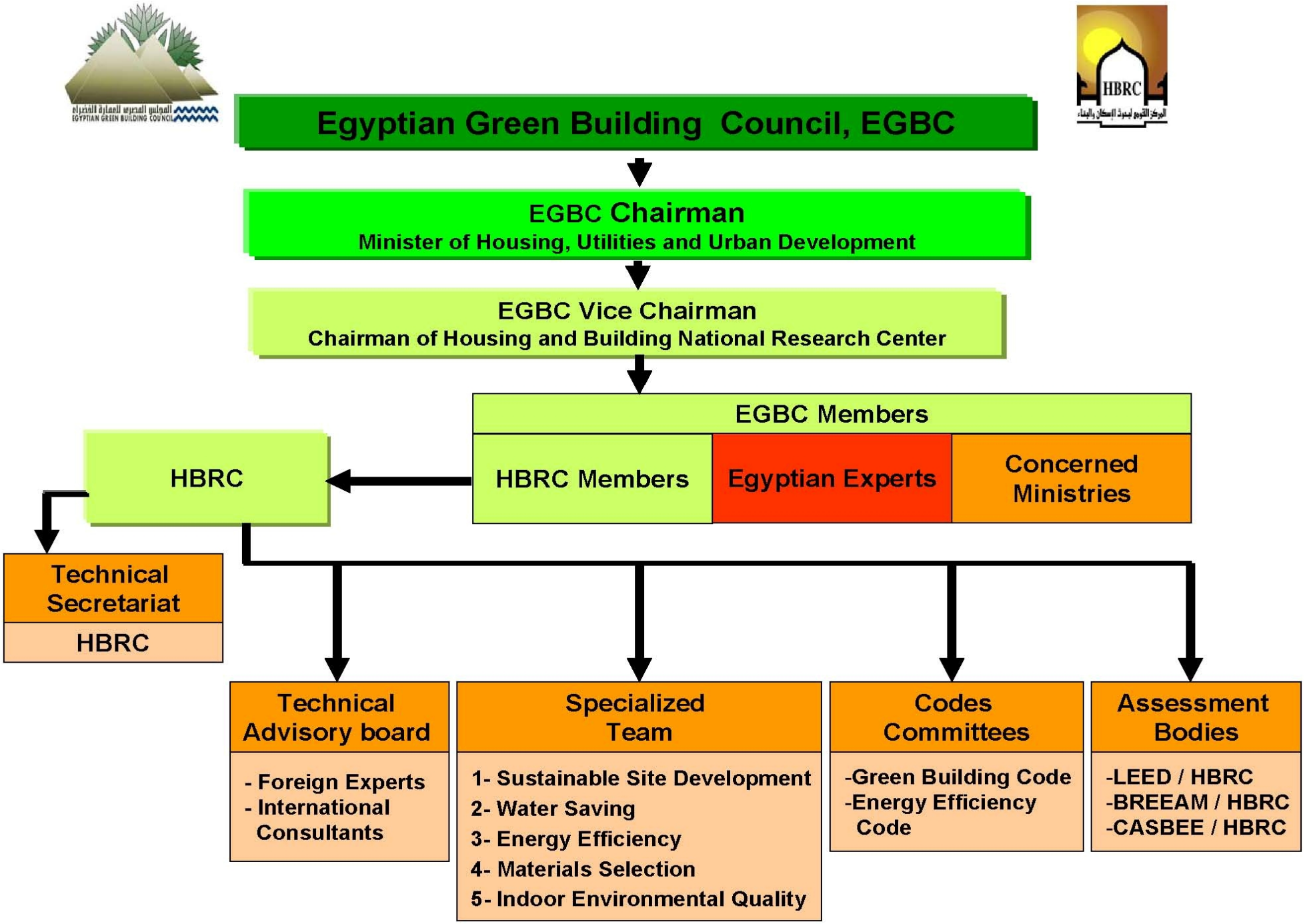
Prof. Mohamed Abd El-Fatah Alkasas
Emeritus Professor, Cairo univ.

Concerned Ministries

- Representative from Ministry of state for Environment
- Representative from Ministry of Electricity and Energy
- Representative from Ministry of Water Resources and Irrigation
- Representative from Ministry of Agriculture and Land Reclamation
- Representative from Ministry of Industry and Commerce
- Representative from Ministry of Petroleum
- Representative from Ministry of Health and Population
-Representative from Ministry of Higher Education

HBRC Technical Secretariat

-Prof. Manal El-Batran
-Ass. Prof. Doaa El- Sherif
-Dr. Medhat Khorshed
-Eng. Bastamy El-Tony


Egyptian Green Building Council, EGBC
EGBC Chairman
Minister of Housing, Utilities and Urban Development
EGBC Vice Chairman
Chairman of Housing and Building National Research Center
EGBC Members
HBRC Members
Egyptian Experts
Concerned Ministries
HBRC
Technical Secretariat
HBRC
Technical Advisory board
- Foreign Experts
- International Consultants
Specialized Team
1- Sustainable Site Development
2- Water Saving
3- Energy Efficiency
4- Materials Selection
5- Indoor Environmental Quality
Codes Committees
-Green Building Code
-Energy Efficiency Code
Assessment Bodies
-LEED / HBRC
-BREEAM / HBRC
-CASBEE / HBRC

ABOUT THE WORKSHOP

GENERAL

The main objective of this kick-off meeting is to draw the roadmap and to establish the foundation for the Egyptian Green Building Council that shall regulate the Green Building initiative leading to the establishment of the first Egyptian Green Building Code and founding the national green building assessment system. Experts from HBRC, American Society of Civil Engineers (ASCE), US Green Building Council (USGBC), International Code Council (ICC), International Accreditation Service (IAS), and national and international institutions connected to sustainable infrastructure will participate in this event. Lectures and panel discussions on different topics related to the Green Building initiatives, Green Building Codes, Green Construction and green buildings assessment systems will be presented. In the last day of the event, a team of international experts will present a review summary of different topics related to LEED certification exam as an example of green building assessment.

VENUE

The EGBC kickoff meeting will be held at the Ministry of Housing, Utilities and Urban Communities (HUUC) in Cairo under the presidency of his H.E. Engineer Ahmed El Maghrabi. The technical program and review session will be held at the Housing & Building National Research Center (HBRC).

ABOUT THE SPONSOR

HBRC is the responsible authority for issuing the Egyptian National Building Codes and Technical Specifications per the Presidential decree No. 63/2005. HBRC is also responsible for carrying out national research projects including projects related to green building construction including the development of innovative environmentally-friendly and energy-efficient construction systems, recycling of organic and synthetic solid wastes in construction applications, etc. In addition to its highly qualified staff of researchers, scientists and professional engineers and architects, it owns internationally recognized state-of-the-art accredited laboratories. This renders HBRC to be the most eligible organization to embrace the formation of the EBGC, the Green Building Code, and subsequently the National Green Construction Assessment Certification.

ABOUT COLLABORATOR

The Civil & Environmental Engineering Department and Structural Engineering Test Hall at the University of California, Irvine (UCI) is promoting the green construction through the formation of University/Industry Sustainable Infrastructure Center. Currently, several research topics related to green buildings and the use of recycled materials in construction are underway.

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TECHNICAL TOPICS

- Built Environment,
- Green Building Code Development,
- Use of Renewable Energy in Construction,
- Environmental Aspects of Green Construction,
- Training Program on Green Topics,
- Legislation and its implementation in green construction.

MINISTRIES RELATED TO GREEN CONSTRUCTION

- Ministry of Housing, Utilities and Urban Development
- Ministry of State for Environmental Affairs
- Ministry of Electricity and Energy
- Ministry of Trade and Industry
- Ministry of Petroleum
- Ministry of Agriculture and Land Reclamation
- Ministry of Water Resources and Irrigation.
- Ministry of Health and Population
- Ministry of Higher Education

INTERNATIONAL PARTICIPANTS

Mr. Sam Ali, PE, LEED AP:
Is the Vice President of Psomas Company and the Chairman of the American Society of Civil Engineers (ASCE) Sustainability Committee.

Mr. Istabraq Al-Janabi, MCE, MASCE:
He worked with the "United Nations Development Program – UNDP" for several years under various capacities. Mr. Al-Janabi is currently within "Nakheel Marine Group - NMG" .

Prof. Saeed Danialai, P.E., MASCE:
He is a Sustainability Construction Chair Professor at College of Built Environments at University of Washington, Seattle.

Prof. Khosrow Ghavami:
Is a Professor of Civil Engineering, (PUC-Rio). Dr. Ghavami is a Founding Member and presently Chairman of International Committee on Non-conventional Materials and Technologies.

Mr. Bruce Hostetter, LEED AP:
Mr. Hostetter is very active in green building both as a sustainability consultant and a pioneer board member of the Orange County Chapter of the USGBC where he serves as Advocacy Chair.

Mr. Ziad Mazboudi, LEED AP:
Mr. Mazboudi is the City of San Juan Capistrano's sustainability, Green Building Program and energy conservation project manager. He is currently the treasurer of the Board of the American Society of Civil Engineers, ASCE.

Prof. Ayman Mosallam, P.E., MASCE:
Dr. Mosallam is a Professor of Civil & Environmental Engineering Department and the Director of the Structural Engineering Test Hall at University of California, Irvine.

Dr. David Nelson, IAS/ICC:
Dr. Nelson has been heading the certification division of the International Code Council (ICC) for many years and currently he is working in a senior position at the International Accreditation Services (IAS).



CONTACT:
Prof. Heba Hamed Bahnsawy
Housing & Building National Research Center
87 El-Tahrir St. Dokki, Giza – Egypt
bahnsawy@yahoo.com
Phone: +20-2-37617102, 37617092
Fax: +20-2-33351564

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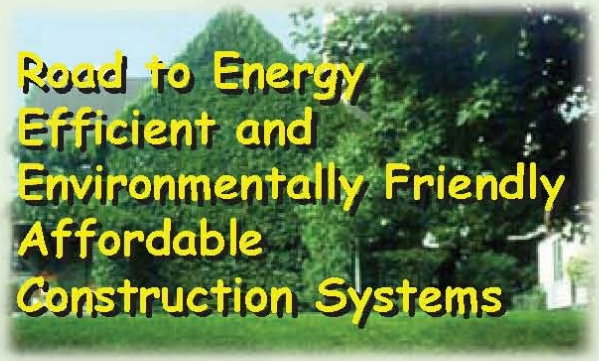

Organized by
Housing & Building National Research Center (HBRC)

In collaboration with
University of California, Irvine

EGYPTIAN GREEN BUILDING COUNCIL (EGBC)

President: **H.E. Eng. Ahmed El-Maghraby**
Chairman: **Prof. Moustafa El-Demirdash**

ORGANIZING COMMITTEE

Prof. Moustafa El-Demirdash (Chair)
Chairman of the Board, HBRC
Prof. Heba Bahnsawy
Vice Chair for Research & Support Staff Affairs, HBRC
Prof. Sherif Fakhry,
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Prof. Ayman Mosallam
University of California Irvine, USA

INTERNATIONAL SCIENTIFIC COMMITTEE

M. A. Zaki, Egypt
A. Abdin, Egypt
I. Al-Janabi, UAE
Al Nuaimi, UAE
Y. Alsalloum, KSA
B. Bakry, Egypt
G. Basili, Egypt
S. Danialai, USA
M. El-Batran, Egypt
D. El-Sherif, Egypt
K. El-Zahaby, Egypt
S. Ewainat, UAE
A. Hasan, Egypt
S. Harib, UAE
B. Hostetter, USA
M. Khorshid, Egypt
I. Mehleb, Egypt
S. Michel, Egypt
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D. Nelson, USA
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S. Okba, Egypt
A. Sharara, Egypt
R. Shemais, Egypt
M. Reda, Egypt
A. Salama, Egypt
M. Shinozuka, USA
M. Tolba, Egypt
A. Ushikov, Russia
C. Warner, USA

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POTENTIAL PARTICIPANTS

Academic faculty members, consulting and government engineers from interested ministries, environmentalists, research scientists, research students, policy and decision makers, stakeholders, suppliers, industrialists and contractors.

PROGRAM

- ***Day 1:*** Kick-off Council Members' meeting under the presidency of his H.E. Engineer Ahmed El-Maghraby at the Ministry of Housing, Utilities and Urban Development .
- ***Day 2:*** The technical program consisting of keynote lectures and panel discussions on green building initiatives.
- ***Day 3:*** Lectures on green building certification examination review.

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(EGBC) Initiation

Cairo, Egypt--January 25-27, 2009

Technical Program

Day 1: Sunday - January 25, 2009

9:00-9:30:	***Registration***
9:30-10:00	***Opening Session by Chairman & Collaborator***
10:00-10:45	***Drivers of Change towards Sustainability from Global Perspective***, Mrs. Elsa Yasukawa (USA), *an organizer and founder of green building chapters of the US Green Building Council (USGBC) and the World Green Building Council (WGBC), both in the US and Argentina.*
10:45-11:30	***Sustainability and Green Certification***, Mr. Sam Ali (USA) *Chairman, (ASCE) Sustainability Committee*
11:30-11:45	***Break***
11:45-12:30	***Government Role and Green Building Models***, Mr. Ziad Mazboudi (USA), *Treasurer of the Board of the ASCE, Orange County branch, Los Angeles Chapter; Member, US Green Building Council, USGBC, and Advocacy Committee of Orange County.*
2:30-3:30	***Kick-off Meeting with HE Minister Ahmed El Maghrabi*** at the Ministry of Housing, Utilities and Urban Development *(Restricted to Egyptian Green Building Council's and International Advisory Board Members ONLY).*

Day 2: Monday: January 26, 2009

9:00-9:45	***Green Building Initiatives in Egypt***, Prof. Mousatafa El-Demirdash (Egypt), *Chairman, HBRC & Vice Chairman, EGBC*
9:45-10:30	***International Certification Model for Green Buildings***, Prof. Ayman Mosallam (USA), *Professor of Civil & Environmental Engineering Department; Director of the Structural Engineering Test Hall at University of California, Irvine and a pioneer in green buildings materials and systems.*
10:30-11:15	***Break***
11:15-12:00	***The Story of Green Building and its Volunteers: How the USGBC Began, Grew and Adapts to New Challenges,*** Mr. Bruce Hostetter (USA), *sustainability consultant and board member of the Orange County Chapter of the USGBC and a certified Dynamic Governance Facilitator with the USGBC*
12:00-12:30	***Sustainable Low Cost Sanitation Solutions,*** Dr. Doaa El-Sherif (Egypt), *Assoc. Prof. and Executive Director of the Training Department, HBRC.*

12:30-1:00 ***Earth, Human Beings & Appropriate Technology***, Mr. Hany El Miniawy, *Architect Consultant, Adapt, EG.*

1:00-1:45 ***Application of Non-Conventional Materials and Technologies "NOCMAT" For Green and Sustainable Buildings***, Prof. Khosrow Ghavani (Brazil), *Professor of Civil Engineering, (PUC-Rio), Pontificia Universidade Católica do Rio de Janeiro, Brazil; Chairman of International Committee on Non-conventional Materials and Technologies, (IC-NOCMAT); President of "Brazilian Association of Non-conventional Materials and Technologies (abmtenc)", Fellow of American Society of Civil Engineers (FASCE), Member of Brazilian Institute of Concrete (IBRACON), Member of American Mathematical Society, and an Emeritus member of Brazilian Association of Mechanical Sciences, (ABCM).*

1:45-2:45 ***Lunch***

2:45-3:30 ***Sustainable Composites***, Dr. Andrey Ushakov (Russia), *President of ApATeCh Companies, Russia and one of the world's pioneers in the area of sustainable materials in infrastructures applications including polymer composites.*

3:30-5:00 ***Sustainable Development Round Table Charette,***
Moderators: Mrs. Elsa Yasukawa (USA) and Prof. Ayman Mosallam (USA)

Day 3: Tuesday- January 27, 2009

Short Course on Green Building Certification Examination

Moderators: Mr. Sam Ali, LEED AP (USA) and Mr. Karim Farah, LEED AP (Egypt), Mr. Ziad Mazboudi (USA)

9:00-12:00 ***Training on Green Building Certification Examination Review***

12:00-1:00 ***Lunch Break***

1:00-3:30 ***Training on Green Building Certification Examination Review***

3:30-4:30 ***Conclusions and Recommendations***





Lectures

Housing & Building National Research Center

Road Map for Establishing Egyptian Green Building

Prof. Dr. Moustafa El Demirdash

Chairman, HBRC

Vice Chairman, Egyptian Green Building Council (EGBC)



Why Green Building for Egypt

- Population Increase = Increase in Housing Demand,

- Potential High Energy Demand:
  - *Population Increase*
  - *Expansion of Industrial Sector*
  - *New Urban Communities*

Why Green Building for Egypt (cont.)



- Agricultural Waste
  - *Rice, cotton, etc*
  - *Existing Disposal Practice & Effect on Air Quality (burning)*
  - *Recycled Construction Materials*



Effect on Tourism Sector







EFFECT ON TOURISM SECTOR

- Tourist is one of the major national economical resources
- Improvement of Air Quality and Environment will attract tourists
- Preservation of Historical Monuments

Potential High Water Demand & Shortage in Water Resources

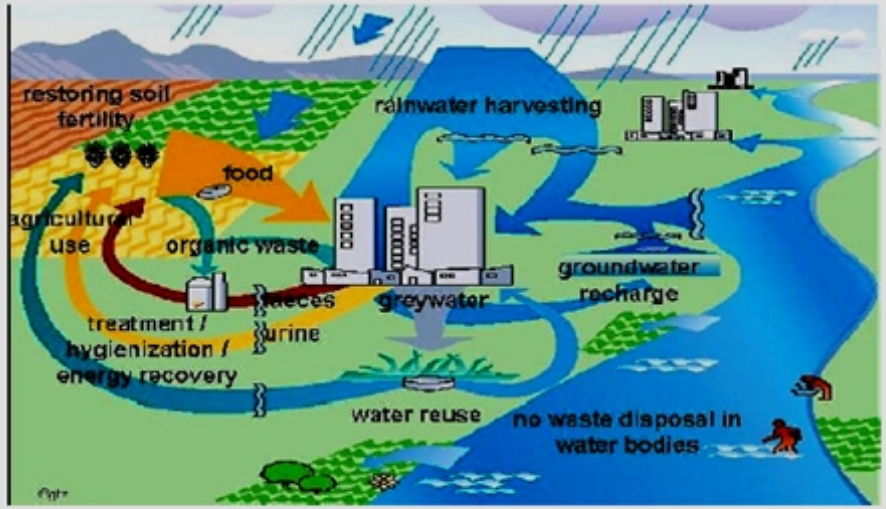
- *New housing projects in the desert area*
- *Increase Agricultural Land*
- *Population Increase*



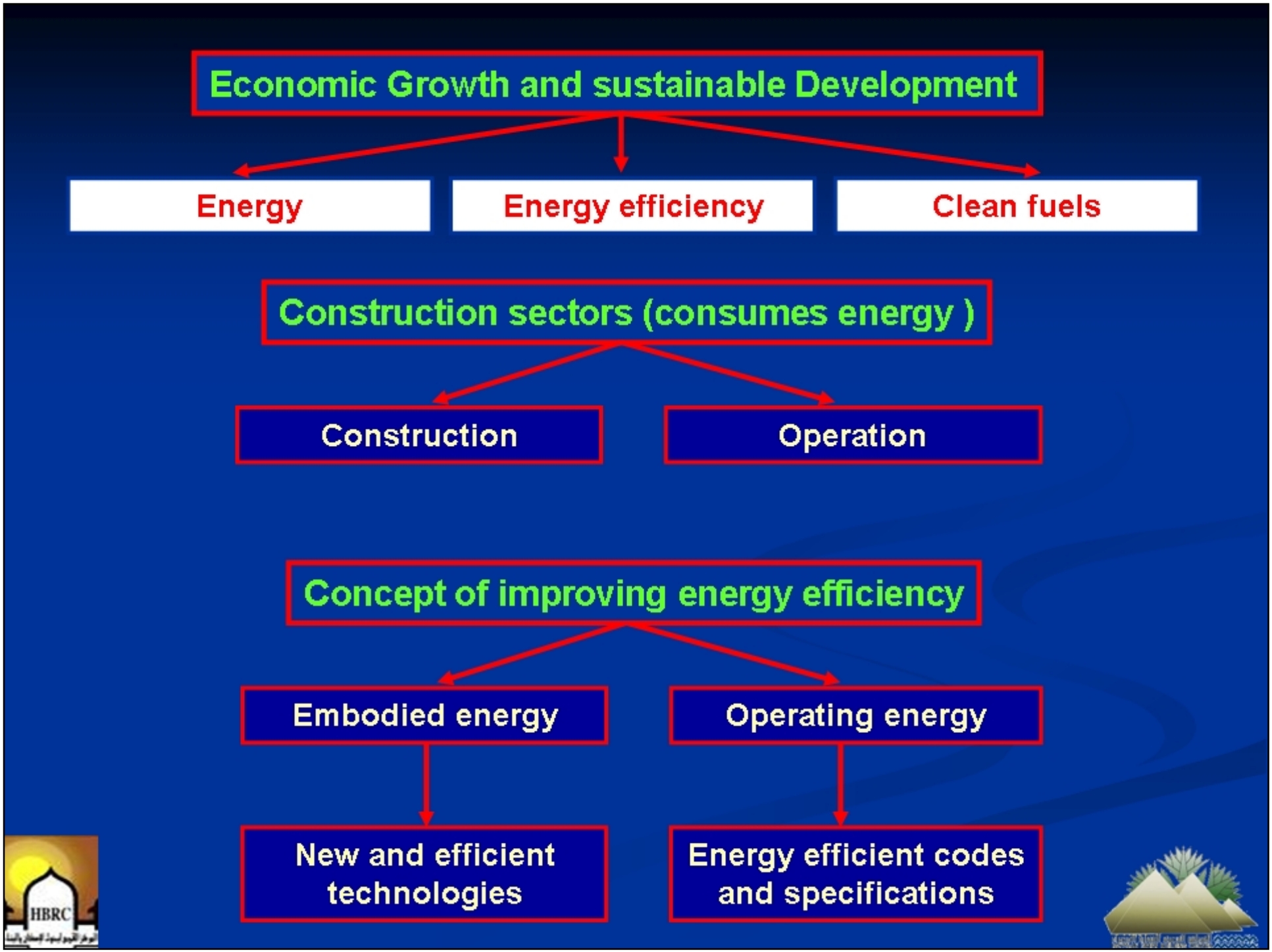
PRESERVING WATER QUALITY & RECYCLING

- Reduction of Water Waste through Optimized Pluming Fixtures & Systems
- Contamination Reduction of Water Resources

The "Improved" Urban Water Cycle



Optimal Usage of Alternative Water Sources


Economic Growth and sustainable Development
Energy
Energy efficiency
Clean fuels
Construction sectors (consumes energy)
Construction
Operation
Concept of improving energy efficiency
Embodied energy
Operating energy
New and efficient technologies
Energy efficient codes and specifications
HBRC

Sustainability

Meeting the needs of the present while *improving* the ability of future generations to meet their own needs.





Sustainable Design

- Minimize operating energy
- Utilize renewable energy
- Site selection and design
- Reduce water use
- Reclaim grey water
- Manage Hydrologic & Hydraulic
- Low impact development
- Renewable sources
- Minimize embodied measures



Energy



- Lighting and equipment use
- Heating, cooling & ventilation
- Occupant processes

Water



- Potable for occupants
- Non potable for processes
- Storm water run-off

Materials



- Site work
- Structure, enveloped, & finishes
- Furnishings & equipment

Energy Challenges Facing the Development in the Construction Sector

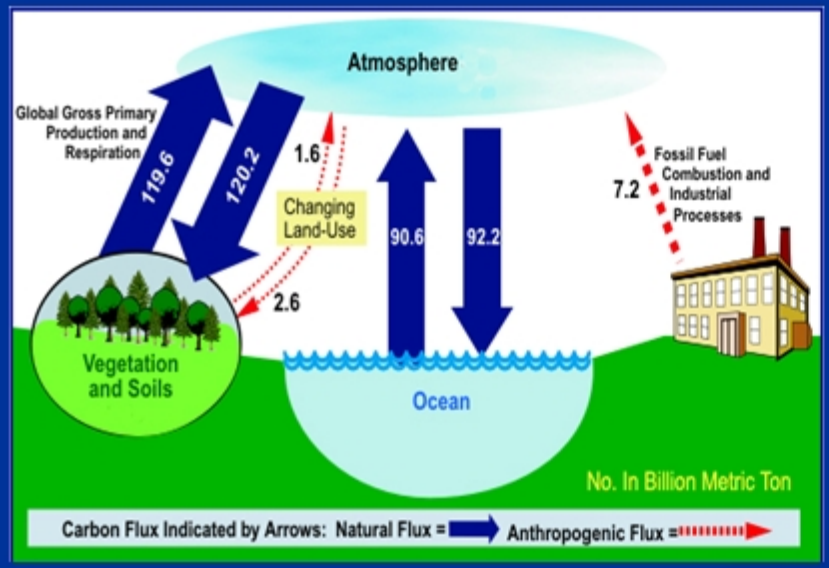
- The major challenge facing the world is reducing the hamful emissions from fossil fuels
- Challenge facing the increasing level of engagement between food markets and production and energy markets and uses
- International Energy Agency has estimated that the world's primary energy needs will grow by 55% by the year 2030. IAE estimated that $22 trillion of investment will be needed between now and 2030 to meet expected demands
- The construction sector produced around 30% of solid waste generation and this is considered one of the biggest challenge facing the population cities.

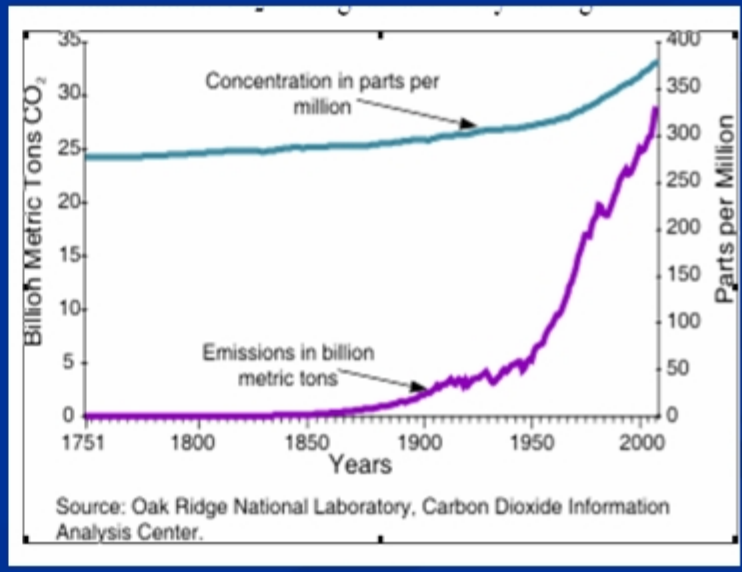
Energy Challenges Facing Egypt in the 21st Century

- The increase in population (1.3m/y)
- Over concentration of population on 5 % of the total area .
- Concentration of urban population in the two main agglomerations (Cairo and Alexandria Regions).
- An extra infrastructure system for about 60 million (2035) peoples are needed concentrated most probably in the desert and this requires a big amount of embodied energy as well as operating energy and effort.
- The limitation of conventional energy resources in Egypt
- Old technology as well as the use of high intensive energy industrial construction for production of building materials.
- Energy efficient codes should be periodical revised and more efforts are need for its implementation

Energy Resources in Egypt: *A Background*

- Fossil fuels such as coal, petroleum, and natural gas are made up of hydrogen and carbon. When fossil fuels are burned, the carbon combines with oxygen to yield carbon dioxide. The major challenge facing the world during the past 20 years, about three-quarters of anthropogenic (human-caused) emissions came from the burning of such fossil fuels. Concentrations of carbon dioxide in the atmosphere are naturally regulated by numerous processes





Energy Resources in Egypt

- Petroleum
- Natural gas
- Electricity
- Nuclear Energy
- Renewable Energy

Energy Resources in Egypt

•Petroleum Sector

Petroleum secures about 92% of primary power needs in Egypt. The year 2008 witnessed an increase in the production rate of crude oil, condensates and butane as production volume hit about 2916 thousand tons in January 2008, while the production volume in January 2007 hits about 2783 thousand tons.

Statement	January 2007	January 2008	Monthly change rate (%)
Production of crude oil, condensates and butane (thousand tons)	2783	2916	0.4

Energy Resources in Egypt

- **Natural Gas**

The following table shows clarifies the changing rate in natural gas production, till consumption and its exports during a period for January 2007, January 2008

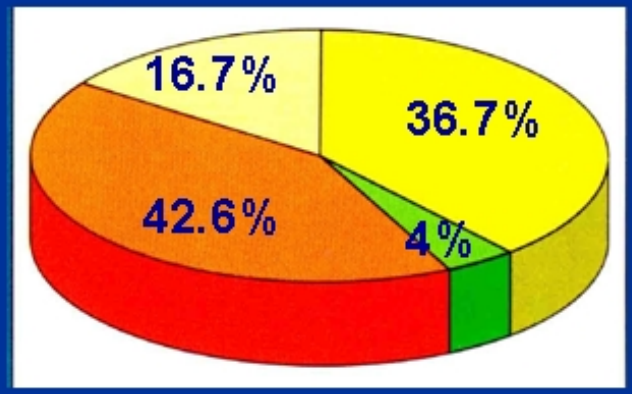
Statement	January 2007	January 2008	Monthly change rate (%)
Natural Gas production (thousand tons)	3524	3578	0.6
Local consumption of natural gas (thousand tons)	2241	2507	1.5
Percentage of electricity consumption from consumed natural gas (%)	57.0	54.6	0.3
Natural gas exports and its derivatives ($ million)	227.6	272.0	1.7

Energy Resources in Egypt

•Electricity Sector

The natural gas rate used for the electricity stations reached 85.2% from total consumed fuel.

The total generated electricity during February 2008 amounted to about 9302 million K.W.Y, scoring a rise of 10.2% from its level during the same month of the previous year. while the total uses of electricity during February 2008 amounted to about 8225 million K.W.Y, by an increase of about 10.2% from its level during the same month from the previous year .



Industrial consumption	36.7%
Agricultural consumption	4%
Resid. & comm. Buildings	42.6%
Gov. & Public Utilities	16.7%

Energy Resources in Egypt

- **Nuclear Energy**

At the end of October, 2007, the government announced Egypt's entrance in the era of peaceful nuclear energy through establishing nuclear stations for generating electricity

Energy Resources in Egypt

- **Renewable Energy available in Egypt**
  - Solar Energy
  - Wind Energy
  - Biomass



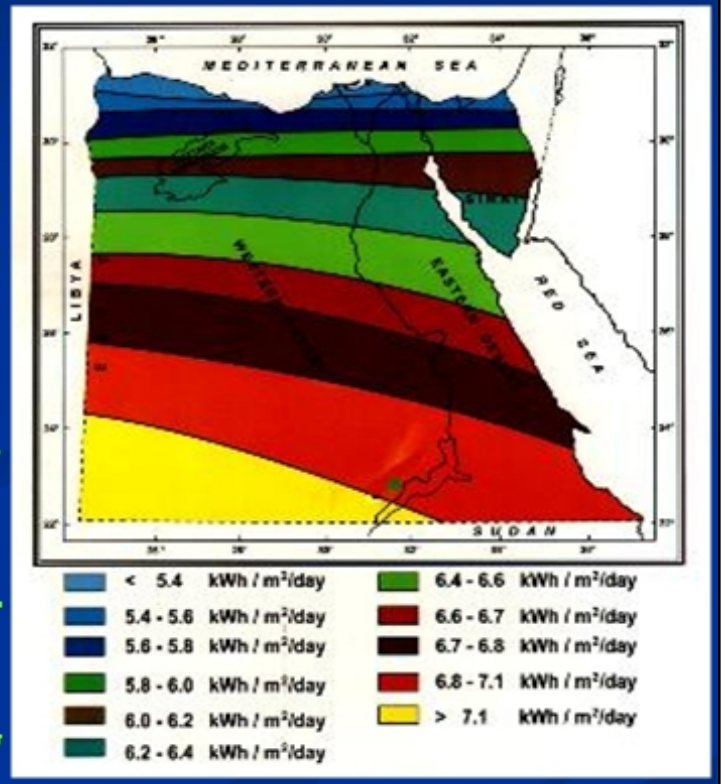


BIOMASS ENERGY

Renewable Energy available in Egypt

Solar Energy

- Egypt is one of the sun belt countries endowed with high intensity of direct solar radiation ranging between 2000 – 3200 kWh / m2 / year from North to South. The sun shine duration ranges from 9 – 11 hours with few cloudy days all over the year.
- In collaboration with the German aerospace center its estimated that the solar energy potential of Egypt is about 72656 TWH/Year
- A solar energy generator station was built at Al-Kuraimat, south of Cairo at a capacity of 150 MW.
- Solar water collects were used in different new cities.

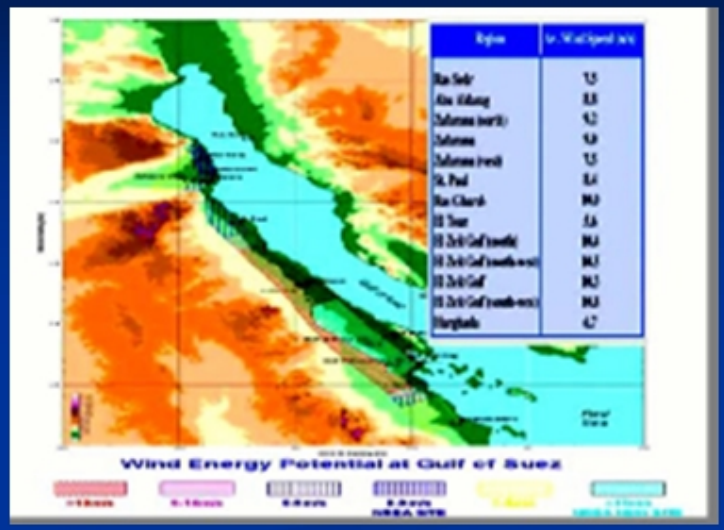


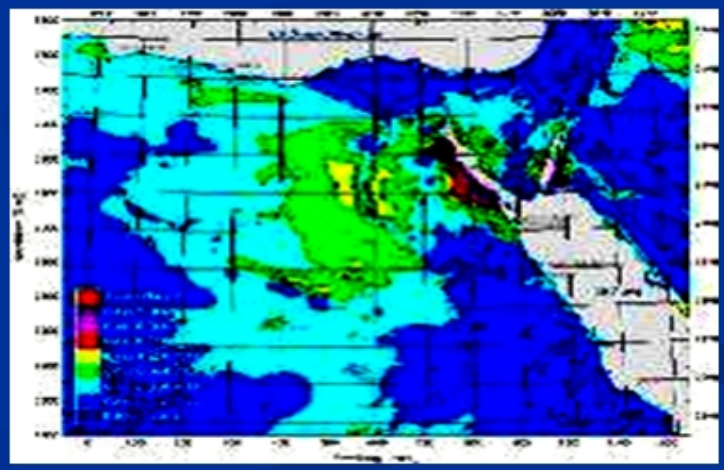
Renewable Energy available in Egypt

•Wind Energy

•Wind represents a favorable source for producing energy through the areas of Suez Gulf, Red Sea coast between Ra's Ghareb and Safaga and east of Owainat as these areas are characterized by a wind blow at a relatively constant velocity (10m/s).

•The capacity till 2010 will reach 850 MW which represent 3% of demand for electric energy in that year.





Renewable Energy available in Egypt

Biomass

- Biomass resources in Egypt that can be used for energy production are classified into the following categories:

1. *Non- Plantation biomass: Animals' and Plants' wastes (29 million ton/year) in Egypt are available by big quantities which are considered as a good source for natural gas in the organic gas and some other gases such as the Ethanol and Methanol*
2. *Fuel crops (energy plantations) such as methanol, and*
3. *Municipal waste.*

EGYPT'S STRATEGIES FOR ENERGY EFFICIENCY

HBRC *Approach for the construction sector*

- **Studying Energy Efficient Codes**
- **Studying Traditional Building in Egypt**
  - **Traditional building in Hot Arid zone**
- **Studying New Green Building (e.g. Toshky Region)**
- **Structural & architectural elements affecting thermal performance of building under extreme hot arid zones**

EGYPTIAN STRATEGIES FOR ENERGY EFFICIENCY IN CONSTRUCTION SYSTEM

Energy Efficient Codes

- Energy Efficiency for residential buildings code,
- Energy Efficiency for commercial buildings code, and
- Energy Efficiency for governmental buildings code

The Green Approach

Impact of Buildings on Economy, Environment & Community

Facts

Buildings in the world consume:

- *40% of the world's energy and materials*
- *25% of the wood harvested*
- *17% of the water*





What is Green Design?

'A Green building should create delight when entered, serenity and health when occupied and regret when departed' – Perhaps this is one of the most inspiring definitions of a Green building, articulated in the book 'Natural Capitalism'.

Benefits of Green Design (General)

- Reduces energy and water consumption,
- Conserves natural resources (*metals, wood, stone, etc.*),
- Increases productivity (*work, schools, home*),
- Improves health (*reduce likelihood of asthma, allergies and other environmental related illnesses*),
- Reduces generation of solid waste,
- Reduces the amount of greenhouse gas,
- Reduces strain on infrastructure (*storm water pipes*),
- Reduces liability and
- Overall positive impact on the Egyptian resources and economy and population health.

Benefits of Green Design (Classified)

- Environmental Benefits
  - *Protect and preserve the natural environment*
- Economic Benefits
  - *Increase cost/benefit ratios*
- Equity Benefits
  - *Enhance occupant comfort, health and productivity*

Economic Benefits

- Competitive First Costs
  - *Down sized or eliminated mechanical systems.*
- Lower Operating Costs
  - *Reduced energy and water use,*
  - *Increased durability.*



GREEN BUILDING BENEFITS

TO THE ENVIRONMENT:

- *Greenhouse gas reduction*
- *Improved water quality*
- *Solid waste reduction*
- *Resource conservation*
- *Improved air quality*

GREEN BUILDING BENEFITS

TO OWNERS:

- Healthier/more productive living/working environment
- Reduced maintenance costs
- Lower utility bills
- Possibility of increased resale value

GREEN BUILDING BENEFITS

TO BUILDERS:

- Lower waste disposal cost,
- More efficient use of materials,
- Higher quality standard,
- Happier clients. and
- Unique marketing potential.

GREEN BUILDING BENEFITS

TO GOVERNMENT:

- Preserve local quality of life,
- Economic Development and
- Demonstrating leadership.

What Should We Know About Green Building (GB)?

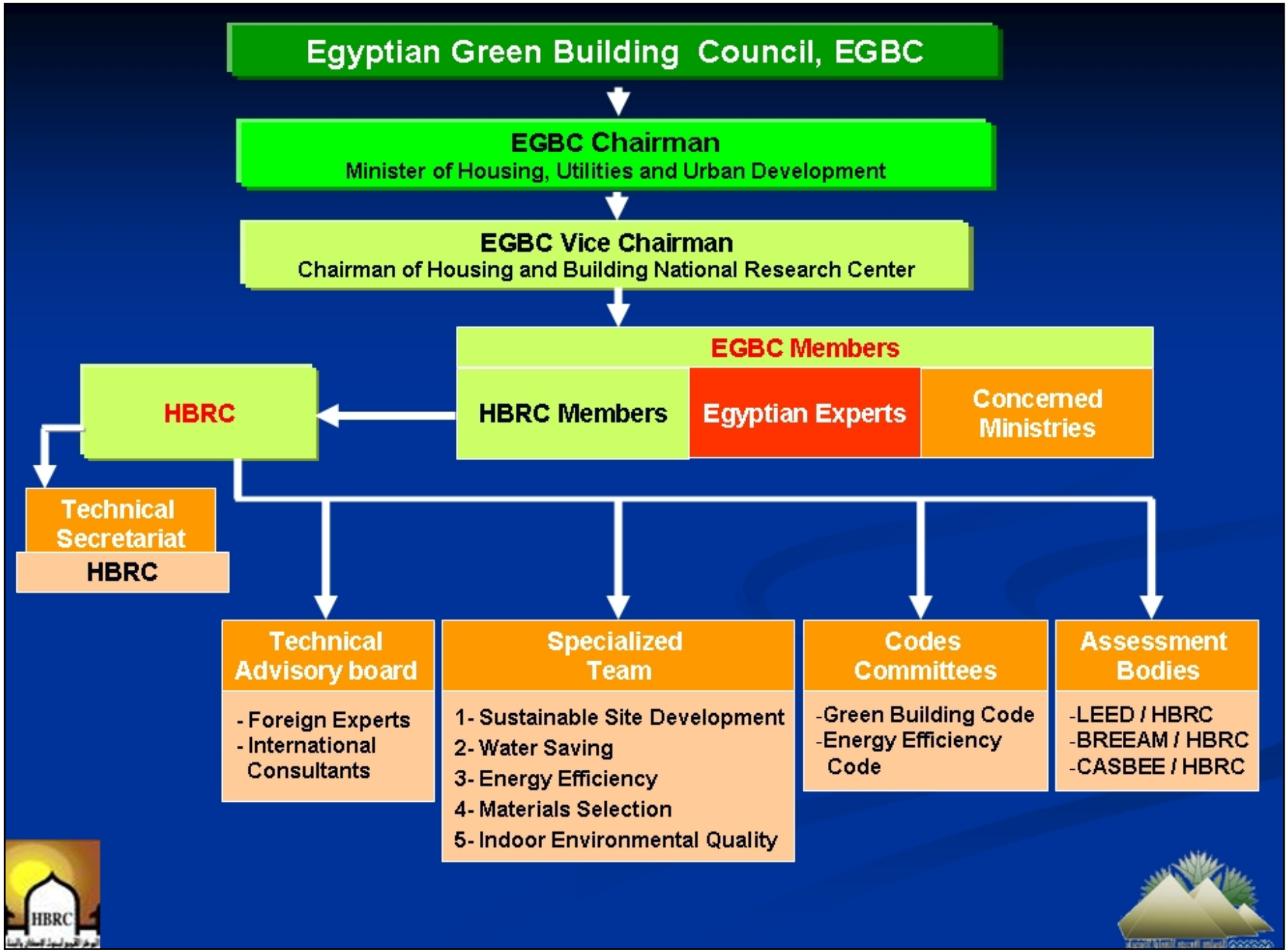
- Green building is just quality design, construction and maintenance,
- It is not something odd or unusual like many of the publicized rarities *(pyramid homes, composting toilets, greenwater, etc.)*,
- It is about educating professionals to do a better job,
- GB is about educating consumers about what they are buying and teaching them to understand that they have choices,
- GB for Egypt can be done at every budget level.



Advancement of GB in Egypt

- The Egyptian Green Building Council (EGBC) has been formed Under the Chairmanship of H.E. The Minster of Housing, Utilities & Urban Development,

- As a first product of EGBC, a national committee for establishing the Egyptian Green Building Code and Green Certification System are underway.


Egyptian Green Building Council, EGBC
EGBC Chairman
Minister of Housing, Utilities and Urban Development
EGBC Vice Chairman
Chairman of Housing and Building National Research Center
EGBC Members
HBRC
HBRC Members
Egyptian Experts
Concerned Ministries
Technical Secretariat
HBRC
Technical Advisory board
- Foreign Experts
- International Consultants
Specialized Team
1- Sustainable Site Development
2- Water Saving
3- Energy Efficiency
4- Materials Selection
5- Indoor Environmental Quality
Codes Committees
-Green Building Code
-Energy Efficiency Code
Assessment Bodies
-LEED / HBRC
-BREEAM / HBRC
-CASBEE / HBRC
HBRC

Egyptian Green Building Council, EGBC

Council's Chairman
Minister of Housing, Utilities and Urban Development

EGBC Members

Ministry of Housing, Utilities and Urban Development		Concerned Ministries
HBRC Members	**Egyptian Experts**	- Representative from Ministry of State for Environment - Representative from Ministry of Electricity and Energy - Representative from Ministry of Water Resources and Irrigation - Representative from Ministry of Agriculture and Land Reclamation - Representative from Ministry of Industry and Commerce - Representative from Ministry of Petroleum - Representative from Ministry of Health and Population - Representative from Ministry of Higher Education
HBRC Chairman (Vice Council Chairman) **HBRC Vice –Chairman for Member Affairs** **HBRC Vice –Chairman for Researches & Studies** **-Prof. George Bassili Hanna** **-Prof .Khalid El-Zahaby**	Six Members representing Government, Industry, Professional Societies and Academia	

HBRC Technical Secretariat


المجلس المصرى للعمارة الخضراء
وزير الإسكان والمرافق والتنمية العمرانية
رئيس المجلس المصرى للعمارة الخضراء
أعضاء المجلس
رئيس مجلس إدارة المركز القومى لبحوث الإسكان والبناء(نائب الرئيس)
نائب رئيس المركز لشئون أعضاء البحوث
نائب رئيس المركز لشئون البحوث والدراسات
عدد ٢ من الأساتذة أعضاء هيئة البحوث بالمركز القومى لبحوث الإسكان والبناء
عدد ٨ أعضاء ممثلين عن الوزارات المعنية
عدد ٦ اعضاء ممثلى المجتمع المدنى من ذوى الخبرة
المركز القومى لبحوث الإسكان والبناء
الأمانة الفنية للمجلس
اللجان النوعية
الخبراء الاجانب
لجان الكودات
المؤسسات الدولية للتقييم
HBRC

Worldwide Sustainability Efforts



Leadership of HBRC in Green Building Applications

- HBRC has a pioneering role in this field
- A Green Building Model was designed and constructed by HBRC at Toshka Project in Upper Egypt. This Model incorporated majority of the GB requirements

Leadership of HBRC in Green Building Applications (cont.)

- In relation to the Green Building Movement, HBRC is leading a national effort for new green and affordable Methods of Construction,

- HBRC is Conducting Several Studies on Green Construction, Environmentally-Friendly Construction Materials and Building Systems and Renewable Energy Resources

Leadership of HBRC in Green Building Applications (cont.)

- HBRC has Developed and Issued Several Energy-Efficient Building Codes that considered the Corner Stones of Future National Green Building Code.

Construction History of the HBRC Green Building:

The Toshka Model



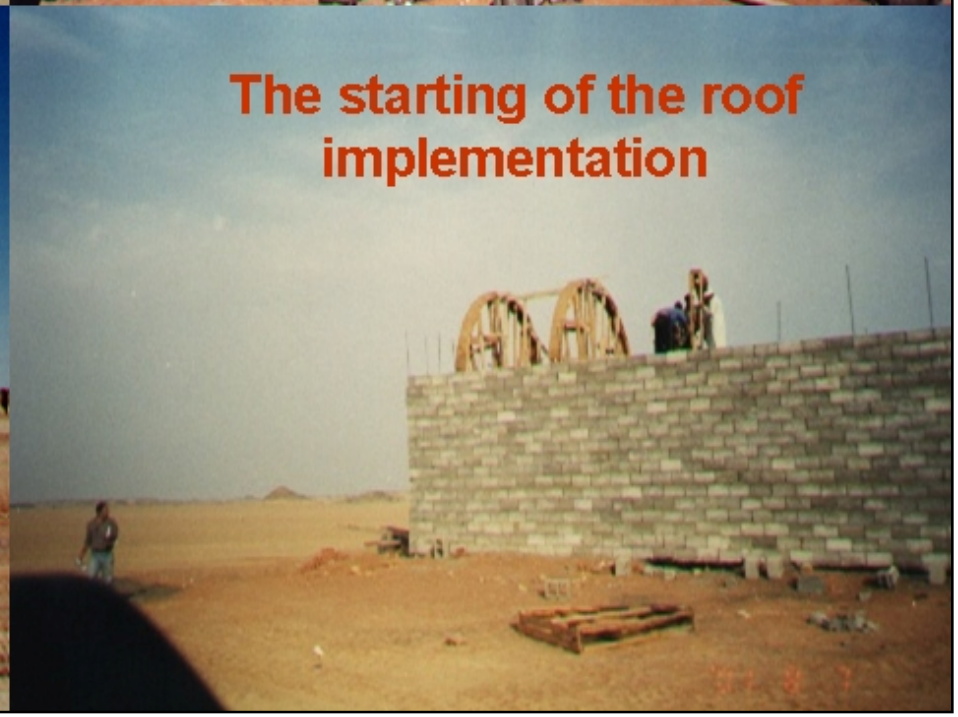
The completion of the wall implementation



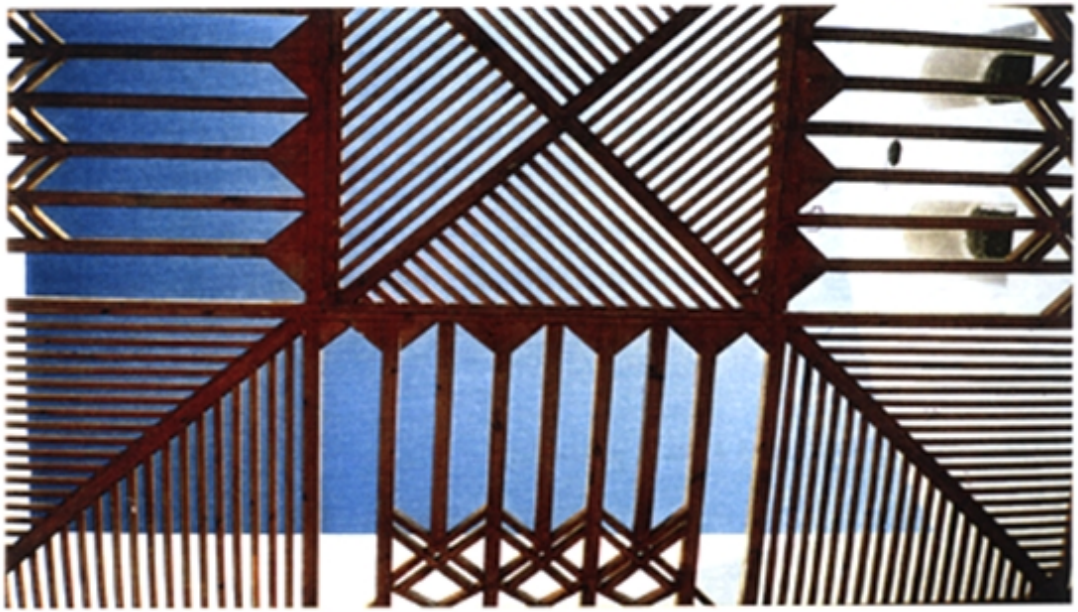
The starting of the wall implementation



The finishing of the roof implementation



The starting of the roof implementation





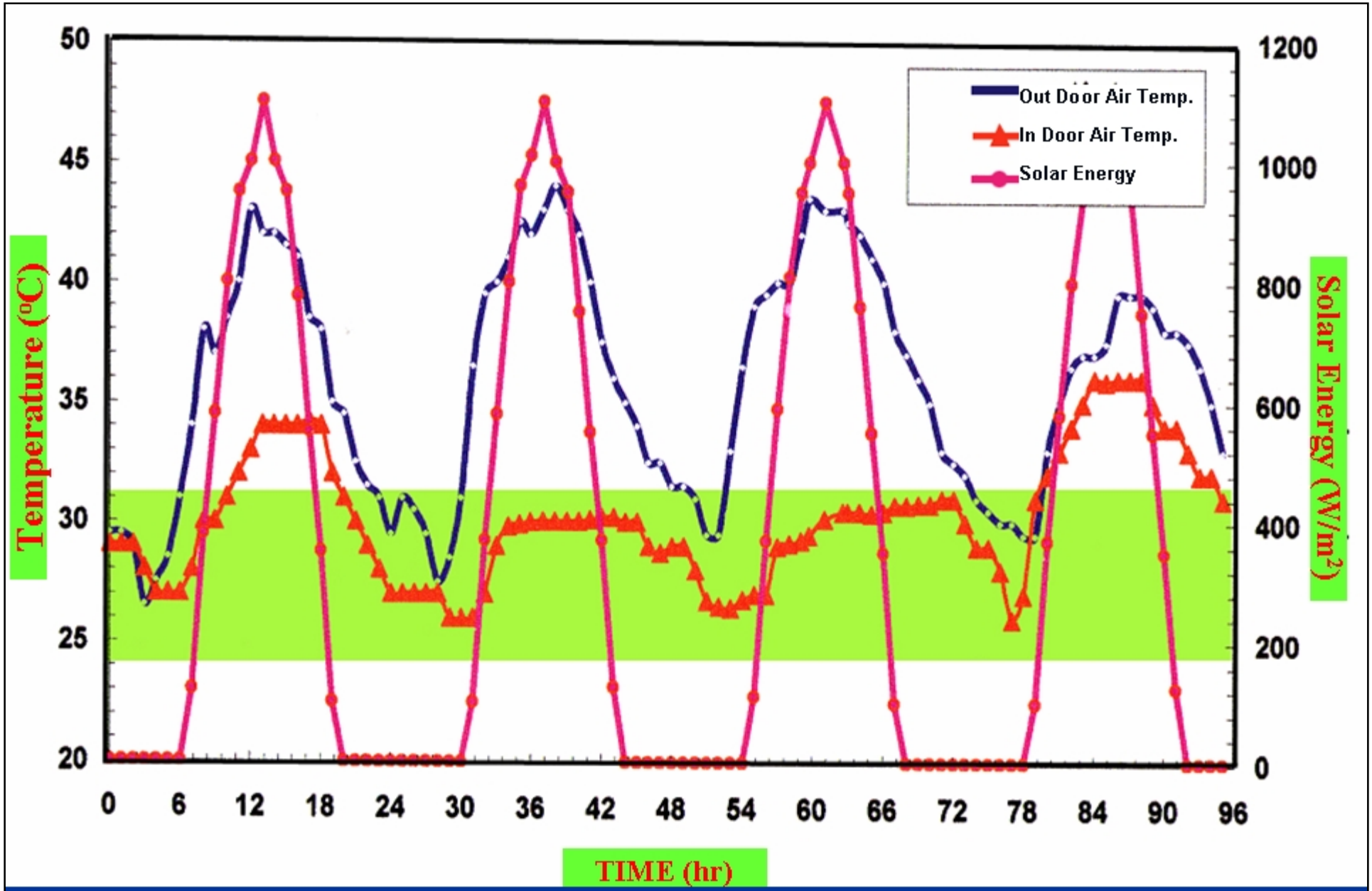
Inner Court in HBRC Green Building Model



Installation of Especially-designed Windows of the HBRC Green Building Model

THE Finished HBRC Green Building MODEL





Variation of Outdoor & Indoor Temperature of Toshka Model House
Under External Climatic Conditions during the Month of July

Conclusions & Future

- There is an Urgent Need for Developing an Efficient National Green Building Code

- Educating and Promoting the Green Building Concept at all Levels:
  - *Development of Training Programs for Professionals, Contractors,*
  - *Development of Curricula for Schools and Universities,*
  - *Development of Conferences, Workshops and Seminars in GB Area*
  - *Media Promotion*

Conclusions & Future

- Development of Incentive and Credit Protocol for the Owners & Industry
- Development of National Rating System (*Green Pyramid*),
- Interaction and intercommunication between different Ministries to ensure optimum implementation and execution of the green policies

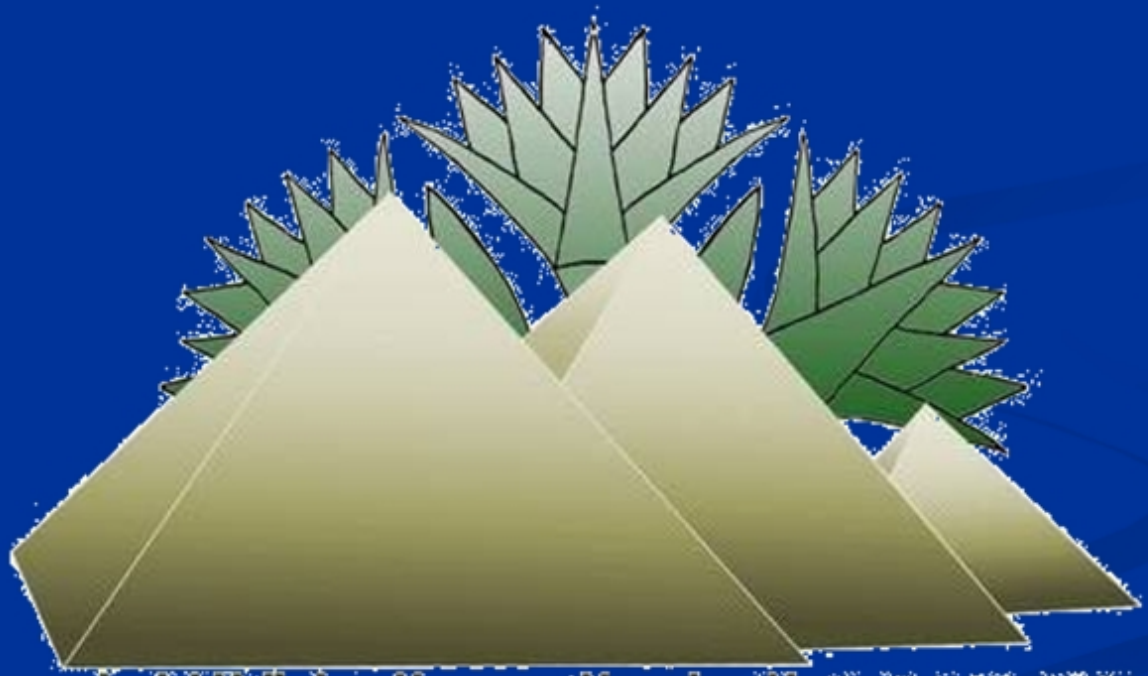
Conclusions & Future

- Promoting Research in the Area of Sustainability and Green Building,

- Encouragement and Involvement of Non-Government Organizations (NGO's) and Civil Society

HBRC Mission is:

"To improve the life of Egyptian People and Contribute to the Global Movement Towards Cleaner Environment and Renewable Energy through the adoption of Green Building Approach "



المجلس المصري للمباني الخضراء
EGYPTIAN GREEN BUILDING COUNCIL

Kickoff Meeting & Round Table on Egyptian Green Building Council (EGBC) Initiation

Cairo, Egypt--January 25-27, 2009

International Certification Model for Green Buildings

Prof. Ayman Mosallam, Ph. D., P.E.

University of California, Irvine, USA





Introduction

- In response to increasing global awareness of the environmental and energy consumption, engineers and the construction industry are facing great challenges in developing energy-efficient and environmentally compatible civil infrastructure systems.

Introduction (Cont'd)

- **Most of the attention and consequently the resources are given to automotive and industrial sectors that are commonly assumed to be responsible of environmental damages and high energy demand.**

Introduction (Cont'd)

- **However, and according to US Department of Energy (DOE) 2007 Buildings Energy Data Book,** ***carbon dioxide emissions for U.S. Buildings in 2005 was 630.3 million metric tons which is 39% of the total Carbon dioxide emissions produced in U.S. and 9.1% of the global emission.***

Introduction (Cont'd)

- **According to DOE report, two to seven tons of waste (*a rough average of 4 pounds of waste per square foo*t) are generated during the construction of a new single-family detached house and 15 to 70 pounds of hazardous waste are generated during the construction of a detached, single-family house.**

Introduction (Cont'd)

- **Each year, U.S. builders produce between 30 and 35 million tons of construction, renovation, and demolition (C&D) waste. Annual C&D debris accounts for roughly 24% of the municipal solid waste stream.**

- **Wastes include wood (27% of total) and other (*73% of total, including cardboard and paper; drywall/plaster; insulation; siding; roofing; metal; concrete, asphalt, masonry, bricks, and dirt rubble; waterproofing materials; and landscaping material*).**

Introduction (Cont'd)

- In the energy side, the U.S. residential and commercial buildings total primary energy consumption is 39.69 quadrillion Btu in 2005 which is a substantial amount of energy as compared to the total consumed energy by other sectors.



RELATIONSHIP BETWEEN CONSUMED ENERGY AND IMPACT ON ENVIRONMENT

- It is important to recognize the direct relationship between consumed energy and impact on environment. In the construction industry, for example, adopting green building approach will result, in many cases, in an efficient use of energy with less negative impact on our environment.

- This direct relationship between energy and environment must be verified in order to justify the adoption of the green code protocol.

Some Assessment Factors for Green Building Materials

1. **Energy saving in material's manufacturing process,**
2. **Environmental impact (*or cost*) generated from the manufacturing process including air and noise pollutions, etc.**
3. **Weight of the material that is directly related to another cycle of energy/environment related to transporting and assembling such material. For example, heavier materials will require larger trucks to transport to the site and larger capacity cranes and machineries to erect and assemble**

Some Assessment Factors for Green Building Materials

4. **Physical ad mechanical properties of the construction material such as sound, fire and thermal insulation properties. Such properties will affect the energy saving and environmental conservation of the built environment,**
5. **Disposal and recycling—not only the material's ability to be recycled, but also the energy involved in the recycling process. If the materials is difficult be recycled, which in my opinion all materials can be recycled if the engineer think out-of-the-box, the disposal cost, both tangible and non-tangible, of the best and safest way of disposing such materials must be considered,**

Some Assessment Factors for Green Building Materials

6. **Method of assembly of these materials. In some cases, what is considered "green" material may require "non-green" components to assemble!**

7. **Reparability and frequency and requirements of maintenance. Again, designated green materials may require replacement or maintenance in short intervals that may involve more energy resources to replace and/or repair. So, the durability and reliability of such green materials must be considered in the overall energy/environmental assessment,**

Some Assessment Factors for Green Building Materials

8. **Related to repair, it is equally critical to evaluate the required repair and strengthening materials or systems and to assess their impact on energy consumption and environmental impacts.**

For example, seismic repair of a reinforced concrete column using conventional materials such as welded steel shell jacket, will require high energy to fabricate, heavier trucks and machineries to transport and assemble, and most importantly longer traffic closure time that may last weeks or months resulting in a substantial environmental penalties through the excessive carbon dioxide emission from the slow and detouring traffic.

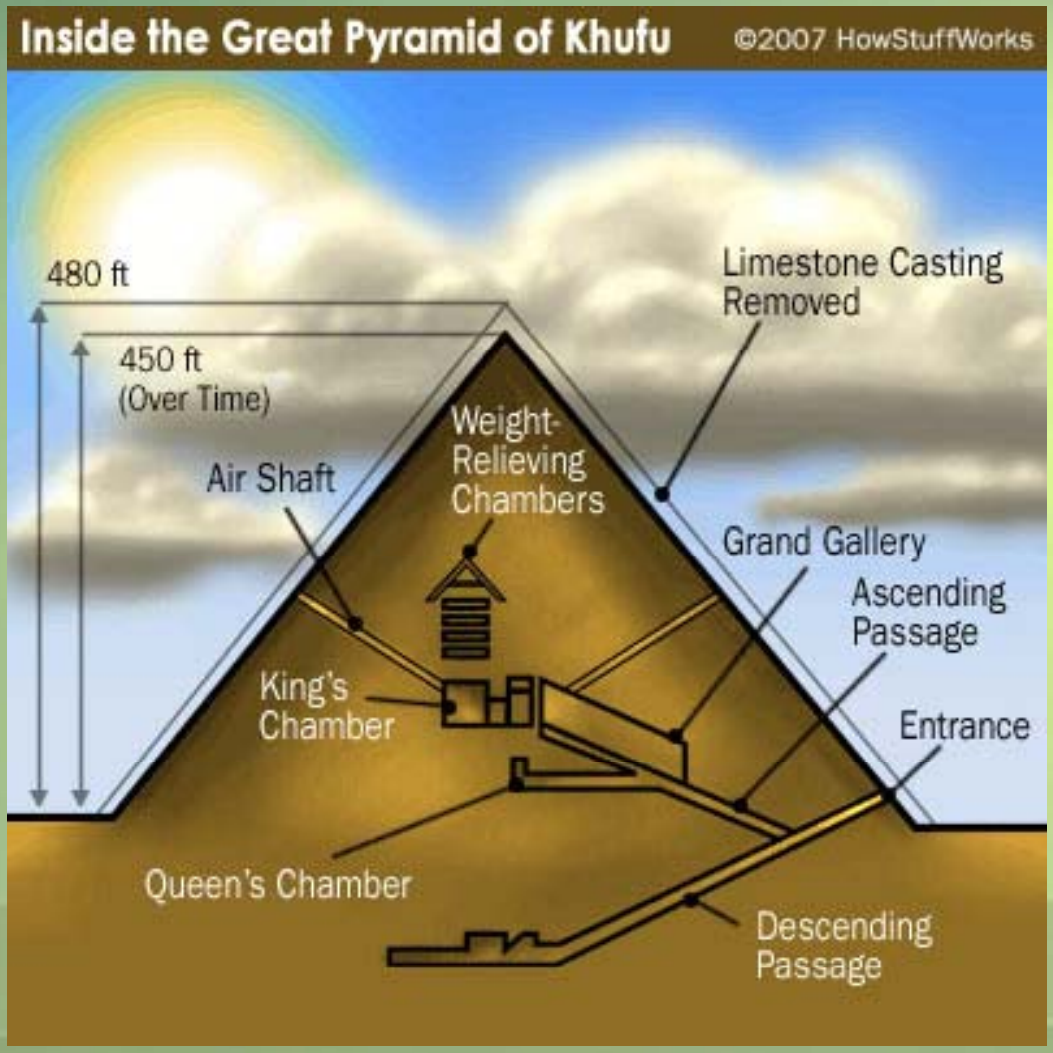
Some Assessment Factors for Green Building Materials

As an alternative repair system such as fiber reinforced polymeric (FRP) laminated jacket, will require minimum or no energy to form, lighter trucks to transport the materials, much less equipment to apply and minimum traffic closure time. However, the high energy cost of producing the fibers and resin as well as environmental penalties related to manufacturing the composite materials constituents must also be considered

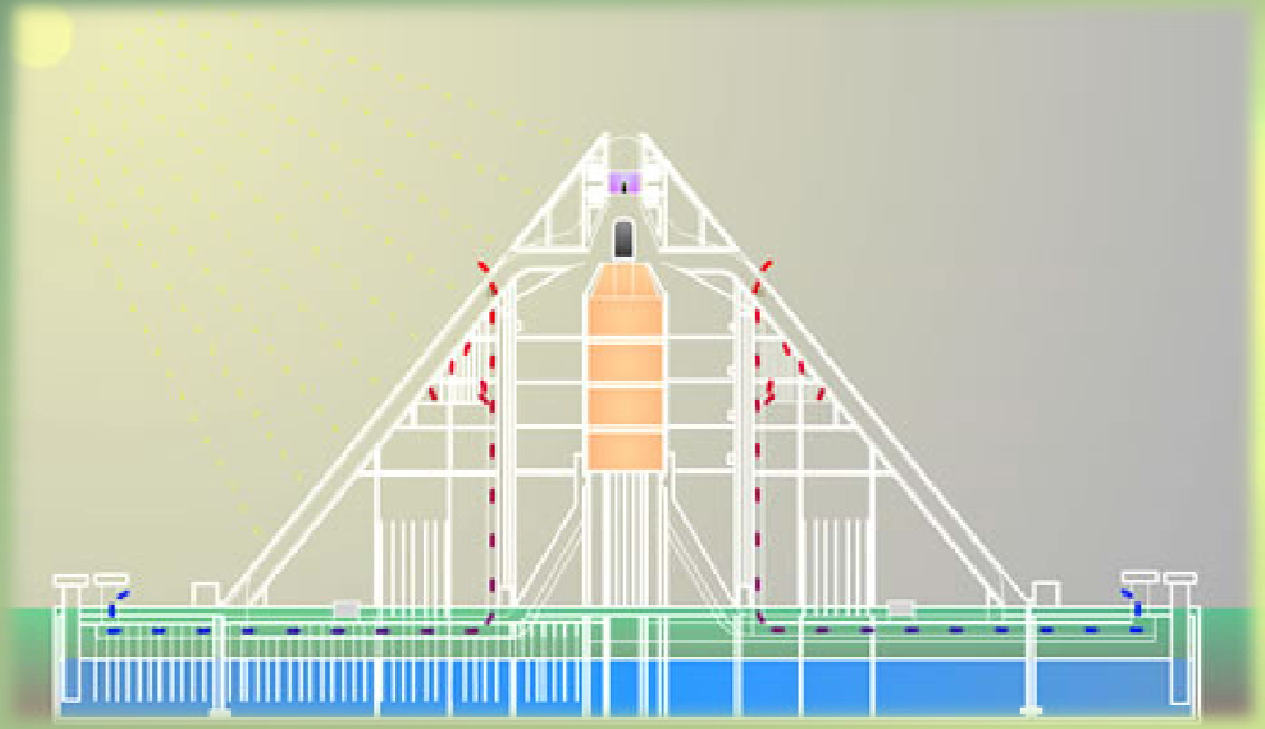
Are Pyramids Considered as Green Construction?



Are Pyramids Considered as Green Construction?



Are Pyramids Considered as Green Construction?



A Singapore-based company, is building its first "solar pyramid" in India. The solar pyramid works by drawing in air, heating it with solar energy and moving it through turbines to generate electricity. The company aims to be listed this year on NASDAQ in an initial public offering that it says could be worth more than $5 billion.

Features of Green Buildings

- Efficient use of Land & Landscape
- Efficient use of water
- Energy efficient and Eco-friendly Equipment and fixtures
- Efficient Control & Building Management System

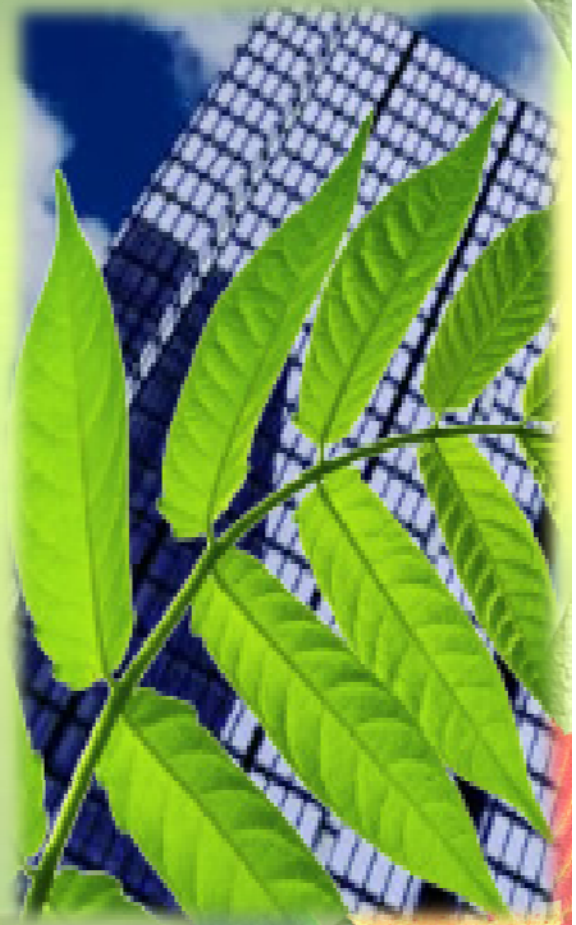


Features of Green Buildings

- Use of Renewable Energy
- Use of Recycled/Recyclable Bio and Synthetic Materials
- Improvement of Air Quality for health and comfort
- Over all budget saving in both short- and long run

GREEN VS. CONVENTIONAL (NON-GREEN)

SIMILARITIES: **They look the same, however, the architecture of the building may change to produce highest energy efficiency and lower environmental negative impact**

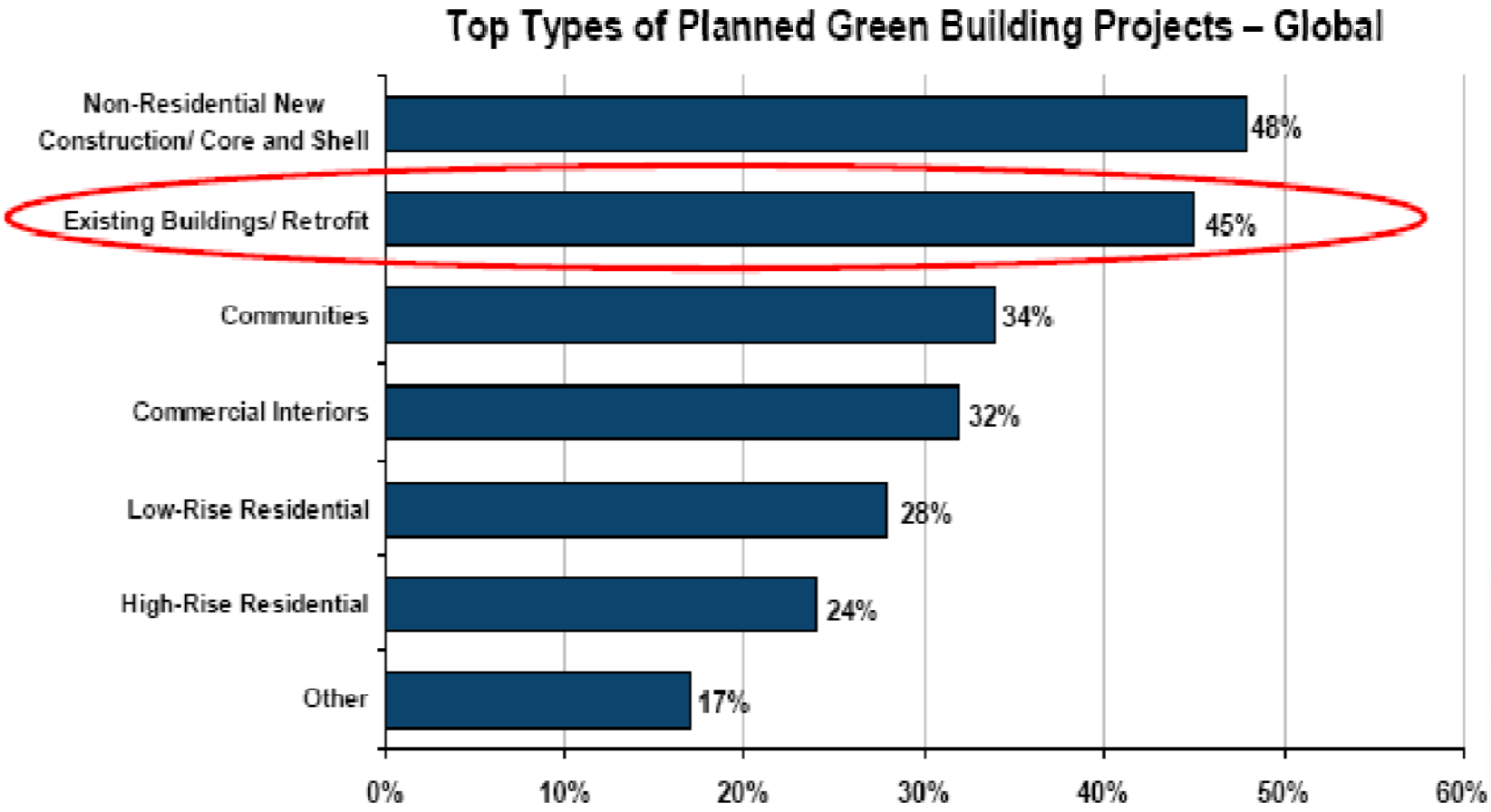


DIFFERENCES: **Green buildings are**

- **Lower operating Cost**
- **Lower Damage to Environment and Health,**
- **Maximum Human Comfort Level**

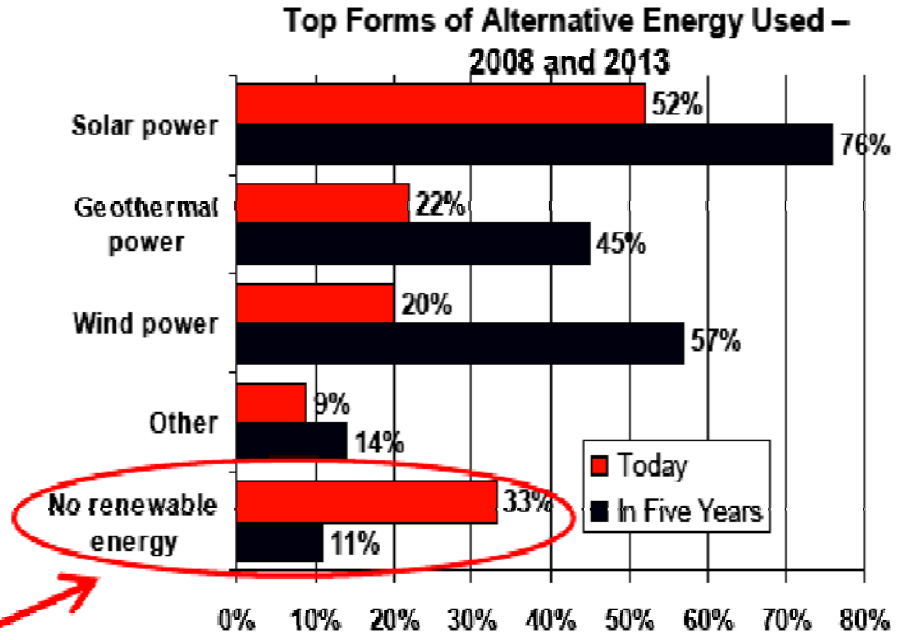
Upgrading Existing Non-Green Buildings

- **Existing buildings** have become one of the biggest sectors for green building, in line with overall construction market growth trends.

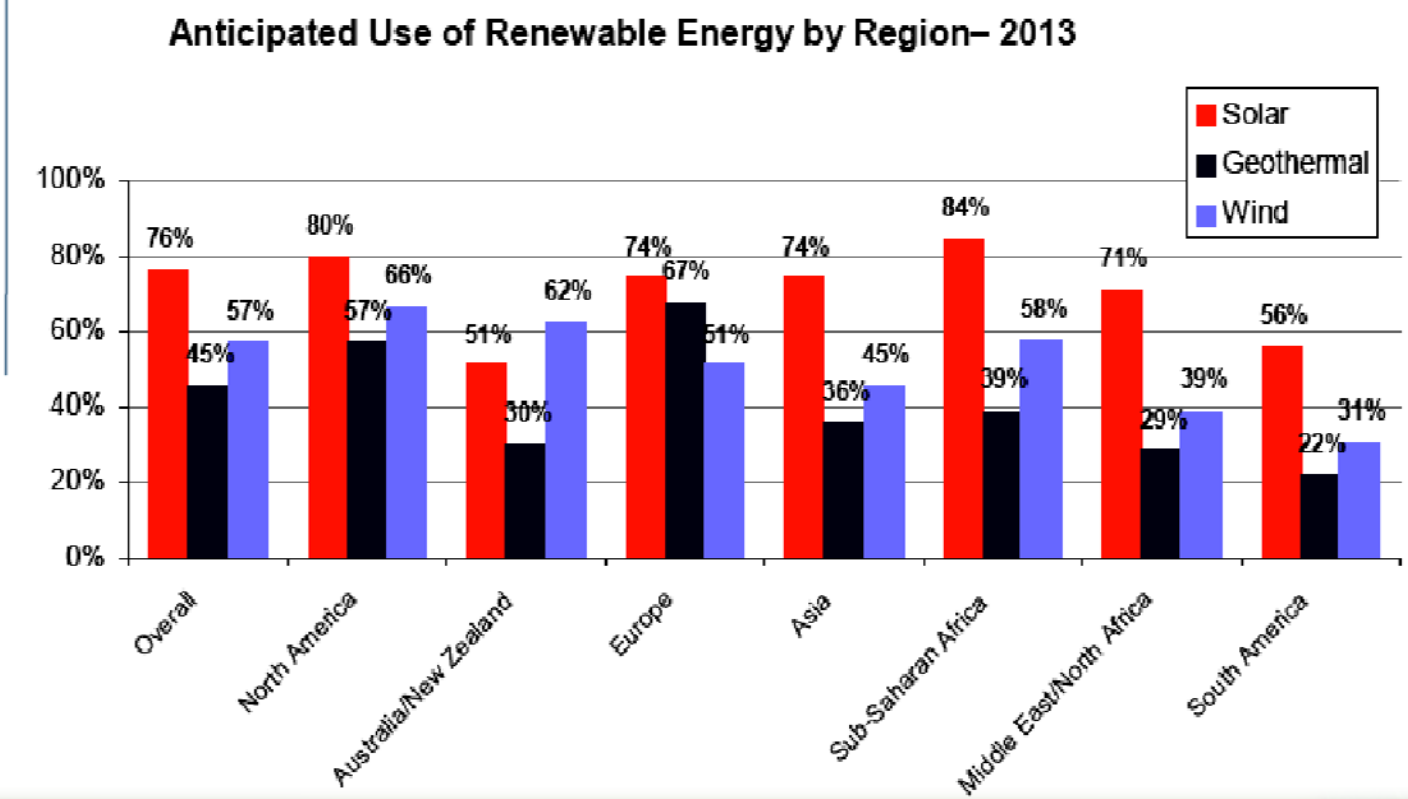


Renewable Energy is Gaining Rapid Adoption

- Top form of renewable energy: **Solar Power**
- Most growth in usage: ***Wind Power*** (20% to 57% in five years)
- Highest use of renewable energy is in **Europe.**
- Percentage of industry professionals not using any renewable energy expected to drop dramatically.



Renewable Energy Use By Region



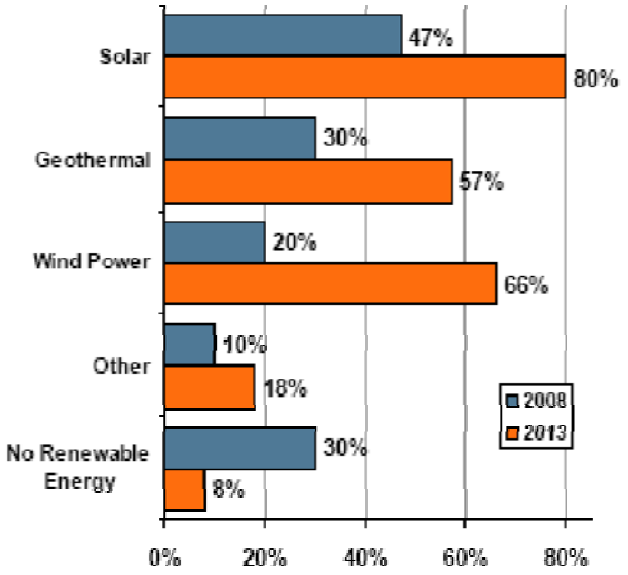




North America
Top Regional Trends

- **Government** and **office sector** are most active today. **Residential** expected to show highest growth.
- Sustainability is a major motivator in this region. Top drivers include:
  - The right thing to do
  - Encourage sustainable business
- **Most dramatic expected growth in renewable energy use** of any global region.

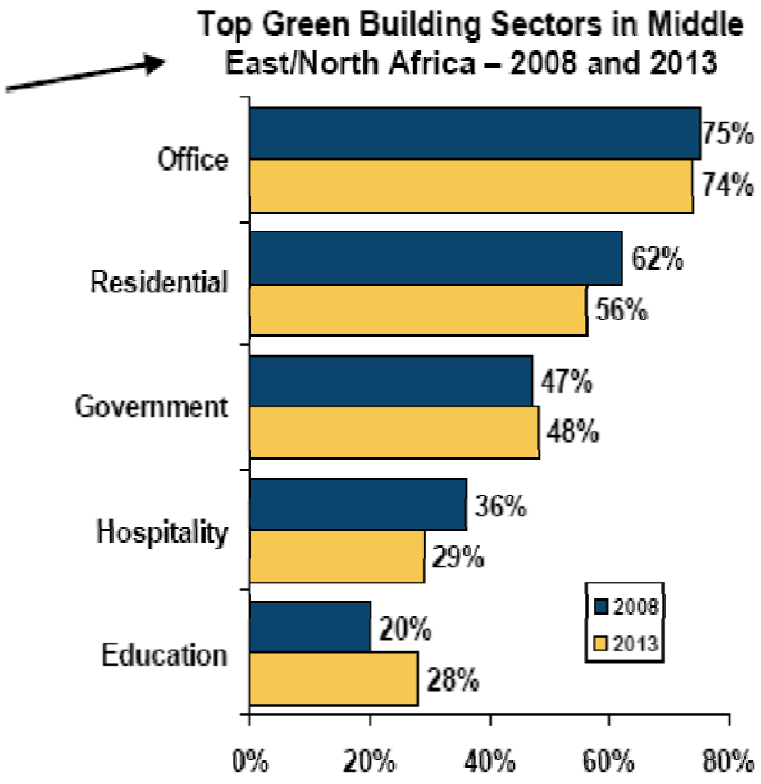
Forms of Renewable Energy Used in North America – 2008 and 2013





Middle East/North Africa Top Regional Trends

- **Office** and **residential** are most active green sectors.
- **The right thing to do** and **Supporting the domestic economy** are top market drivers.
- **Lack of trained/educated green building professionals** is the top obstacle to market growth.
- **50%** of planned green projects are **green communities.**



GREEN BUILDING RATING SYSTEMS WORLDWIDE:

- Australia: Green Star
- Brazil: LEED-Brasil
- Canada: LEED-Canada
- China: GBAS
- Finland: PromisE
- France: HQE
- Germany: DGNB
- Hong Kong: HKBEEM
- India: LEED-India
- Italy: Protocollo Itaca
- Mexico: LEED-Mexico
- Netherlands: BREEAM-Netherlands
- New Zealand: Green Star-NZ
- Portugal: Lider A
- Singapore: Green Mark
- South Africa: Green Star SA
- Spain: VERDE
- United States: LEED
- United Kingdom: BREEAM
- Egypt: **Green Pyramid!**

US Green Building Rating System (LEED)

LEED was created to accomplish the following:

- Define "green building" by establishing a common standard of measurement.
- Promote integrated, whole-building design practices.



Green Building Rating System in the United States (LEED)

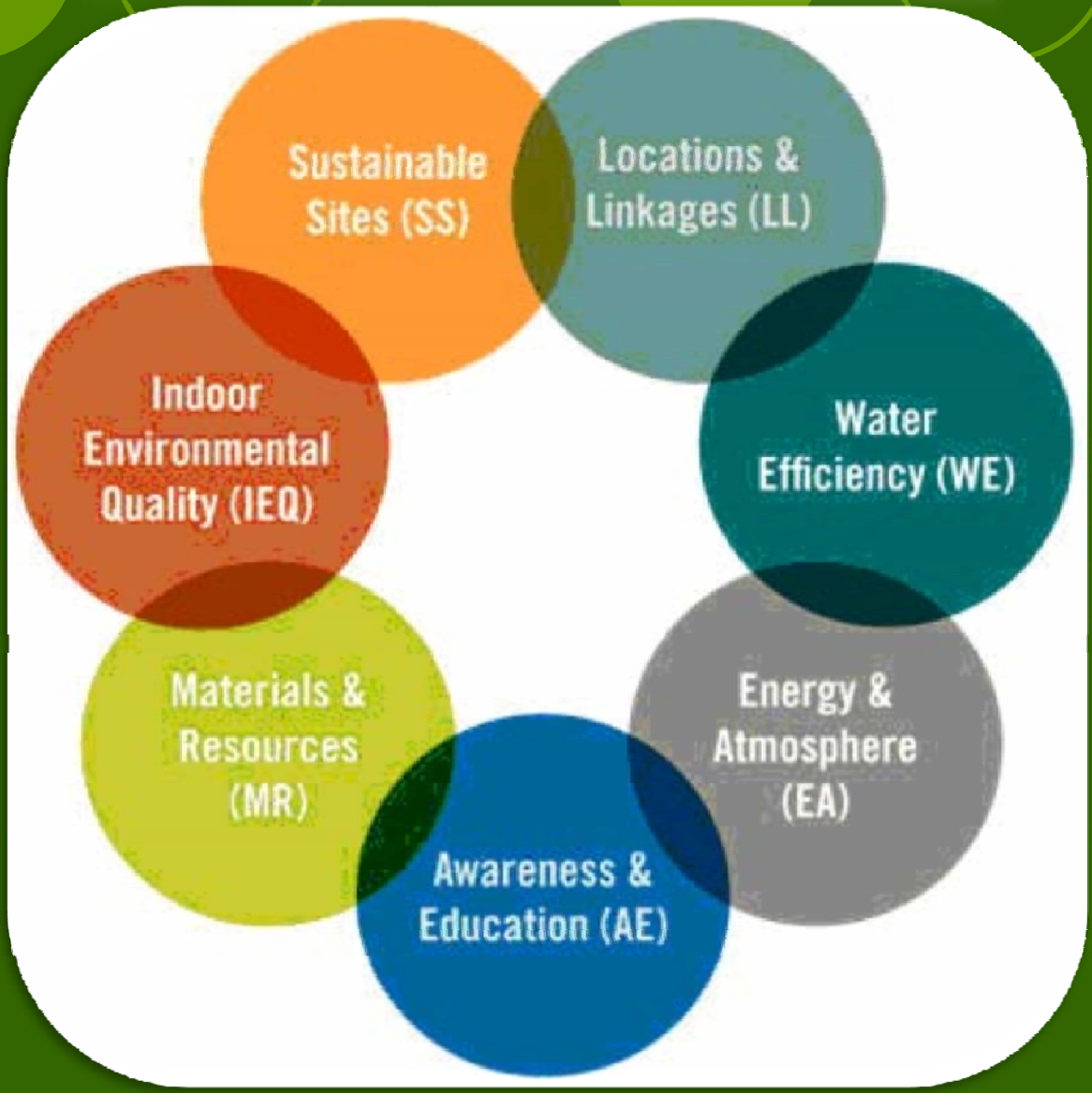
- Recognize environmental leadership in the building industry.



- Stimulate green competition
- Raise consumer awareness of green building benefits
- Transform the building market

LEED

LEADERSHIP IN ENERGY & ENVIRONMENTAL DESIGN



Green Building Rating System in the United States (LEED)

Different versions of the rating system are available for specific project types:

- LEED for New Construction: New construction and major renovations (the most commonly applied-for LEED certification)
- LEED for Existing Buildings: Existing buildings seeking LEED certification

Green Building Rating System in the United States (LEED)

- LEED for Commercial Interiors: Commercial interior fitouts by tenants
- LEED for Core and Shell: Core-and-shell projects (total building minus tenant fitouts)
- LEED for Homes: Homes
- LEED for Neighborhood Development: Neighborhood development

Green Building Rating System in the United States (LEED)

- LEED for Schools: Recognizes the unique nature of the design and construction of K-12 schools

- LEED for Retail: Consists of two rating systems. One is based on New Construction and Major Renovations version 2.2. The other track is based on LEED for Commercial Interiors version 2.0.

Green Building Rating System in the United States (LEED)

Different LEED versions have varied scoring systems based on a set of required "prerequisites" and a variety of "credits" in the six major categories

- Sustainable sites
- Water efficiency
- Energy and atmosphere
- Materials and resources
- Indoor environmental quality
- Innovation and design proces

Green Building Rating System in the United States (LEED)

As an example, in LEED v2.2 for new construction and major renovations for commercial buildings there are 69 possible points and buildings can qualify for four levels of certification:

- Certified - 26-32 points
- Silver - 33-38 points
- Gold - 39-51 points
- Platinum - 52-69 points



Green Building Rating System in the United States (LEED)

USGBC has four levels of LEED consensus based standards:

- ✓**Certified (48-62 points)**
- ✓**Silver (63-77 points)**
- ✓**Gold (78-92 points)**
- ✓**Platinum (93-136 points)**



Green Building Rating System in the United Kingdom (BREEAM)

BREEAM is the world's most widely used environmental assessment method for buildings. BREEAM assesses buildings against a set criteria and provides an overall score which will fall within a band providing either a:

- ✓ PASS,
- ✓GOOD,
- ✓VERY GOOD,
- ✓EXCELLENT or
- ✓OUTSTANDING rating.



Green Building Rating System in the United Kingdom (BREEAM)

BREEAM Buildings can be used to assess the environmental performance of any type of building (*new and existing*). Standard versions exist for common building types and less common building types can be assessed against tailored criteria under the Bespoke BREEAM version. Buildings outside the UK can also be assessed using BREEAM International.



Green Building Rating System in the United Kingdom (BREEAM)

BREEAM: Bespoke

BREEAM Bespoke can assess buildings that fall outside the standard BREEAM categories, including leisure complexes, laboratories, higher & further education buildings and hotels at the design stage and post construction.



BREEAM: Courts

BREEAM Courts can assess both new build and the major refurbishment of court buildings.

Green Building Rating System in the United Kingdom (BREEAM)

BREEAM:Ecohomes

Ecohomes can assess new homes, apartments/flats, and houses, apartments and flats undergoing major refurbishment at the design stage and post construction.

The Code for Sustainable Homes

In April 2007 the Code for Sustainable Homes replaced Ecohomes for the assessment of new housing in England.



Green Building Rating System in the United Kingdom (BREEAM)

BREEAM: EcohomesXB

A tool for housing associations and housing stock managers as a stock management aid for existing buildings.



BREEAM: Healthcare

BREEAM Healthcare can be used to assess all healthcare buildings containing medical facilities, and at different stages of their lifecycle.



Green Building Rating System in the United Kingdom (BREEAM)

BREEAM: Industrial

BREEAM Industrial can assess storage & distribution, light industrial units, factories and workshops at the design stage and post construction.

BREEAM: International

BREEAM International can assess a single development or BRE can also assist in creating a BREEAM version for a country or region outside of the UK.\



Green Building Rating System in the United Kingdom (BREEAM)

BREEAM: Multi-residential

BREEAM Multi-Residential can assess student halls of residence, sheltered housing for the elderly, supported housing and hostel type accommodation at the design stage and post construction.



BREEAM: Education

BREEAM Education can assess new schools, major refurbishment projects and extensions at the design stage and post construction.

Green Building Rating System in the United Kingdom (BREEAM)

BREEAM: Prisons

BREEAM Prisons can assess high and standard security prisons, young offenders institutions, local prisons and women's prisons at the design stage and post construction.



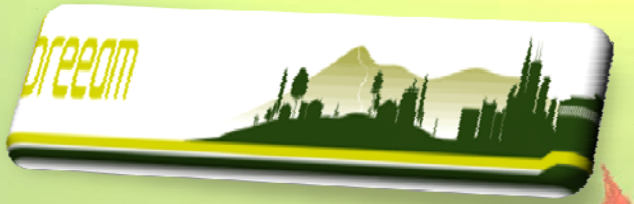
BREEAM Offices

BREEAM Offices can assess new build or major refurbishment and existing offices, at the design stage, post construction and in use.

Green Building Rating System in the United Kingdom (BREEAM)

BREEAM: Retail

BREEAM Retail can assess new build or major refurbishment, post construction, tenant fit-out, existing (occupied), management and operation.



BREEAM: Communities

This BREEAM scheme will help planners and developers to improve, measure and independently certify the sustainability of development proposals at the planning stage.



Green Building Rating System in the United Kingdom (BREEAM)

BREEAM Issue Categories



- Management



- Transport



- Energy



- Materials



- Water



- Pollution



- Land Use &Ecology

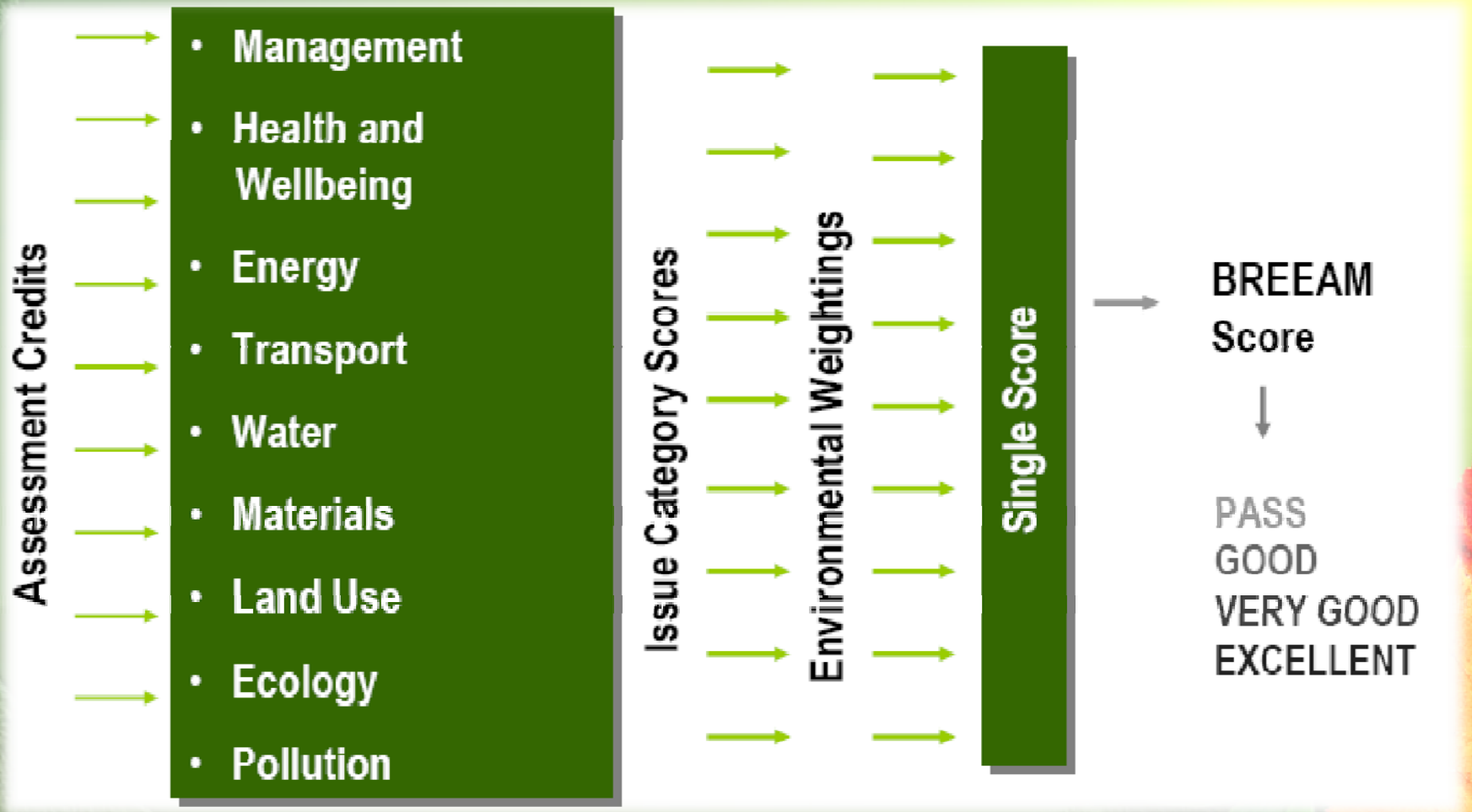


- Health & Wellbeing



Green Building Rating System in the United Kingdom (BREEAM)

BREEAM-Scoring



Green Building Rating System in Japan (CASBEE)



In Japan, a joint industrial/government/academic project was initiated with the support of the Housing Bureau, Ministry of Land, Infrastructure, Transport and Tourism (MLIT), in April 2001, which led to the establishment of a new organization, the Japan GreenBuild Council (JaGBC) / Japan Sustainable Building Consortium (JSBC) which developed the Comprehensive Assessment System for Building Environmental Efficiency (CASBEE).

Green Building Rating System in Japan (CASBEE)

Since JaGBC/JSBC started the development of CASBEE in 2001, they have compiled the following tools.

- **CASBEE for New Construction.**
- **CASBEE for New Construction (Brief version).**
- **CASBEE for Existing Building.**
- **CASBEE for Renovation.**
- **CASBEE for Heat Island**
- **CASBEE for Urban Development.**
- **CASBEE for an Urban Area + Buildings.**
- **CASBEE for Home (Detached House)**



Green Building Rating System in Japan (CASBEE)

CASBEE covers the following four assessment fields:

(1)Energy efficiency

(2)Resource efficiency

(3) Local environment

(4) Indoor environment



Green Building Rating System in Japan (CASBEE)

These four fields are largely the same as the target fields for the existing assessment tools described above in Japan and abroad, but they do not necessarily represent the same concepts, so it is difficult to deal with them on the same basis.



Green Building Rating System in Japan (CASBEE)

Under CASBEE there are two spaces, internal and external, divided by the hypothetical boundary, with two factors related to the two spaces.

Thus we have put forward CASBEE in which the "negative aspects of environmental impact which go beyond the hypothetical enclosed space to the outside (the public property)" and "improving living amenity for the building users" are considered side by side.



Green Building Rating System in Japan (CASBEE)

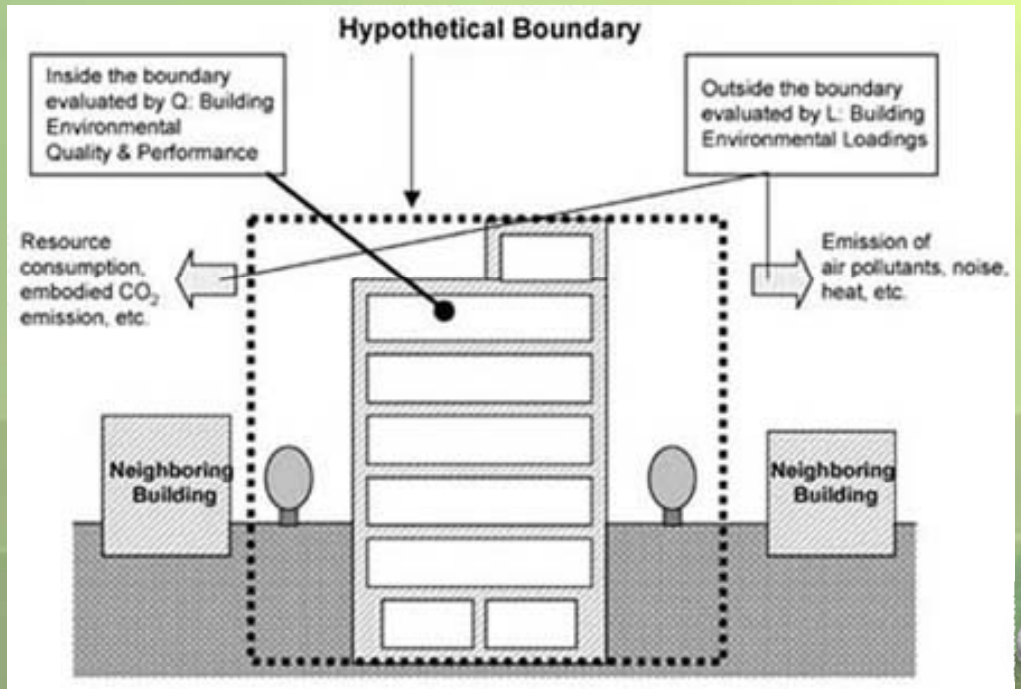
Under CASBEE, these two factors are defined below as Q and L, the main assessment categories, and evaluated separately.

Q (Quality): Building Environmental Quality & Performance:
Evaluates "improvement in living amenity for the building users, within the hypothetical enclosed space (the private property)."

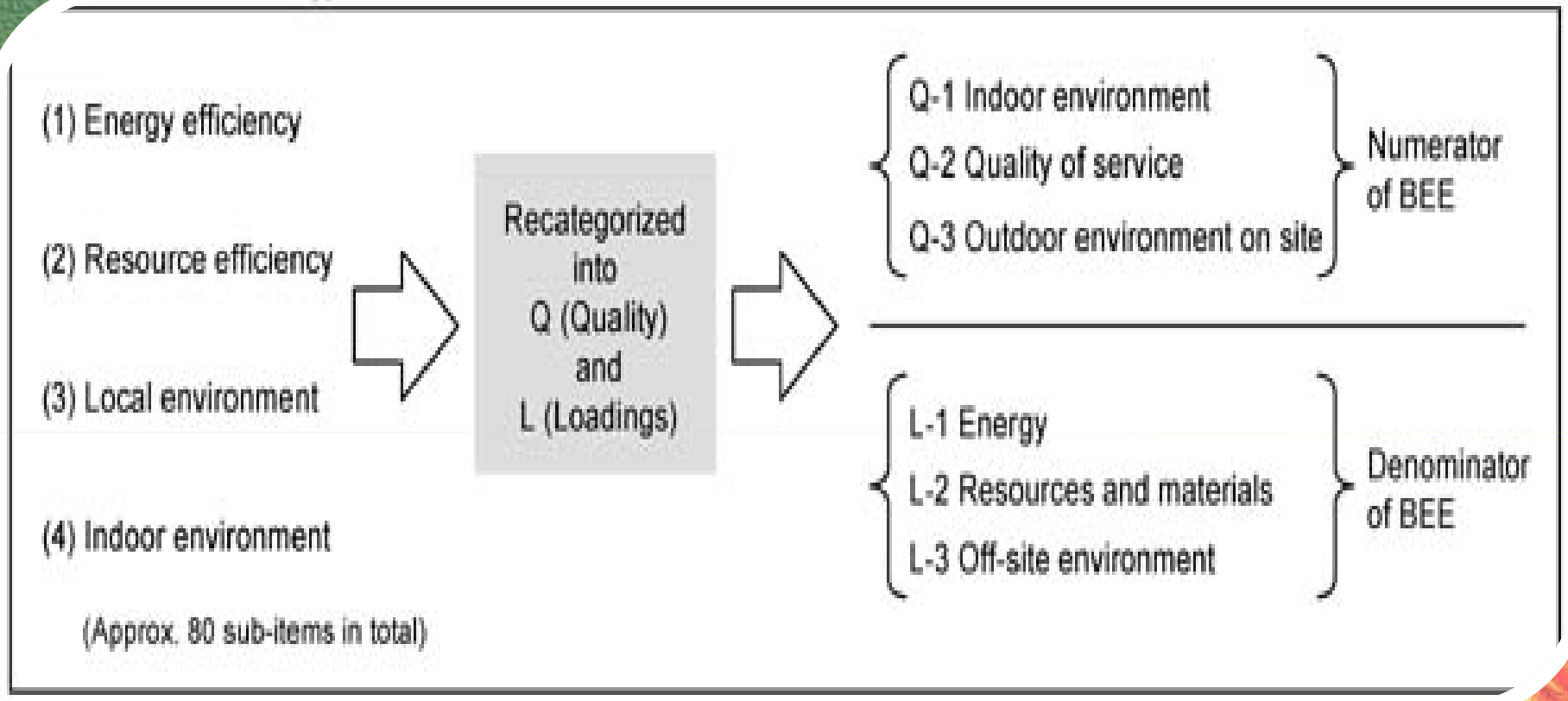


Green Building Rating System in Japan (CASBEE)

L (Loadings): Building Environmental Loadings: Evaluates "negative aspects of environmental impact which go beyond the hypothetical enclosed space to the outside (the public property)."



Green Building Rating System in Japan (CASBEE)





Green Building Rating System in Australia (Green Star)

The Green Building Council of Australia (GBCA) is committed to providing world class rating tools to measure the environmental performance of buildings across a range of building types. GBCA has created a suite of Green Star tools that:

- Are suited to the Australian climatic, ecological, regulatory and commercial environments;

Green Building Rating System in Australia (Green Star)

❖Provide weighting between diverse environmental concerns to ensure a clearly communicable single measure of green;

❖Reward best practice and therefore compliment • the activities of others in legislating minimum environmental performance standards in planning schemes and the building code;

Green Building Rating System in Australia (Green Star)

❖Provide the maximum opportunity for • widespread adoption through clearly stated credit criteria and low cost of implementation;

❖Are freely available and also provides for independent third party accredited assessment through the Green Building Council of Australia;

Green Building Rating System in Australia (Green Star)

- Are supported by a non-commercial • professional training and accreditation process;

- Are informed by the success and failure of Are informed by the success and failure of similar schemes overseas; and,

- Include different building types and the distinct stages of a buildings life cycle.

Green Building Rating System in Australia (Green Star)

The Green Star framework:

The framework is based on other international rating tools, including the Building Research Establishment's BREEAM rating tools and the US Green Building Council's LEED rating system.

Green Building Rating System in Australia (Green Star)

Green Star is a points-based system that evaluates buildings across the following environmental impact categories:

- Management
- Indoor Environment Quality
- Energy
- Transport
- Water
- Materials
- Land Use and Ecology
- Emissions, and
- Innovation



Green Building Rating System in Australia (Green Star)

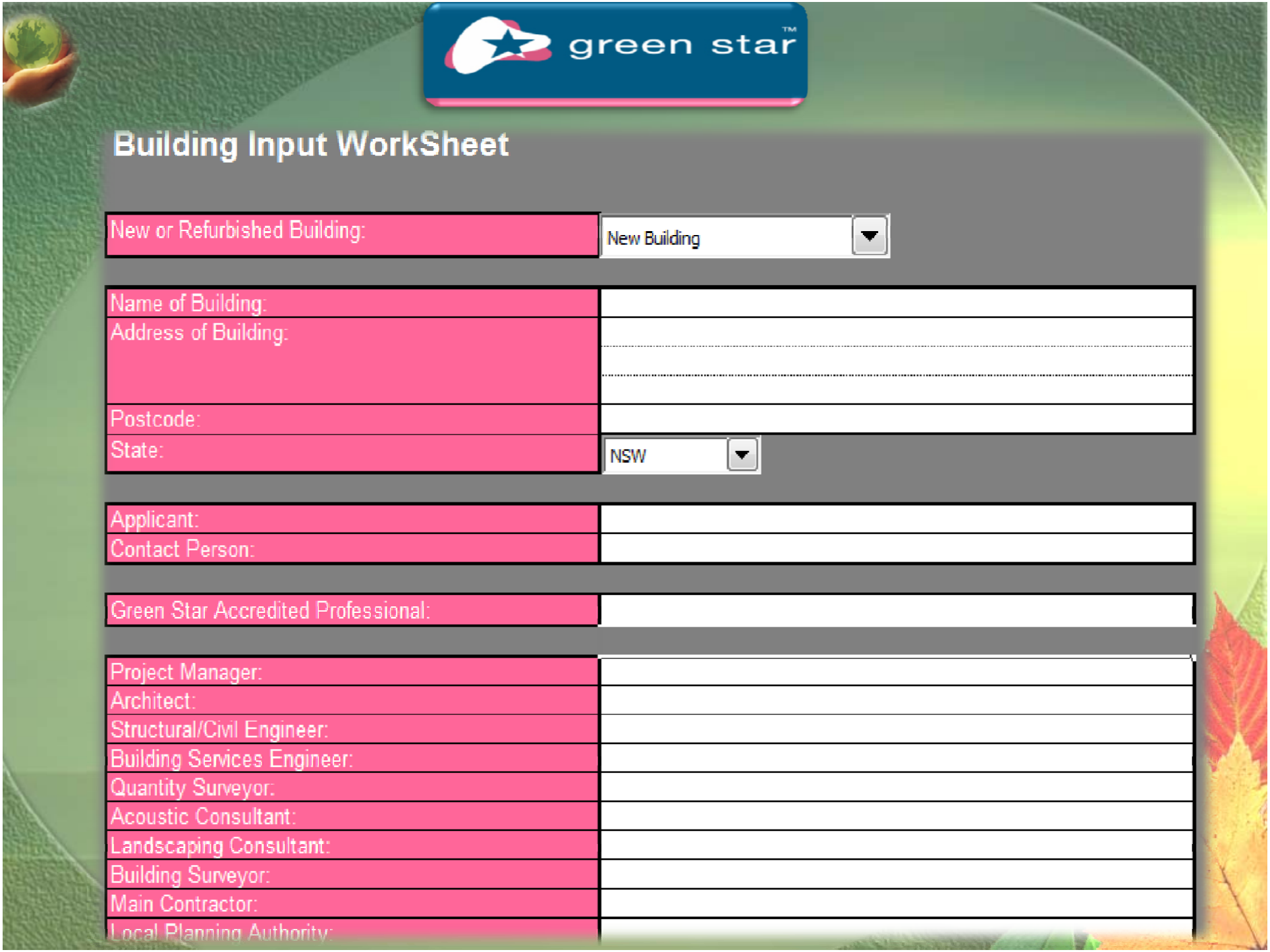
Green Star Tools:

- Green Star – Office
- Green Star – Office Interiors
- Green Star – Office Existing Building
- Green Star – Shopping Centre Design
- Green Star – Healthcare
- Green Star – Education
- Green Star - Multi Unit Residential
- Green Star - Mixed Use

Green Building Rating System in Australia (Green Star)

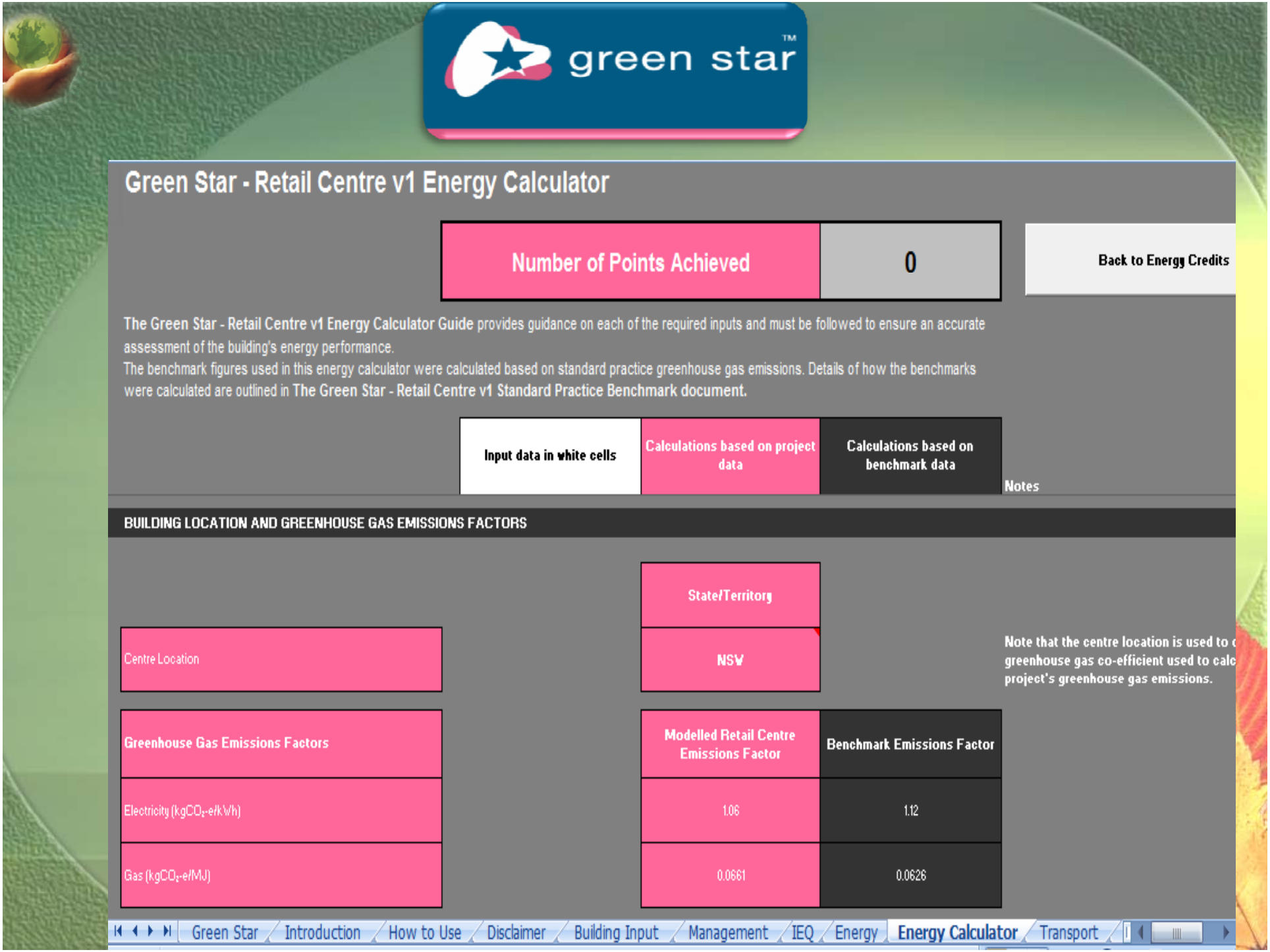
Points are awarded in each credit for documentation that demonstrates that the project has met the overall objectives of the relevant Green Star rating tool. The Green Star rating is determined by comparing the overall score with the rating scale shown below.

- 45-59 - Four Star “Best Practice”
- 60-74 - Five Star “Australian Excellence”
- 75+ - Six Star “World Leader”



Building Input WorkSheet

New or Refurbished Building:	New Building
Name of Building:	
Address of Building:	
Postcode:	
State:	NSW
Applicant:	
Contact Person:	
Green Star Accredited Professional:	
Project Manager:	
Architect:	
Structural/Civil Engineer:	
Building Services Engineer:	
Quantity Surveyor:	
Acoustic Consultant:	
Landscaping Consultant:	
Building Surveyor:	
Main Contractor:	
Local Planning Authority:	

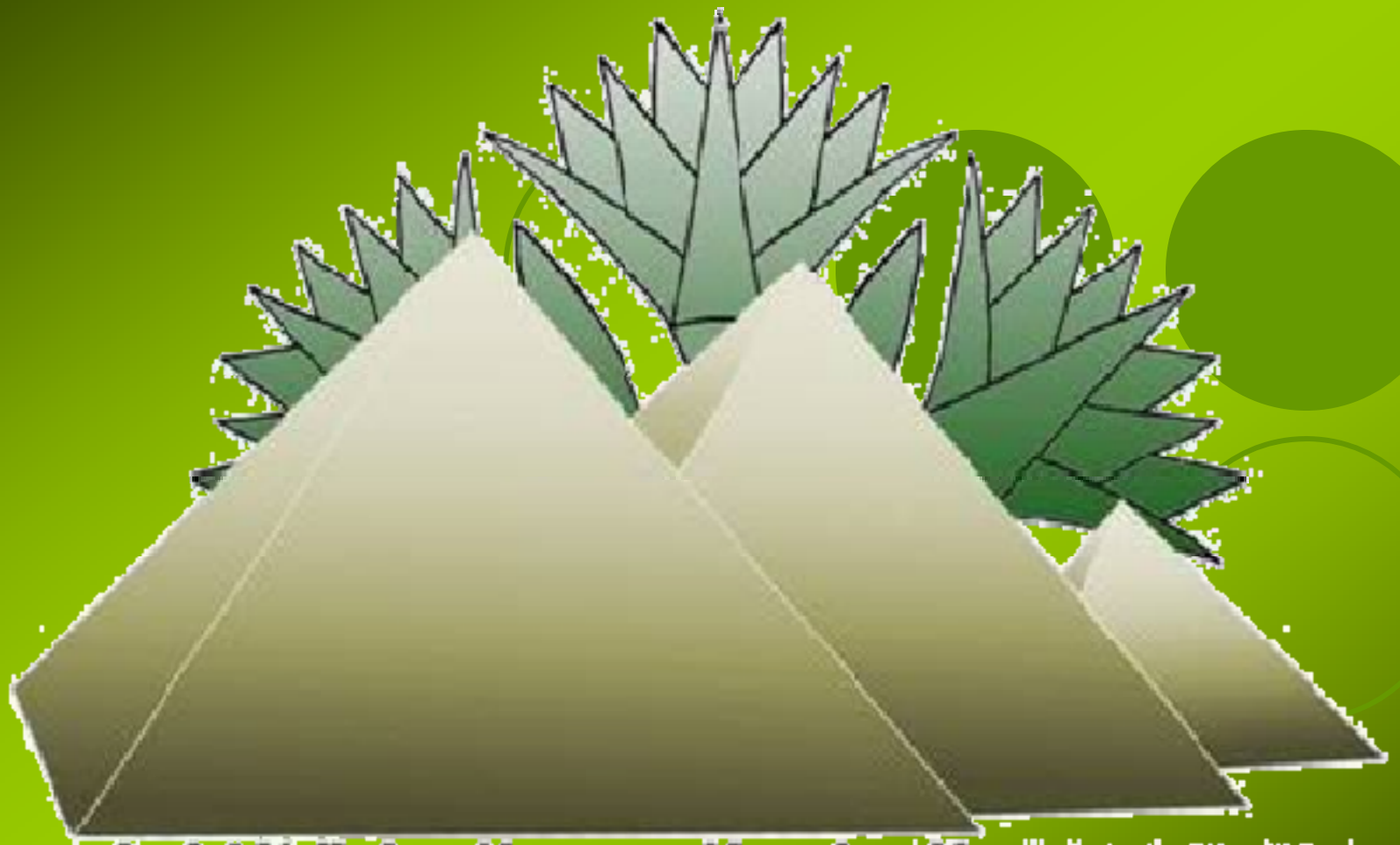

green star
Green Star - Retail Centre v1 Energy Calculator
Number of Points Achieved
0
Back to Energy Credits
The Green Star - Retail Centre v1 Energy Calculator Guide provides guidance on each of the required inputs and must be followed to ensure an accurate assessment of the building's energy performance.
The benchmark figures used in this energy calculator were calculated based on standard practice greenhouse gas emissions. Details of how the benchmarks were calculated are outlined in The Green Star - Retail Centre v1 Standard Practice Benchmark document.
Input data in white cells
Calculations based on project data
Calculations based on benchmark data
Notes
BUILDING LOCATION AND GREENHOUSE GAS EMISSIONS FACTORS
State/Territory
Centre Location
NSW
Note that the centre location is used to
greenhouse gas co-efficient used to calc
project's greenhouse gas emissions.
Greenhouse Gas Emissions Factors
Modelled Retail Centre Emissions Factor
Benchmark Emissions Factor
Electricity (kgCO2-e/kWh)
1.06
1.12
Gas (kgCO2-e/MJ)
0.0661
0.0626
Green Star
Introduction
How to Use
Disclaimer
Building Input
Management
IEQ
Energy
Energy Calculator
Transport



Conclusions & Recommendations

- Several green building assessment and certification systems were presented.
- Each evaluation system has its merits and in some cases deficiencies.
- It is highly recommended that The Egyptian Green Building Council develops a national assessment system suited for Egyptian culture, climatic, ecological, regulatory and commercial environments.

Congratulations Egypt



المجلس المصري للعمارة الخضراء

EGYPTIAN GREEN BUILDING COUNCIL

Особая экономическая зона
г.Дубны

ENVIRONMENTAL FRIENDLY COMPOSITE INFRASTRUCTURE FOR OLYMPIC GAMES 2014 IN SOCHI

Spartakovskaya str.6, 105066, Moscow, Russian Federation
Tel. +7 (495) 2672-833, Fax. +7 (495) 2617-076, apatech@apatech.ru

SOCHI – OLYMPIC CAPITAL 2014



UNIQUE ENVIRONMENT OF SOCHI









PLAN OF OLYMPIC CONSTRUCTION AREA IN SOCHI

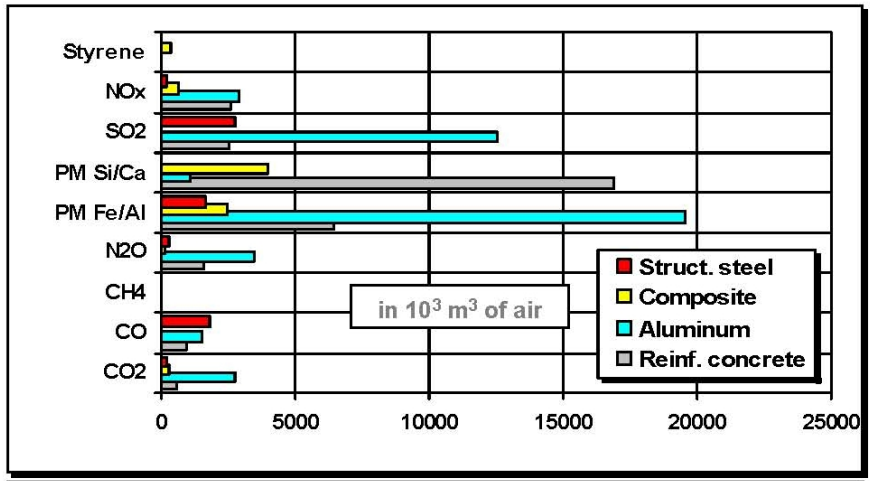


UNIQUE ENVIRONMENT OF SOCHI

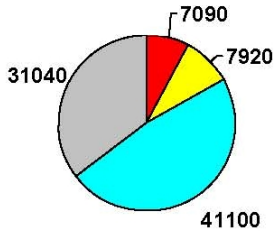
- Sochi is a Russian National Park
- Ancient trees, mountain rivers, coastal and Black Sea nature here make the unique ecological system
- 250 types of rare animals and plants are under protection in National Park
- Unique combination of highlands & sea climate
- Huge amount of dust and gases coming from welding, casting, painting and rendering in Olympic construction may cause severe damage to Sochi environment
- Application of FRP structures provides possibility to prevent environmental damage

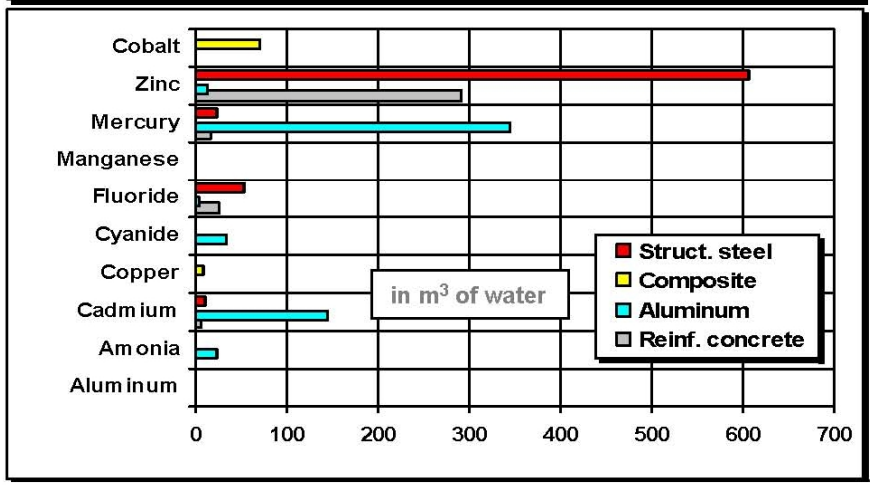
ENVIRONMENTAL ADVANTAGES OF COMPOSITE MATERIALS

COMPOSITES ARE MOST ENVIRONMENTAL FRIENDLY SOLUTION FOR CONSTRUCTION *

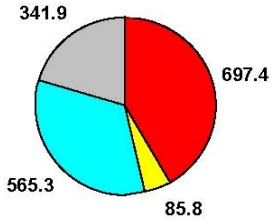


Air pollution as result of bridge construction in various materials





Water pollution as result of bridge construction in various materials



*«In Search of Optimal Shapes for Composite Bridges», Ryszard A. Daniel, Ministry of Transport & Water Management, Utrecht, The Netherlands, «COBRAE CONFERENCE 2007», Stuttgart, Germany, March 28-30, 2007

ECOLOGICAL COMPETITIVE ADVANTAGES OF COMPOSITE MATERIALS (APATECH EXPERIENCE)

- Corrosion and corrosive medium resistance
- Light weight
- Untraditional design solutions

Design of structures that cannot be produced with traditional materials (steel, concrete, wood)
→ **Adaptation of projects to the ecological situation in particular areas**

Reduction of metal needs, reduced transportation costs, short-term installation → **Reduced environmental impact during construction**

Reduced working hours for maintenance (painting, repairs, nodes replacement)
→ **Reduced environmental impact during the life cycle of a structure**

Storage of the structure elements in unequipped conditions
→ **Reduced interference in the local environment at the preparatory stage**

ENVIRONMENTAL IMPACT REDUCTION DURING CONSTRUCTION WITH COMPOSITES (APATECH EXPERIENCE)



Assembly in workshops







Delivery of finished details by means of standard transport



Short-term installation on site

ENVIRONMENTAL IMPACT REDUCTION AT THE CONSTRUCTION STAGE

ENVIRONMENTAL IMPACT REDUCTION DURING MAINTENANCE OF COMPOSITE STRUCTURES (APATECH EXPERIENCE)

CORROSION RESISTANCE BENEFITS

Statistics by Moscow Government Bridge Maintenance Organization

Material	Painting costs
Steel and reinforced concrete	52 $ per m^2 annualy
Composite	2.6 $ per m^2 annualy

Application of composites allows to reduce the amount of harmful emissions from painting and chemical protection of a structure to 95%



Storage of details and materials in any unequipped conditions allows not to interfere in the local environment

REDUCED ENVIRONMENTAL IMPACT DURING THE WHOLE LIFE CYCLE OF A STRUCTURE

APATECH COMPOSITE STRUCTURES FOR MAIN TRANSPORTATION PART OF NORTH CAUCASUS RAILWAY TUAPSE – ADLER – KRASNAYA POLYANA

CONSTRUCTION OF OLYMPIC INFRASTRUCTURE IN SOCHI



- Federal investment 12 billion $
- 218 buildings of Olympic infrastructure will be built
- More than 100 million tons of cement required
- 70% of materials will be brought by railways
- 30% of materials will be brought by sea
- Coastal railway will be reconstructed and capacity will be increased 4 times
- 2 new ports will be built

PART OF NORTH CAUCASUS RAILWAY
TUAPSE – ADLER – KRASNAYA POLYANA



COMPOSITE FOOTBRIDGES FOR RAILWAYS









"STTC ApATeCh-Dubna" Ltd., tel.+7 (499) 261-7076

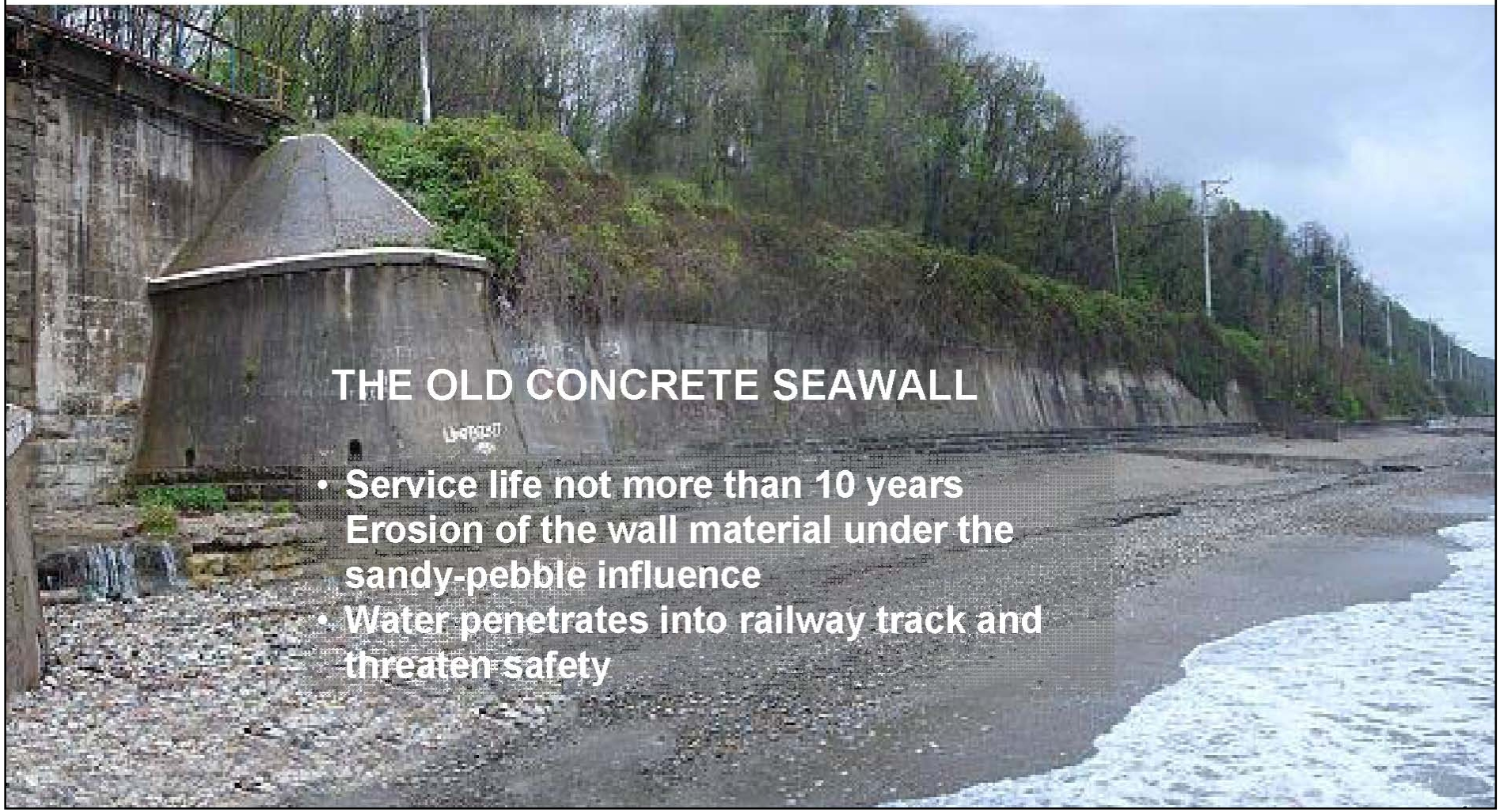
FULLCOMPOSITE SHELTERED BRIDGE (586 KM OF SOUTH EASTERN RAILROAD), 2008



Weight of the superstructure	14.4 tons
Weight of the shelter	3.4 tons
Length	42 m
Width	3.2 m
Spans	3

"STTC ApATeCh-Dubna" Ltd., tel.+7 (499) 261-7076

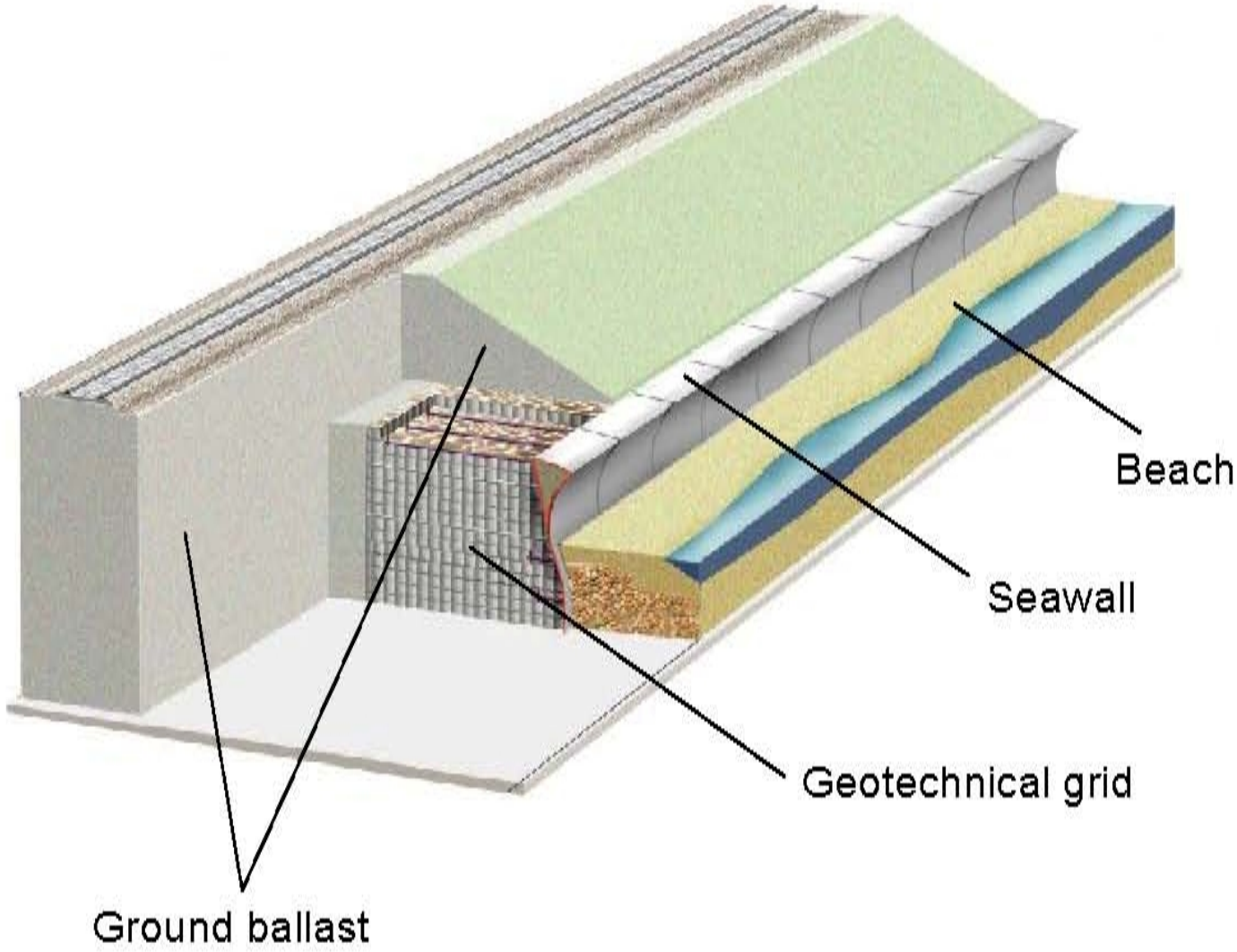
CONSTRUCTION OF NEW SEAWALL ON THE BLACK SEA COAST NEAR SOCHI



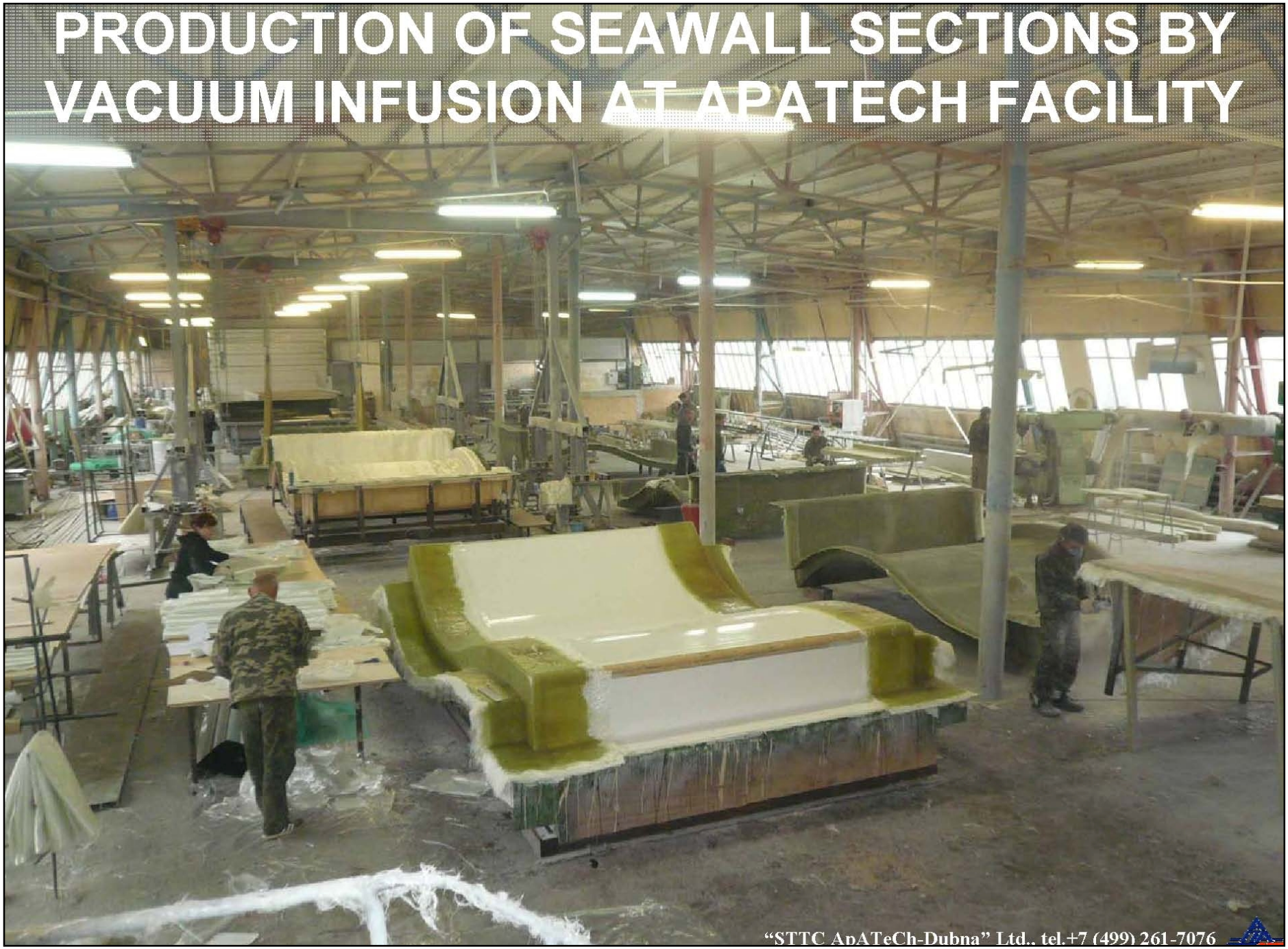
SEAWALL PROJECT REQUIREMENTS

- Railway track protection from sea water during wave 8-points storm
- Construction of the second railway track without traffic interruption
- 8-10-times reduction of construction time
- Preservation of Black Sea environment
- Service life up to 70…100 years
- In service testing of a composite seawall in the marine climate and under sandy-pebble erosion
- Monitoring of a sea wall behavior under acting loads using embedded sensors

CONCEPT OF COMPOSITE SEAWALL



PRODUCTION OF SEAWALL SECTIONS BY VACUUM INFUSION AT APATECH FACILITY

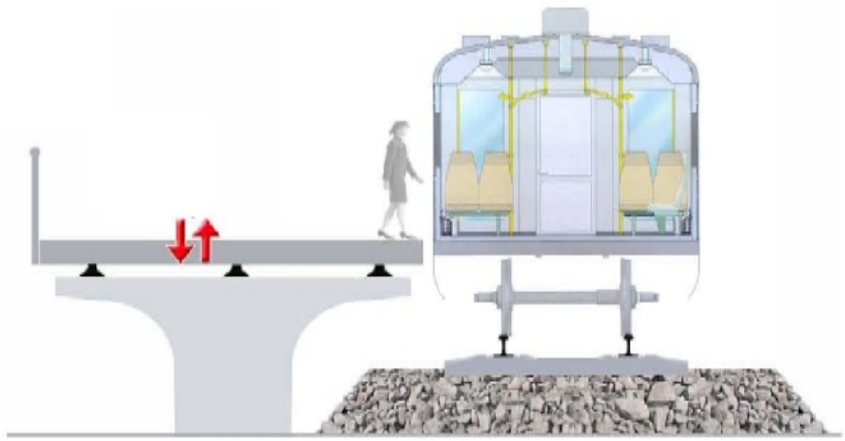


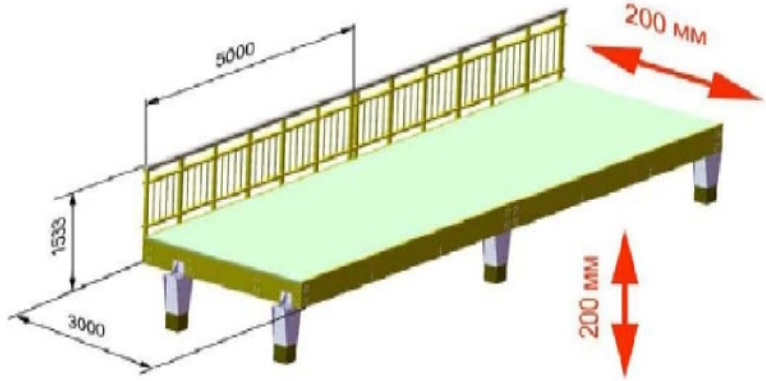
SEALING OF JOINTS BETWEEN SECTIONS




NEW COMPOSITE SEAWALL ON THE BLACK SEA COAST

ADJUSTABLE PASSENGER PLATFORMS





	Traditional materials	Composite materials
Weight of 1 sq. m.	800 kg	60 kg
Adjustment range, mm	-	± 200
Maintenance cycle	5 years	10 years
Life cycle	20 years	75 years

APATECH COMPOSITE NOISE BARRIERS



- Modular, lightweight design
- Multiple Finish Options
- Graffiti, moisture and freeze thaw resistant
- Will not crack, corrode or rot
- No heavy equipment required for installation or repairs
- 70 years of service life
- Lowest life cycle cost
- Repairs and modifications can easily be made on-site

INSTALLATION OF APATECH NOISE BARRIERS ON SOUTH EASTERN RAILROAD









"STTC ApATeCh-Dubna" Ltd., tel.+7 (499) 261-7076

COMPOSITE WATER REMOVAL CHANNELS



Winner of world main composite award JEC Award 2007

Life Cycle	**50 years**
Width	**0.5…0.8 m**
Length	**2…6 m**
Weight	**6…23 kg / r. m.**
Depth	**0.4…1 m**

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COST EFFECT OF COMPOSITE WATER REMOVAL CHANNELS





Advantages of composite water removal channels comparing with concrete channels (experience of Russian Railways):

- **Cost expenses for installation 3 times less**
- **Cost expenses for maintenance 10 times less**
- **Possibility of installation in hard-to-reach areas without machinery**

ELECTRICAL ISOLATING JOINTS & FISHPLATES

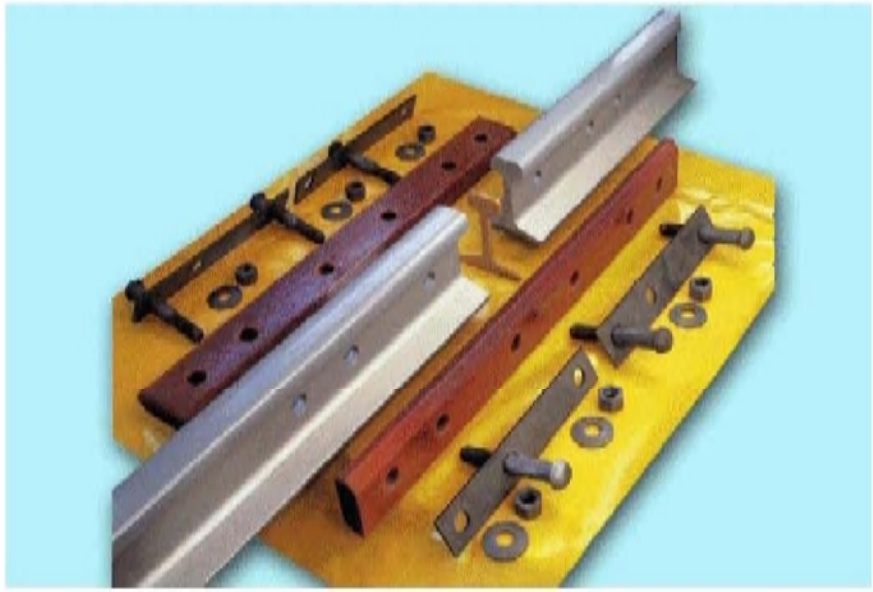
Winner of world main composite award JEC Award 2004



"STTC AnATeCh-Dubna" Ltd., tel.+7 (499) 261-2076

ELECTRICAL ISOLATING JOINTS

with COMPOSITE FISHPLATES
For segmented tracks



with METAL-COMPOSITE FISHPLATES
For jointless tracks



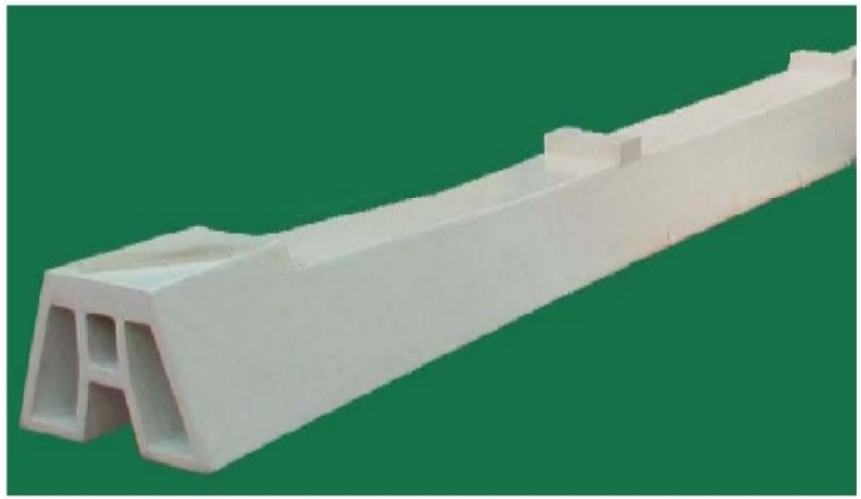
№	Property	Value
1	Life cycle carrying capacity	up to 1 billion tons gross load
2	Train speed	up to 200 km/hour
3	Joint minimum insulation	1 kOm
4	Operating temperature range	-60ºC…+80ºC

COMPOSITE BALLASTLESS SLABS AND SLEEPERS



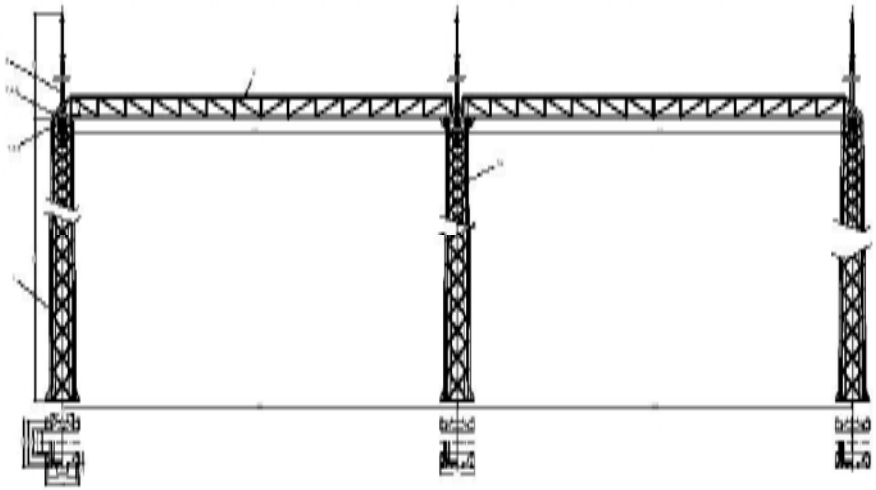
IN-SERVICE PROPERTIES OF COMPOSITE BALLASTLESS SLABS AND SLEEPERS





Service life	50 years
Service temperature	-60 °C…+ 60 °C
Minimum specific resistance	30 kOhm/sm^2
Life cycle carrying capacity	2 billion tons gross weight
Axis load	30 tons
Maximum speed	140 km/h

POLES AND CROSSBARS FOR THE RAILWAY ELECTRICAL NETWORK



Comparison of poles 8 m (accepted moment M=3000 kg·m)

Concept	Material	Weight of components	Weight of the structure
Steel	Galvanized steel	440 kg	440 kg
Composite + Steel	Composite	150 kg	170 kg
	Galvanized steel	20 kg	

APATECH COMPOSITE STRUCTURES FOR CITY OF SOCHI

EXHIBITION PLATFORM OVER SOCHI RIVER



Project was initiated in 2007 by local regional government

PROJECT REQUIREMENTS AND PROPOSED CONCEPT

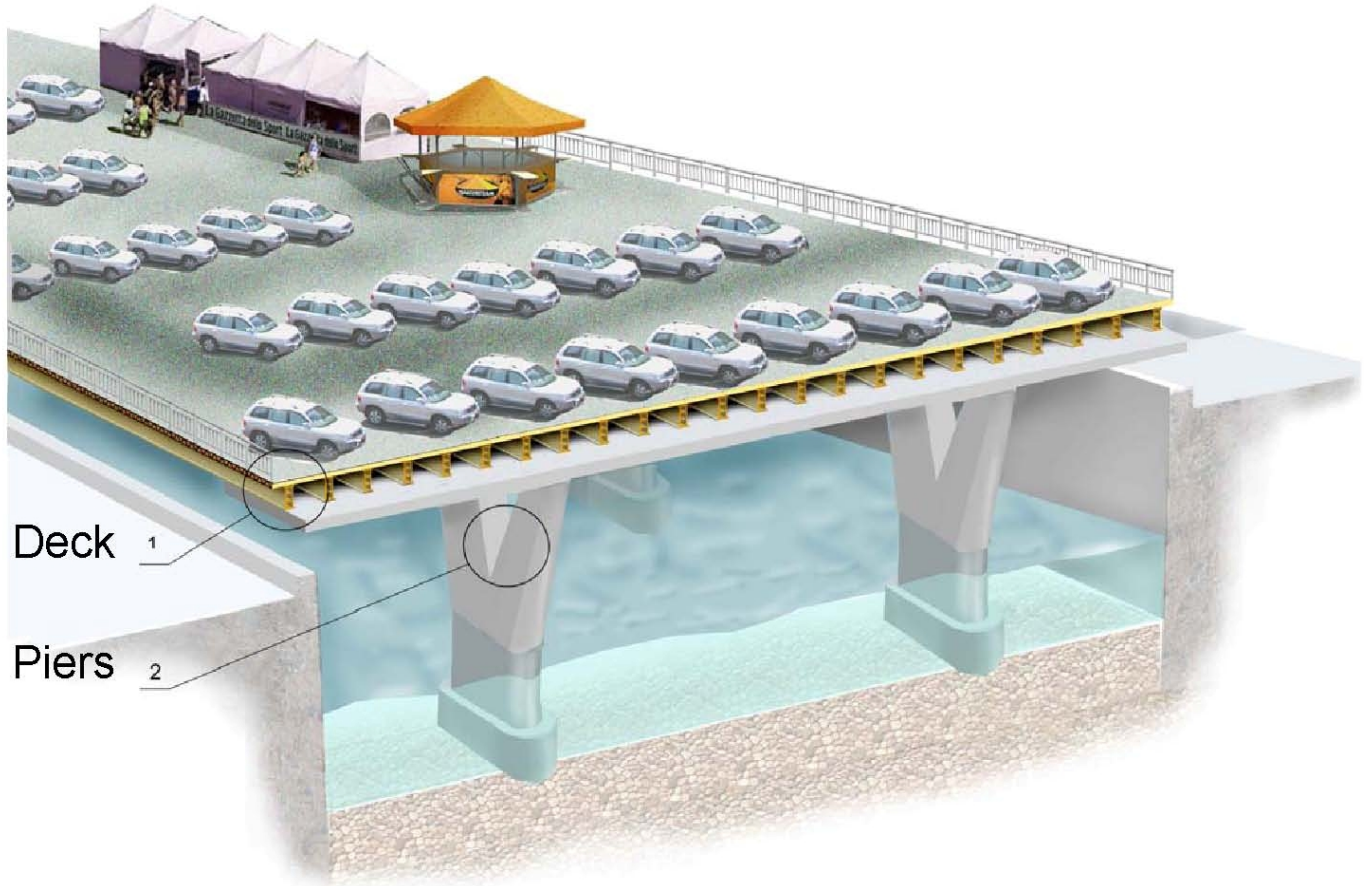
requirements

- Construction of the platform in extremely short period
- Preservation of original trees and landscape along the river
- Minimization of the damage effect on the local environment during construction

concept

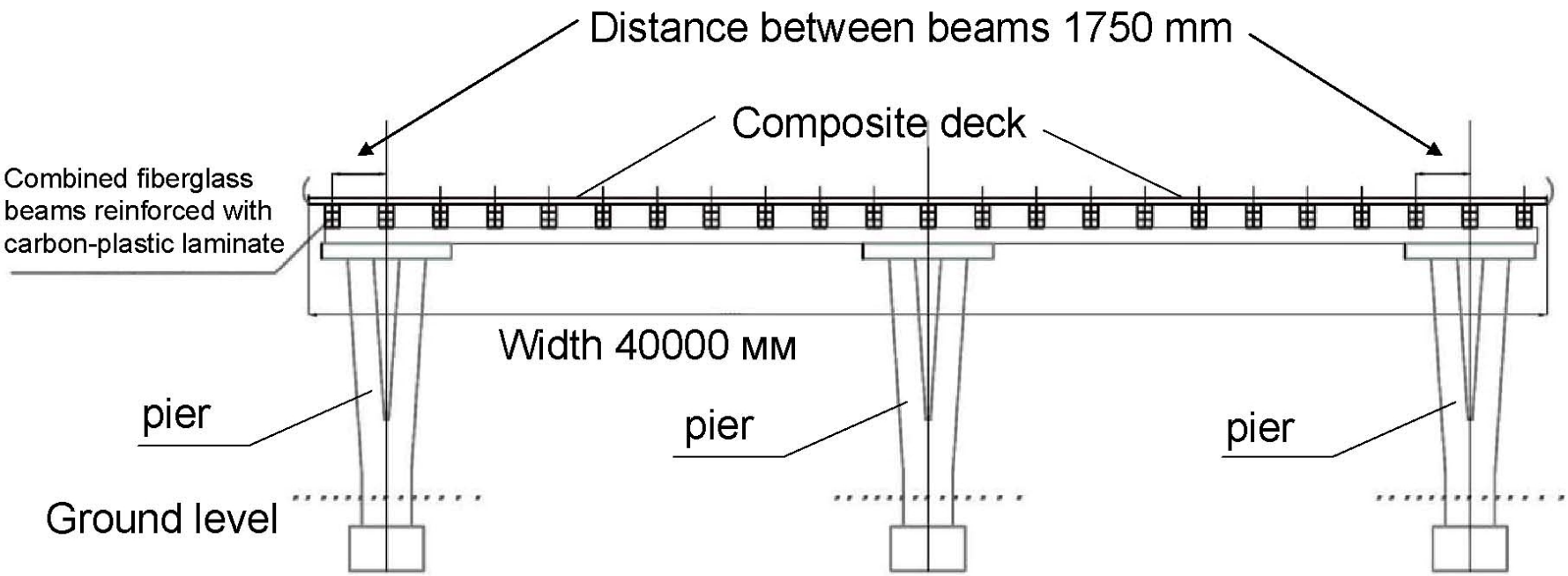
- The designed structure of the platform can be installed from the very beginning in one year
- The platform is installed without using the riverside
- Minimization of the maintenance costs in the subtropical climate of the Sochi City

CONCEPT OF EXHIBITION PLATFORM



Cost of 1m^2, $	33800
Development time	11 months
Construction time	2 months

CROSS SECTION STRUCTURAL DESIGN



Deck mass for automobile load	200 kg/m^2
Deck mass for pedestrian load	100 kg/m^2

FULL-COMPOSITE ILLUMINATED BRIDGE

Gift of "ApATeCh" to city of Sochi





Length	12.8 m
Width of footpath	1.6 m
Height	0.33 m
Height of handrails	0.9 m

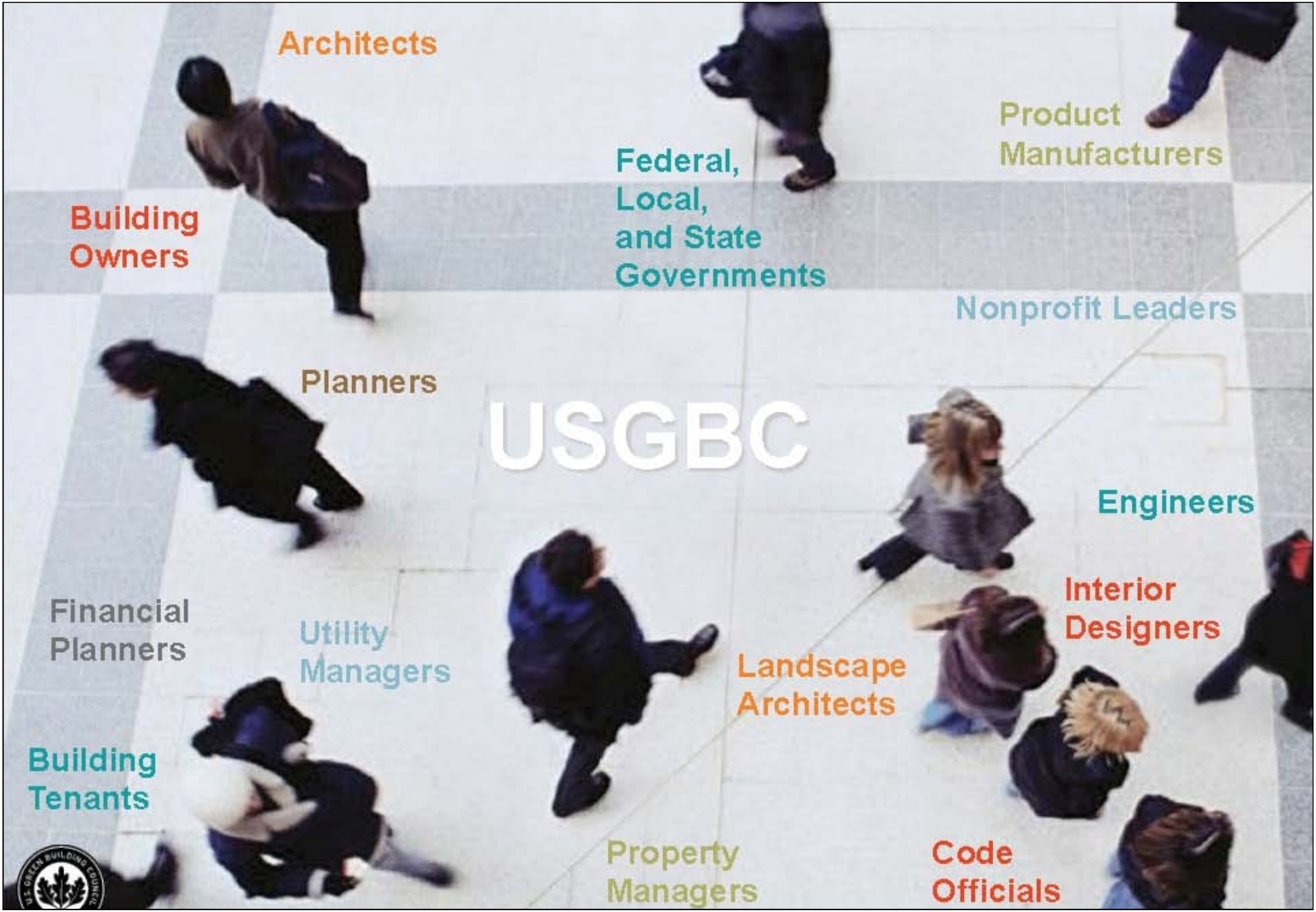
Bruce Hostetter YCC International
USGBC Orange County Chapter Leadership
USGBC Pacific Regional Council
IES Sustainable Lighting Committee
EGBC Advisory Council

USGBC Organizational Models: Potential Applications for EGBC



Egypt Green Building Council (EGBC) Initiation
Housing & Building National Research Center (HBRC)




Architects
Product Manufacturers
Federal, Local, and State Governments
Building Owners
Nonprofit Leaders
Planners
USGBC
Engineers
Financial Planners
Utility Managers
Interior Designers
Landscape Architects
Building Tenants
Property Managers
Code Officials





USGBC is a community of leaders working to transform the way buildings and communities are designed, built, and operated.

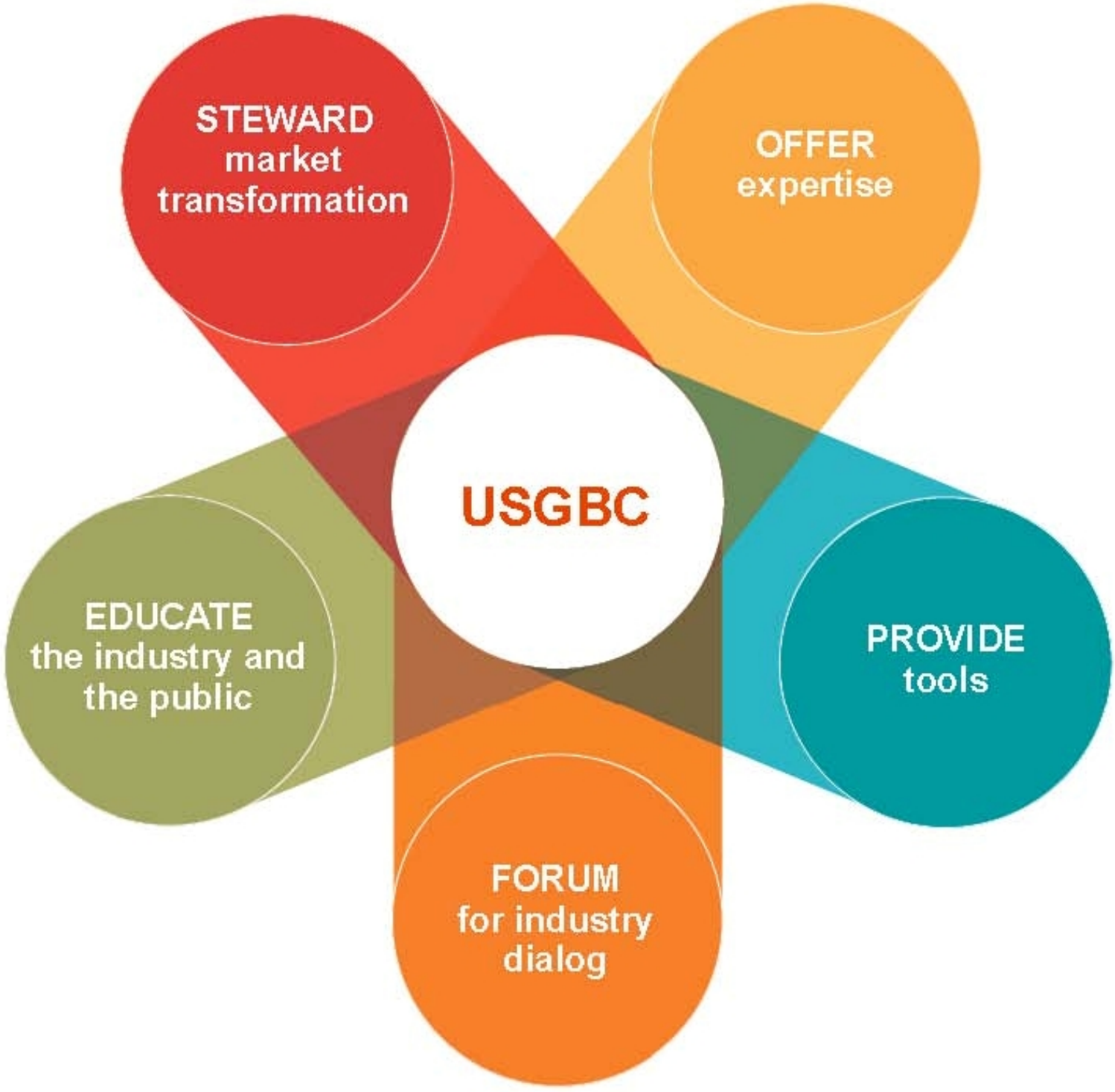




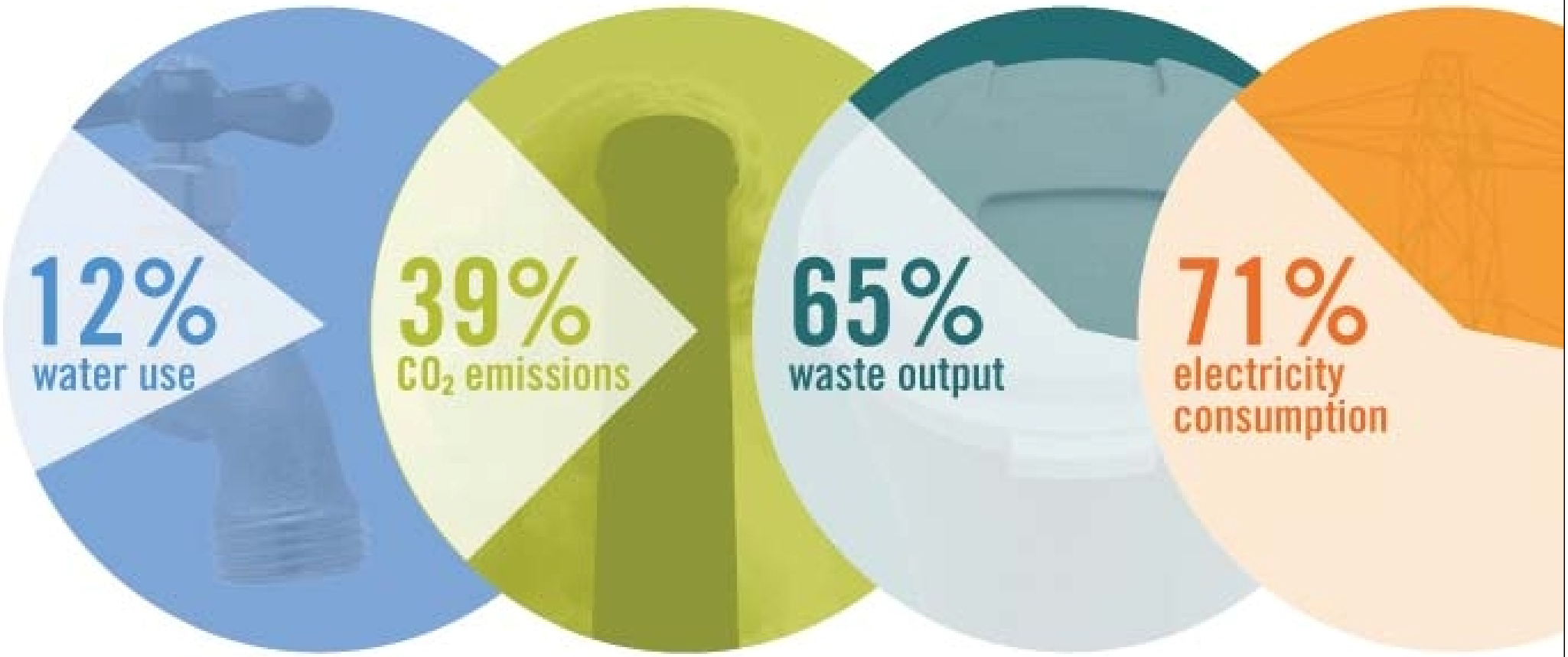
We envision an environmentally responsible, healthy, and prosperous environment.

USGBC

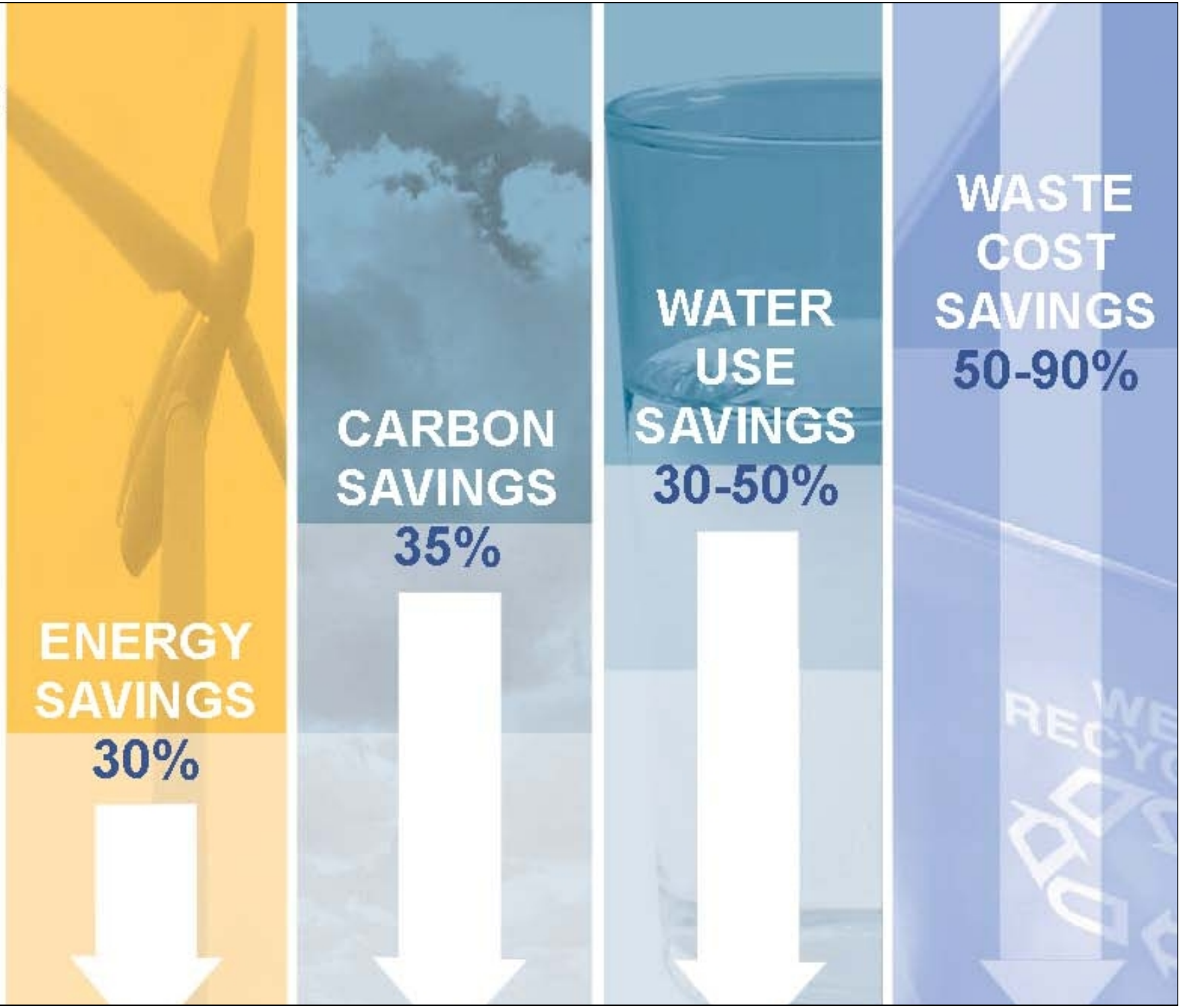



STEWARD
market
transformation
OFFER
expertise
USGBC
EDUCATE
the industry and
the public
PROVIDE
tools
FORUM
for industry
dialog

U.S. Building Impacts:



Average Environmental Savings of Green Buildings



Source:

PERCEIVED ADVANTAGES OF BUILDING GREEN

8-9% decrease in operating costs

7.5% increase in building values

6.6% improvement in ROI

3.5% increase in occupancy

3% rent increase

Levels of LEED Ratings



Levels of LEED Ratings

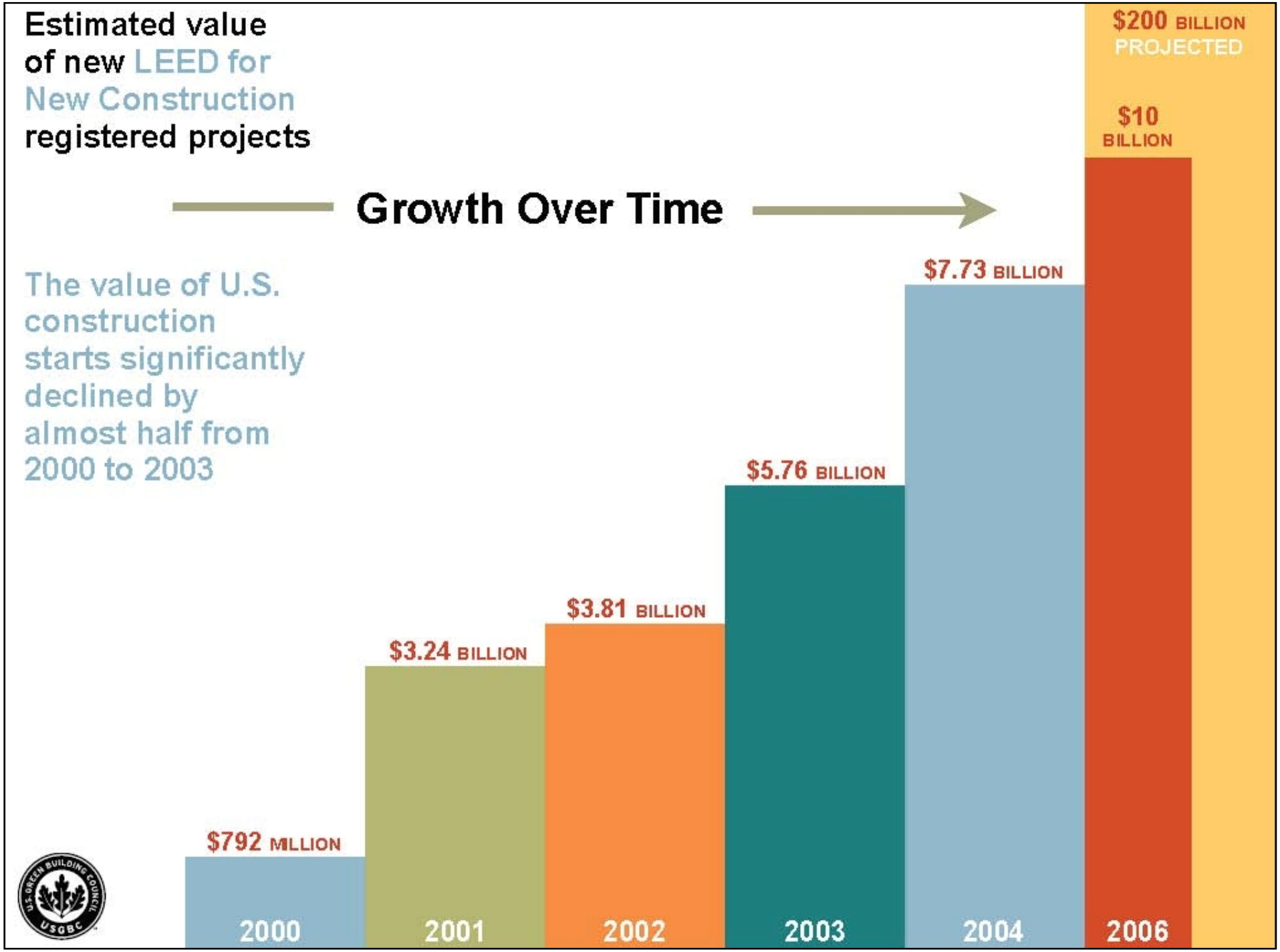


Green Buildings worldwide are certified with a voluntary, consensus-based rating system.

Estimated value
of new LEED for
New Construction
registered projects

Growth Over Time

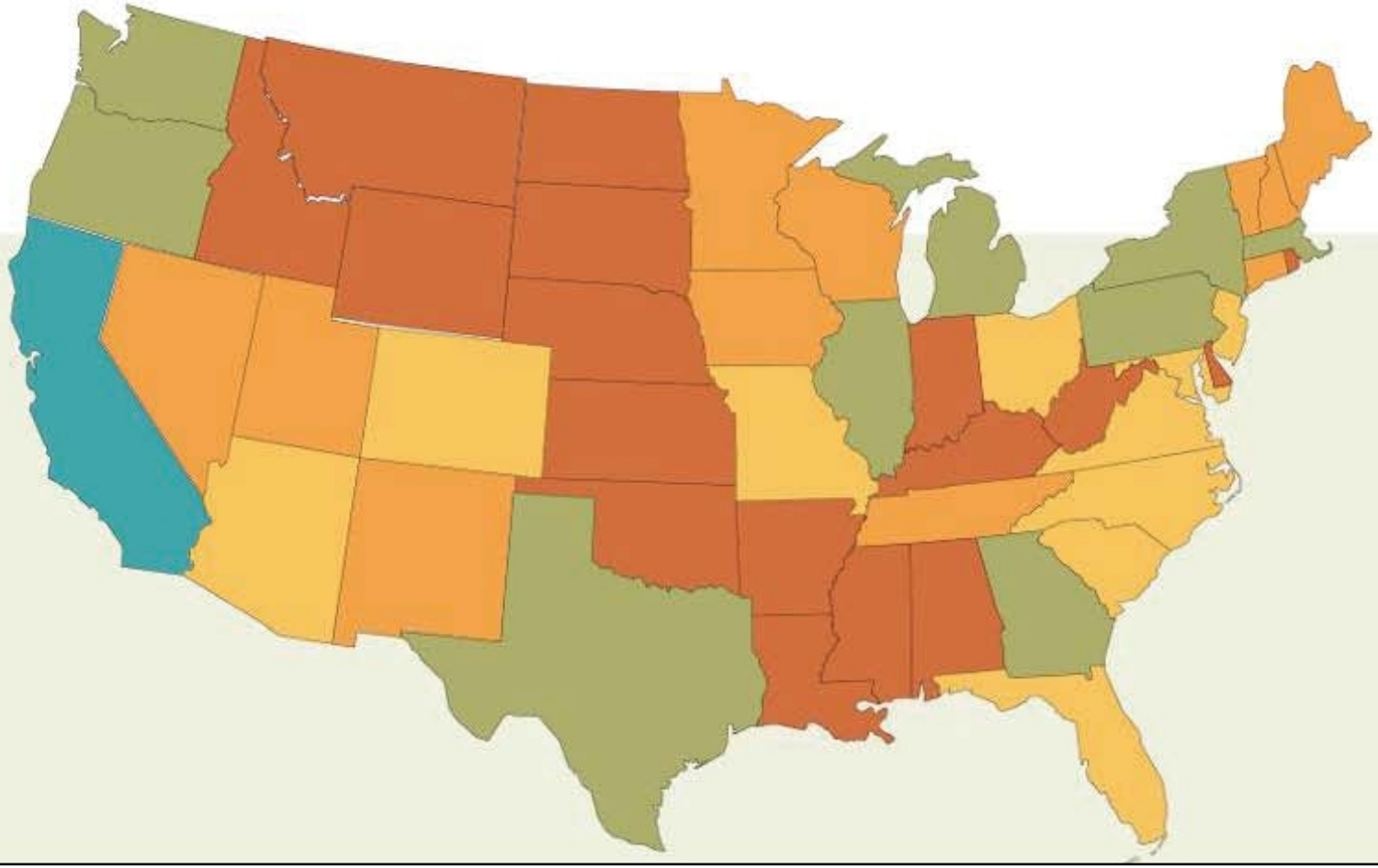
The value of U.S.
construction
starts significantly
declined by
almost half from
2000 to 2003


Estimated value of new LEED for New Construction registered projects
Growth Over Time
The value of U.S. construction starts significantly declined by almost half from 2000 to 2003
$792 MILLION
$3.24 BILLION
$3.81 BILLION
$5.76 BILLION
$7.73 BILLION
$10 BILLION
$200 BILLION PROJECTED
2000
2001
2002
2003
2004
2006

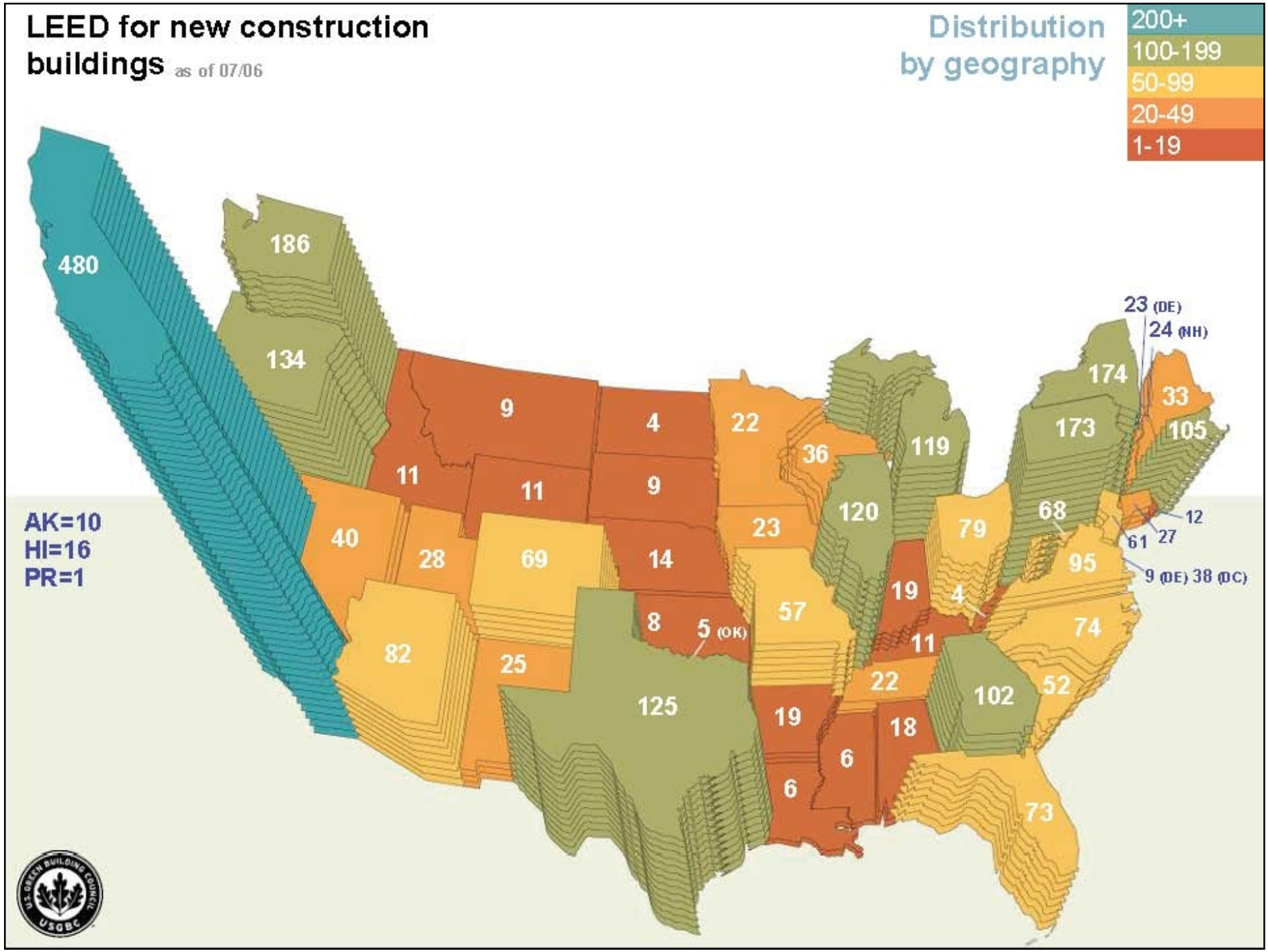
LEED for new construction buildings as of 07/06

Distribution by geography

200+
100-199
50-99
20-49
1-19



U.S. GREEN BUILDING COUNCIL USGBC


LEED for new construction buildings as of 07/06
Distribution by geography
200+
100-199
50-99
20-49
1-19
AK=10
HI=16
PR=1
480
186
134
9
4
22
36
119
174
173
23 (DE)
24 (NH)
33
105
11
11
9
120
79
68
12
61
27
9 (DE) 38 (DC)
40
28
69
14
23
95
19
4
57
8
5 (OK)
74
82
25
11
22
102
52
125
19
18
6
6
73

LEED for New Construction Buildings

Distribution by Building Type

as of 09/06

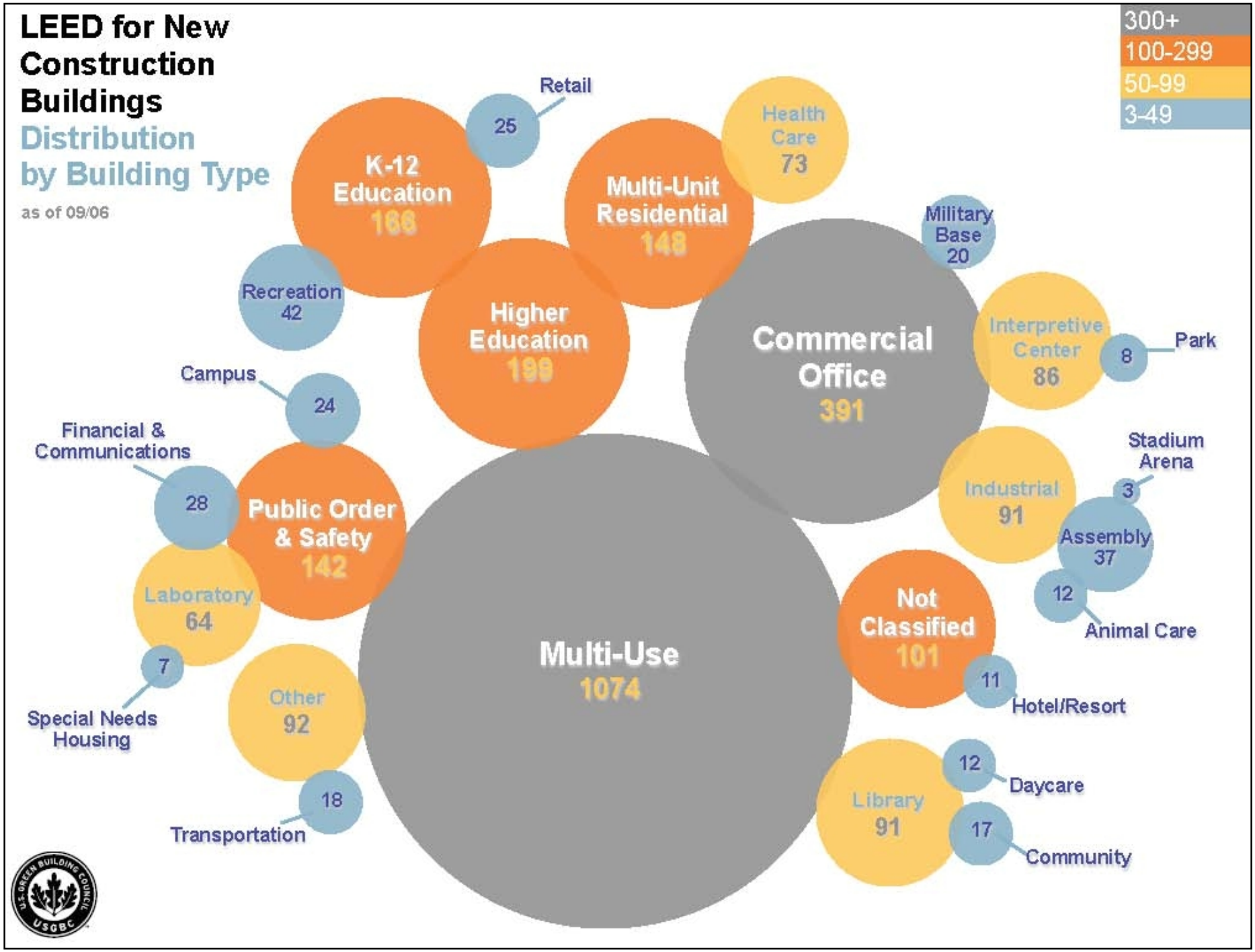


300+
100-299
50-99
3-49

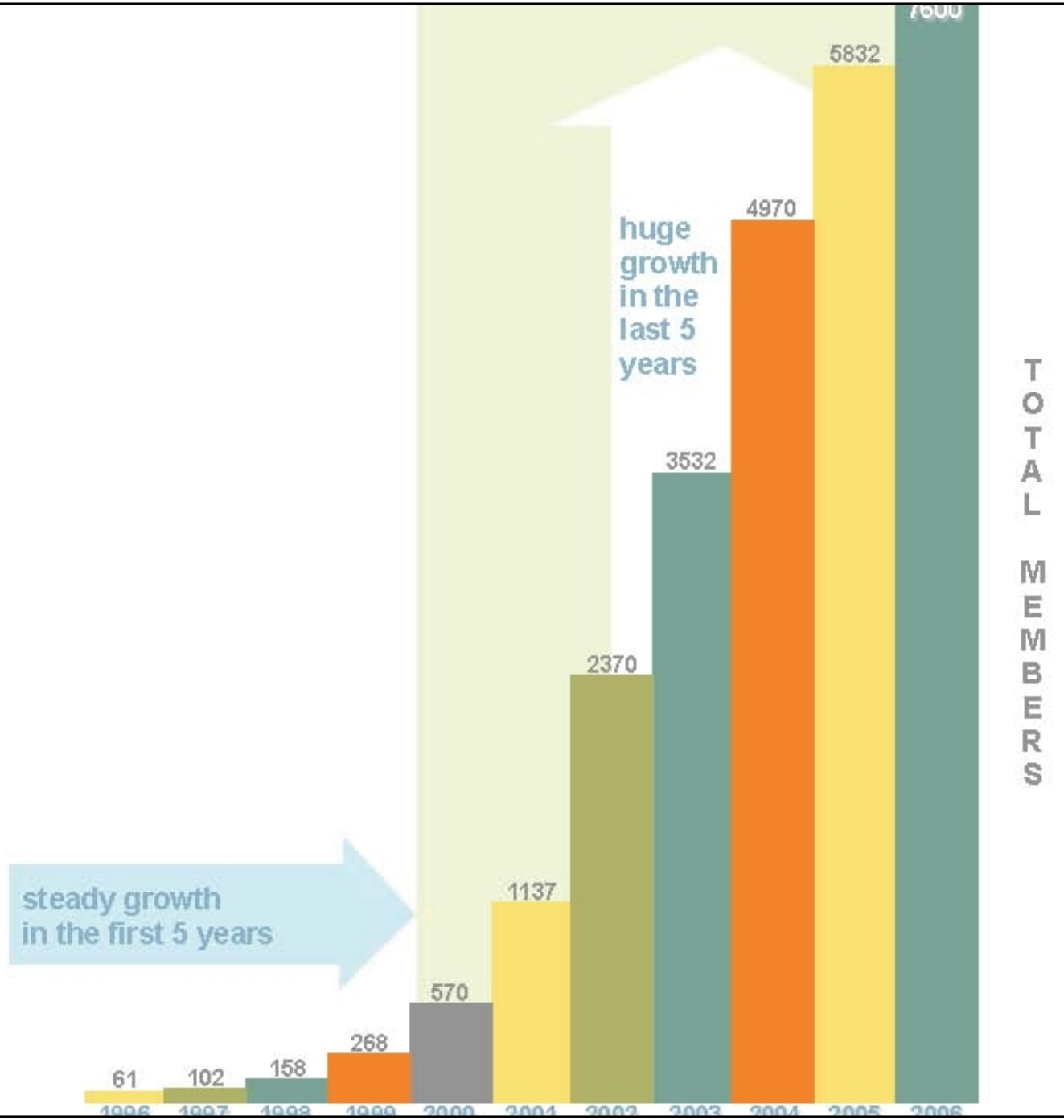
LEED for New Construction Buildings

Distribution by Building Type

as of 09/06



USGBC membership growth reflects the expansion of green buildings in the market




USGBC COMMUNITY
ENGINEERS
NON PROFIT LEADERS
INTERIOR DE
PRODUCT MANUFACTURERS
ARCHITECTS
CODE OFF
PROPERTY MANAGERS
FEDERAL, LOCAL, AND STA
GROUNDSKEEPERS
CAPITAL PLANNING STAFF
GR
LANDSCAPE ARCHITECTS
UTILITY MANAGERS
PLANNERS
BUILDING TENANTS
FINANCIAL PLANNERS
BUILDI
CODE OFFICALS
PRODUCT MANUFACTURES
ENGI
BUILDING OWNERS
INTERIOR DESIGNERS
BUILDI
OFFICALS
FEDERAL, LOCAL, AND STATE GOVERNMENT

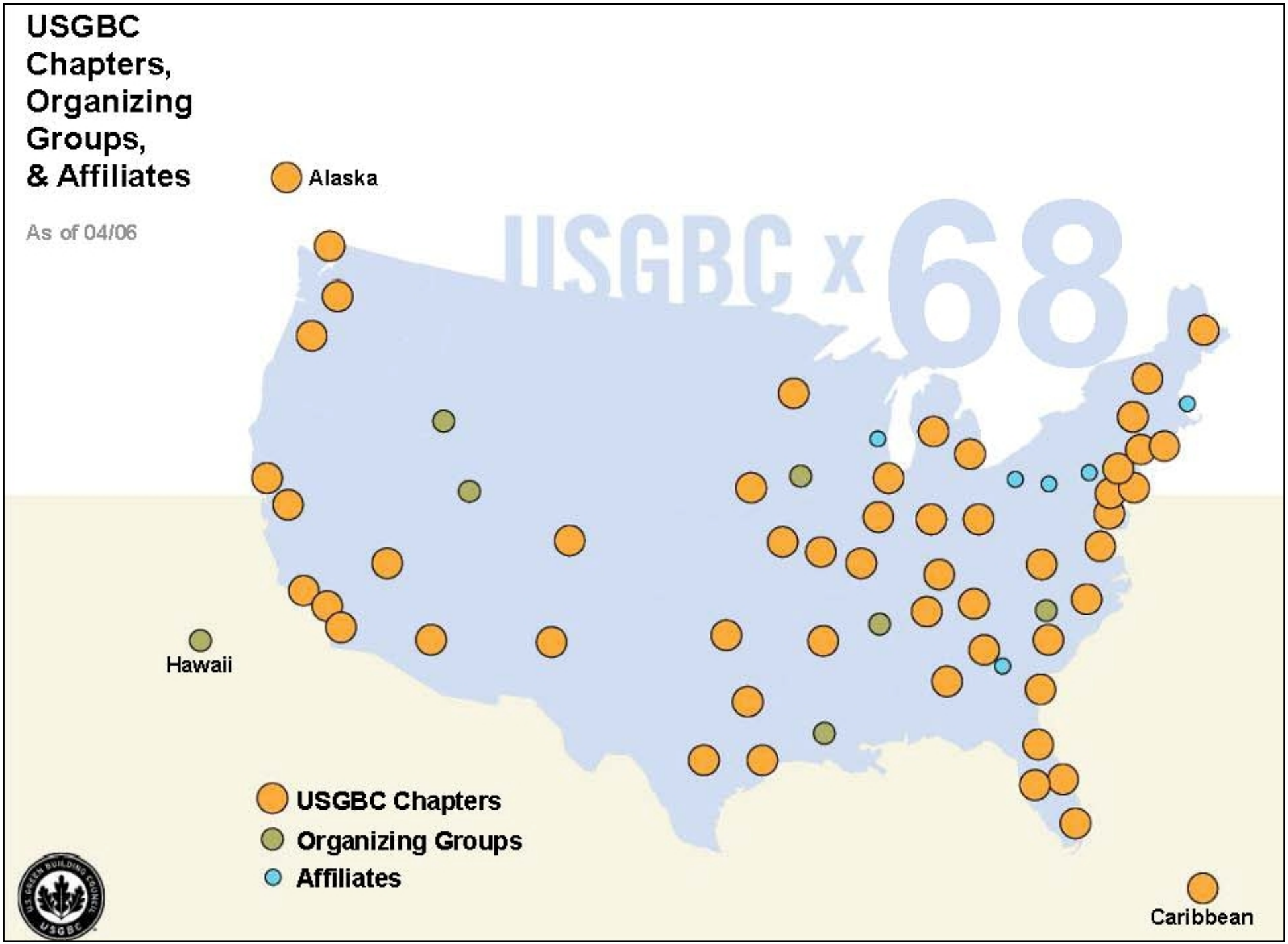
Chapter Program Overview 2009

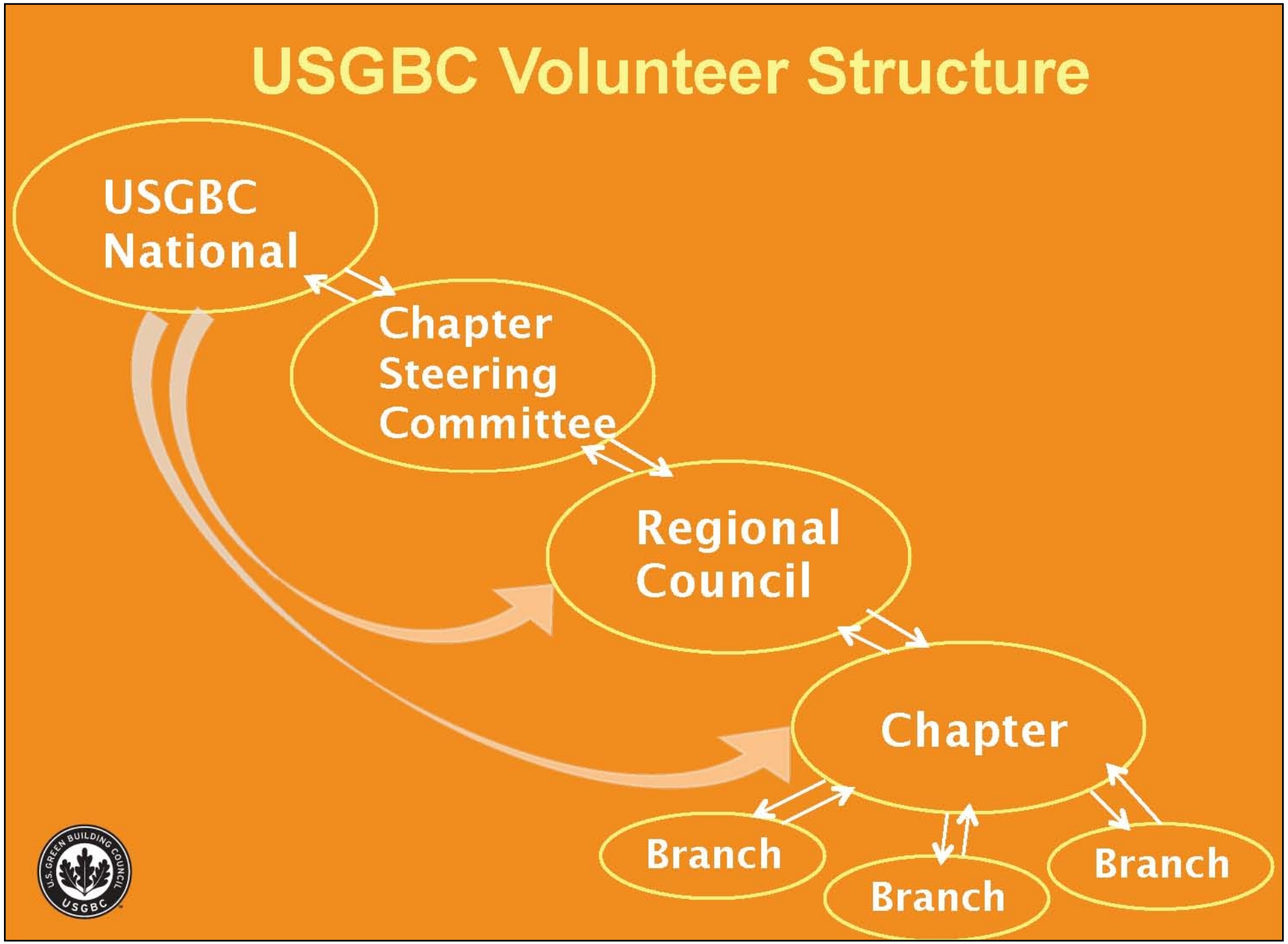
U.S. Green Building Council

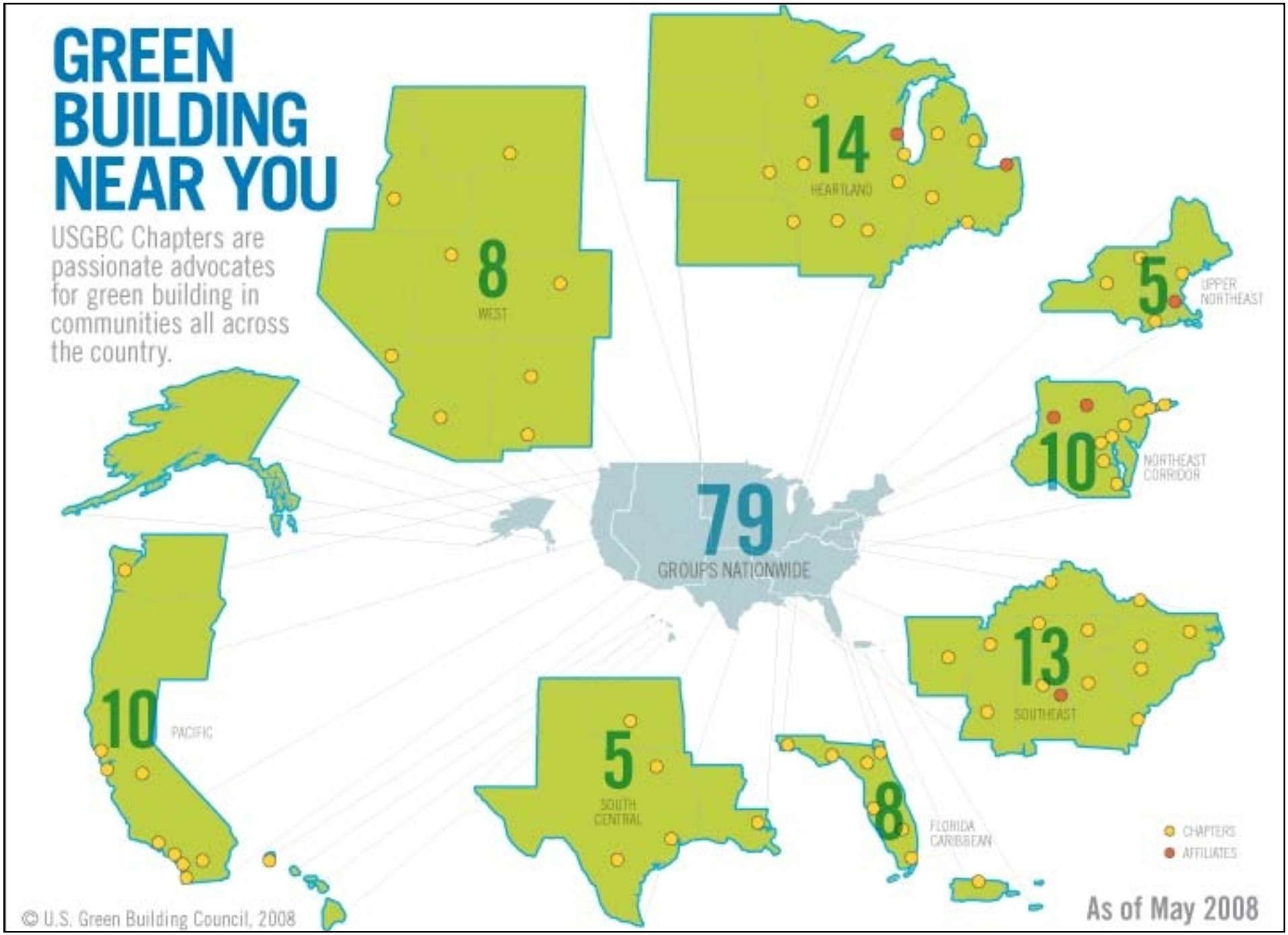


Steps to Becoming A Chapter

- Interest Group
- Organizing Group
- Provisional Chapter
- Full Chapters


USGBC Chapters, Organizing Groups, & Affiliates
As of 04/06
Alaska
Hawaii
Caribbean
USGBC x 68
USGBC Chapters
Organizing Groups
Affiliates


USGBC Volunteer Structure
USGBC National
Chapter Steering Committee
Regional Council
Chapter
Branch
Branch
Branch


GREEN BUILDING NEAR YOU
USGBC Chapters are passionate advocates for green building in communities all across the country.
14
HEARTLAND
8
WEST
5
UPPER NORTHEAST
10
NORTHEAST CORRIDOR
79
GROUPS NATIONWIDE
13
SOUTHEAST
10
PACIFIC
5
SOUTH CENTRAL
8
FLORIDA CARIBBEAN
CHAPTERS
AFFILIATES
As of May 2008
© U.S. Green Building Council, 2008

Goals

Goals

- Self-sustaining Chapters

Goals

- Self-sustaining Chapters
- Chapters as THE Local Green Building Source

Goals

- Self-sustaining Chapters
- Chapters as THE Local Green Building Source
- Partnerships with USGBC to Achieve our Shared Mission

2008 Advocacy

- Schools Advocates
- Residential Advocates
- Congressional Advocacy Day
- USGBC Staff Support
- 6 Advocacy Trainings



12 federal agencies or departments

28 states

120+ localities



FEDERAL GOVERNMENT PROJECTS

60 LEED certified projects, representing **7** million sf

589 registered projects, representing **121** million sf



STATE GOVERNMENT PROJECTS

140 LEED certified projects,
representing **20** million sf

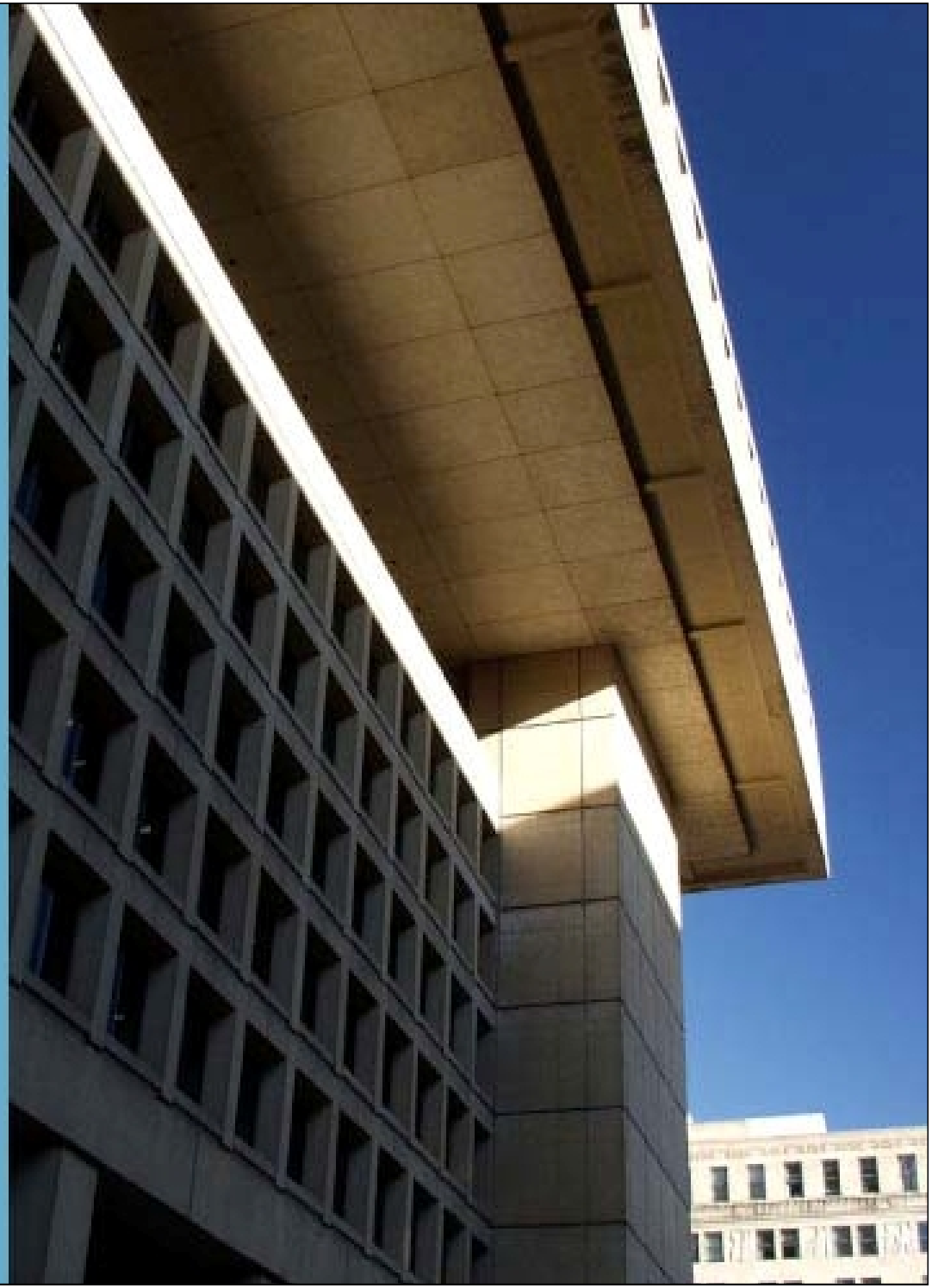
901 registered projects,
representing **106** million sf



LOCAL GOVERNMENT PROJECTS

204 LEED certified projects, representing **21** million sf

1,428 registered projects, representing **264** million sf



2008 Education

- LEED Workshops Held by Chapters: 50%
- New Delivery Model Pilot:17
- **E**ducation **P**rovider **P**rogram: 3
- USGBC Staff Support

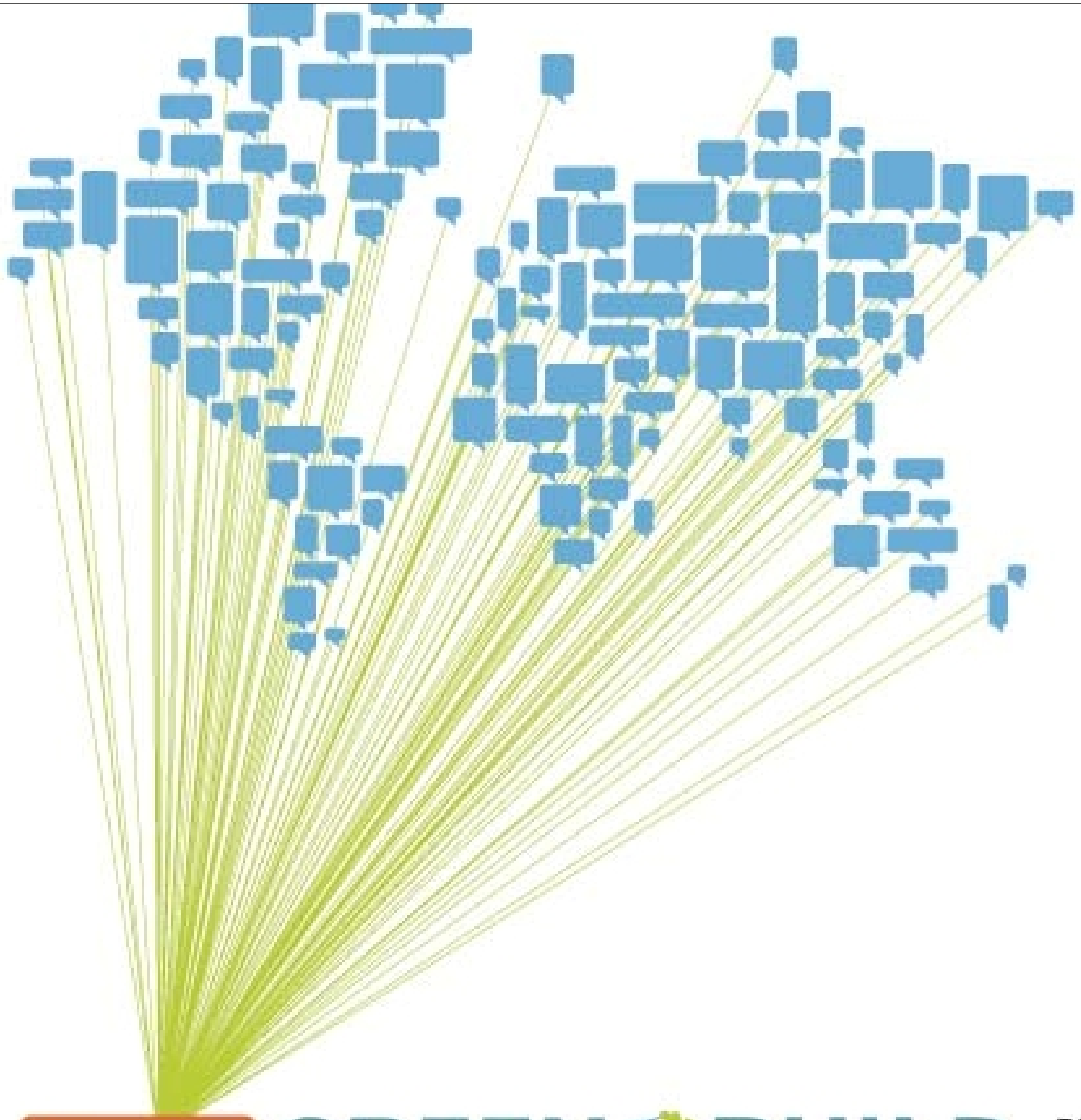



LEED Education Programs
WORKSHOPS ONLINE COURSES WORK
PRIVATE LEED WORKSHOPS GREENBUILD
SPECIAL EVENTS WEBINARS SPECIAL EVE
EDUCATION PROVIDER PROGRAM
GROUP DISCOUNTS STUDENT PRICING
SPONSORSHIPS CASE STUDIES SPONSOR
CONTINUING EDUCATION CREDITS CONTIN
ONLINE COURSES PRIVATE LEED WORKSHOPS



USGBC
EDUCATION
PROVIDER
PROGRAM

A DIVERSE INDUSTRY HAS DIVERSE NEEDS



Revolutionary green.

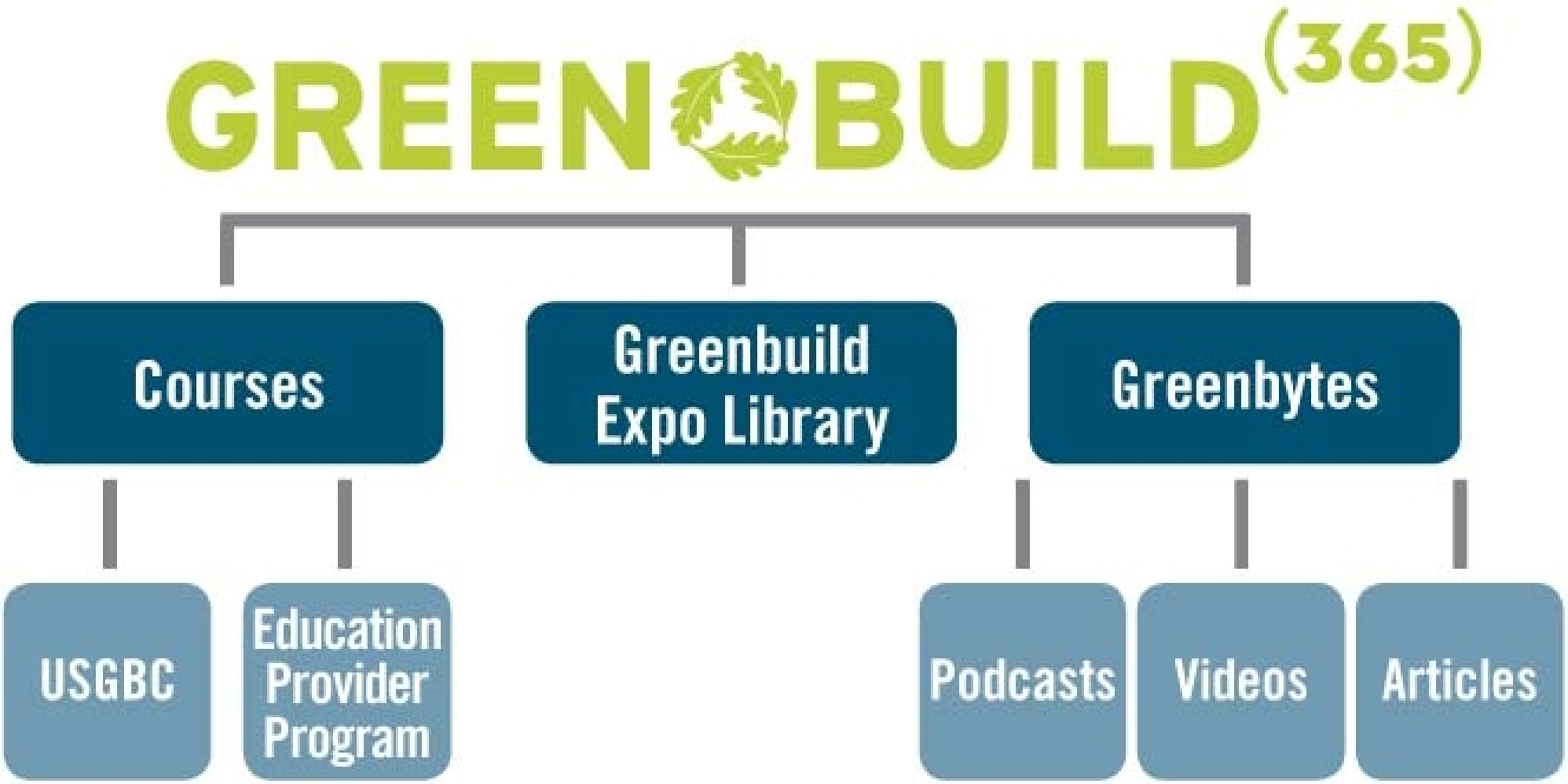
GREEN BUILD

INTERNATIONAL CONFERENCE AND EXPO

BOSTON, NOVEMBER 19-21, 2008
REGISTER TODAY AT
WWW.GREENBUILDEXPO.ORG

With keynote speakers Desmond Tutu, E.O. Wilson and Janine Benyus

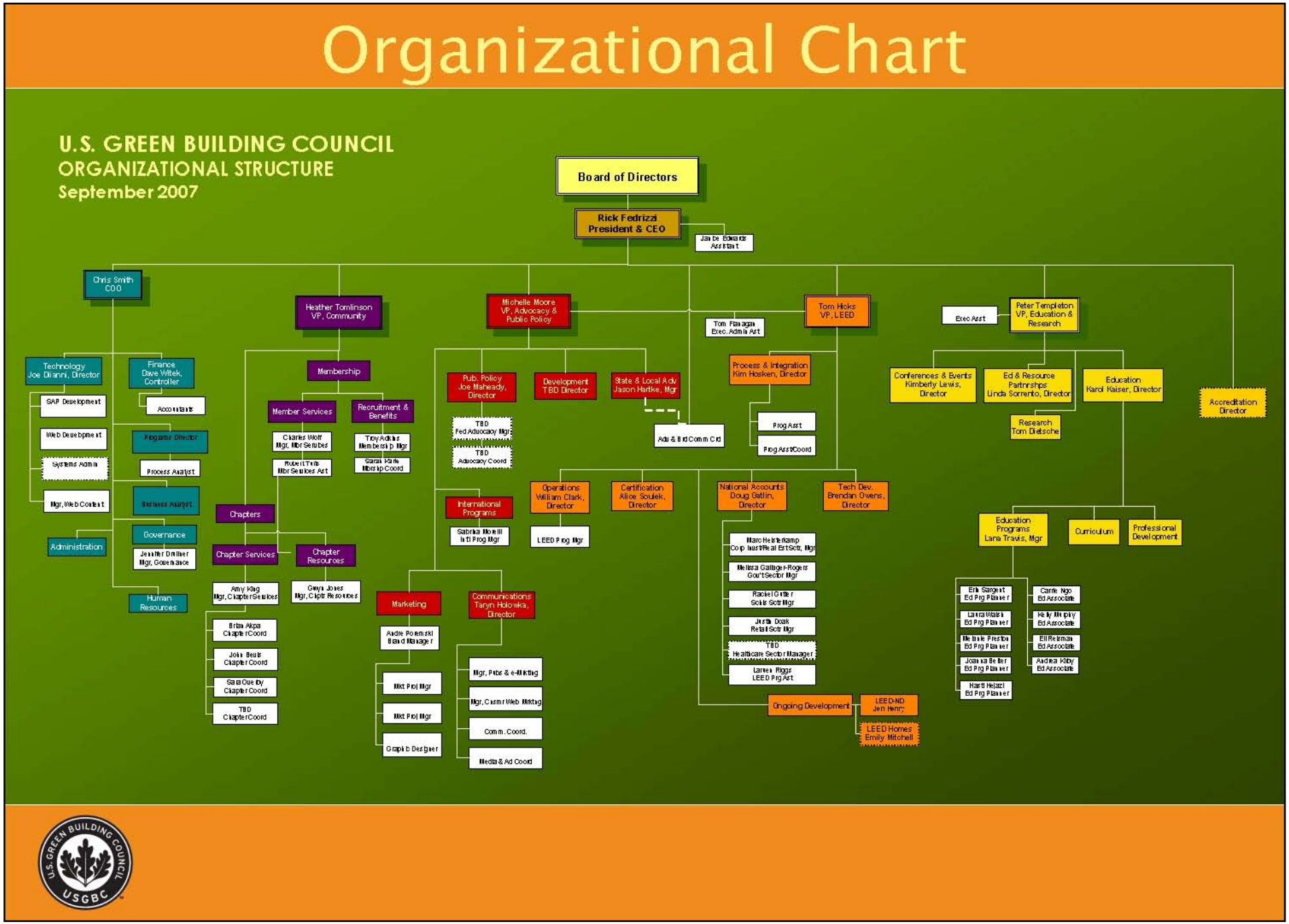

T.S.I.
www.cwc.ca
Wood
COMPOSITE PANEL ASSOCIATION
CPA
CALMAC
HCFC FREE AT LAST
Nanda, Inc.
EXIT
LUTRON ELECTRONICS CO. INC.
LUTRON
Lighting Control Solutions
environdesignworks
environ
green@work
green@work
Michael Eskew
WAU


GREENBUILD(365)
Courses
Greenbuild Expo Library
Greenbytes
USGBC
Education Provider Program
Podcasts
Videos
Articles

Get Involved: As an Individual

- Learn (www.usgbc.org/education)
- Join a chapter (www.usgbc.org/chapters)
- Attend Greenbuild (www.greenbuildexpo.org)
- Become an advocate
- Become a LEED AP (www.gbci.org)
- Pursue LEED certification in your building projects (www.usgbc.org/leed)
- Purchase a LEED Reference Guide (www.usgbc.org/leed)

Organizational Chart



USGBC 2009 - 2013
Strategic Plan

U.S. Green Building Council

August 15-17, 2008

National Conservation Training Center

Shepherdstown, West Virginia

Vision

Buildings and communities will regenerate and sustain the health and vitality of all life within a generation.

Mission

To transform the way buildings and communities are designed, built and operated, enabling an environmentally and socially responsible, healthy, and prosperous environment that improves the

Guiding Principles

Promote the Triple Bottom Line

Establish Leadership

Reconcile Humanity with Nature

Foster Social Equity

Maintain Integrity

Ensure Inclusiveness

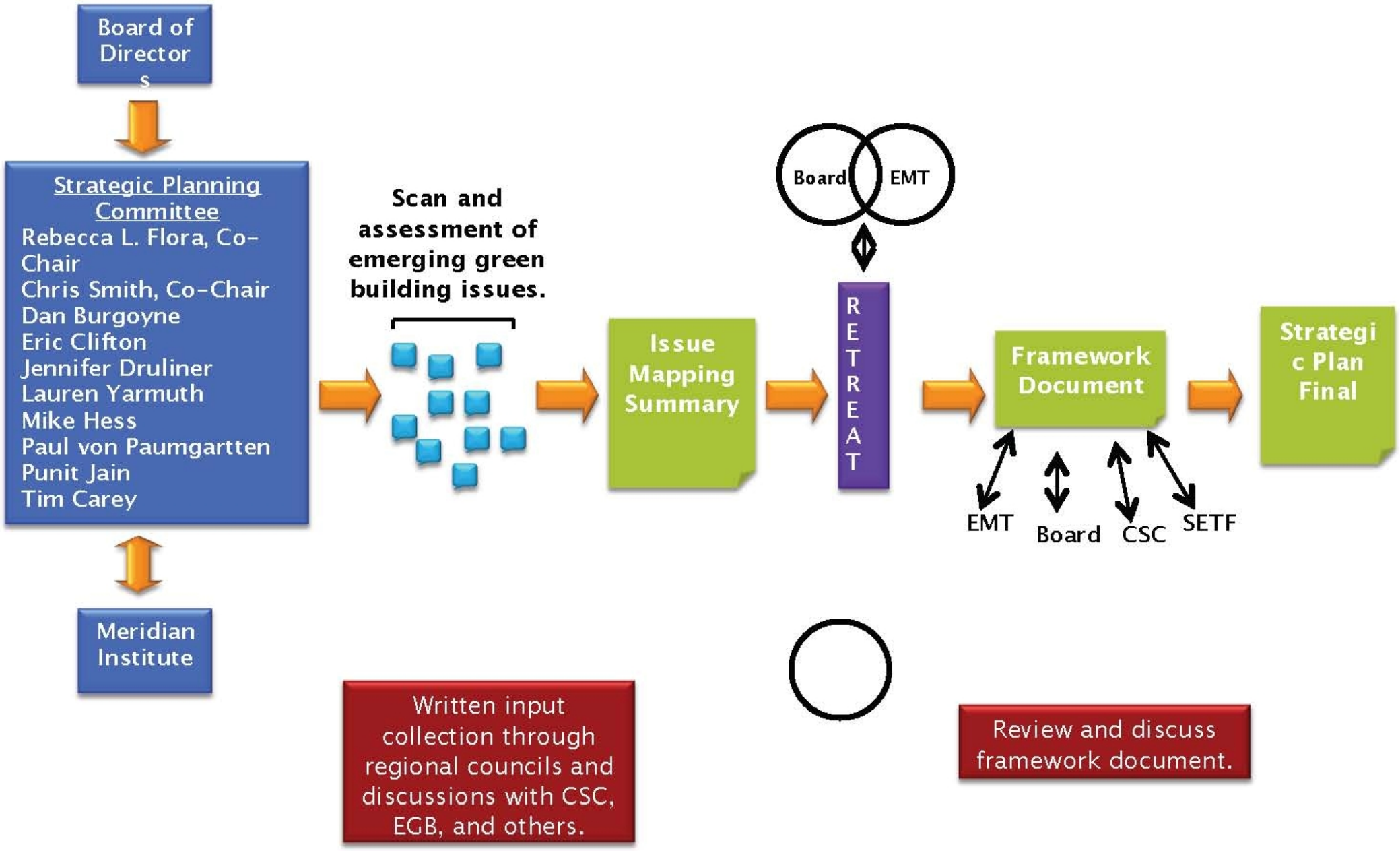
Exhibit Transparency

Foster Social Equity

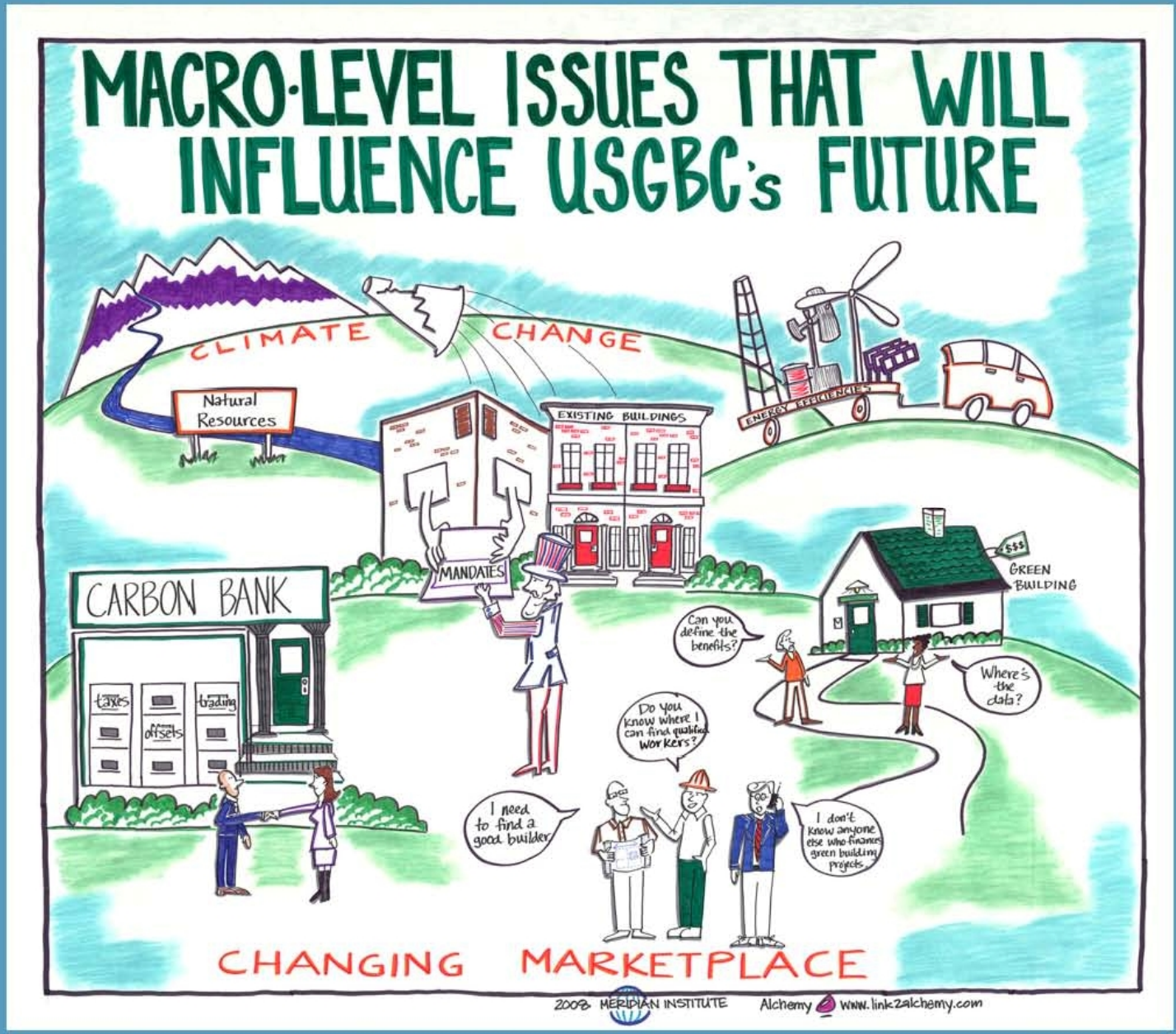
USGBC will respect all communities and cultures and aspire to an equal opportunity for all.

Chapters and national will need to work together to consult with diverse communities, and be proactive in identifying opportunities to advance social equity objectives.

Strategic Planning Process




CONTEXTUAL SOCIETAL ISSUES and TRENDS
Climate Change
USGBC
Resource Scarcity
Technology Shifts
Aging Population
AMBULANCE
Health and Healthcare
Intellectual Property Rights & Copyright
Water
Economic Conditions
Potential decline of US power globally
Deteriorating National Infrastructure
Increased National Security Concerns
Uncertain U.S. Political Climate
2008 for Meridian Institute by Alchemy www.link2alchemy.com


MACRO-LEVEL ISSUES THAT WILL INFLUENCE USGBC's FUTURE
CLIMATE CHANGE
Natural Resources
EXISTING BUILDINGS
ENERGY EFFICIENCY
MANDATES
CARBON BANK
taxes
offsets
trading
$$$
GREEN BUILDING
Can you define the benefits?
Where's the data?
Do you know where I can find qualified workers?
I need to find a good builder
I don't know anyone else who finances green building projects
CHANGING MARKETPLACE
2008 MERIDIAN INSTITUTE
Alchemy www.link2alchemy.com

How USGBC Achieves Its Goals

- Education
- Advocacy
- Strategic Partnerships
- Collaborations
  - AIA
  - ASHRAE
  - ASID

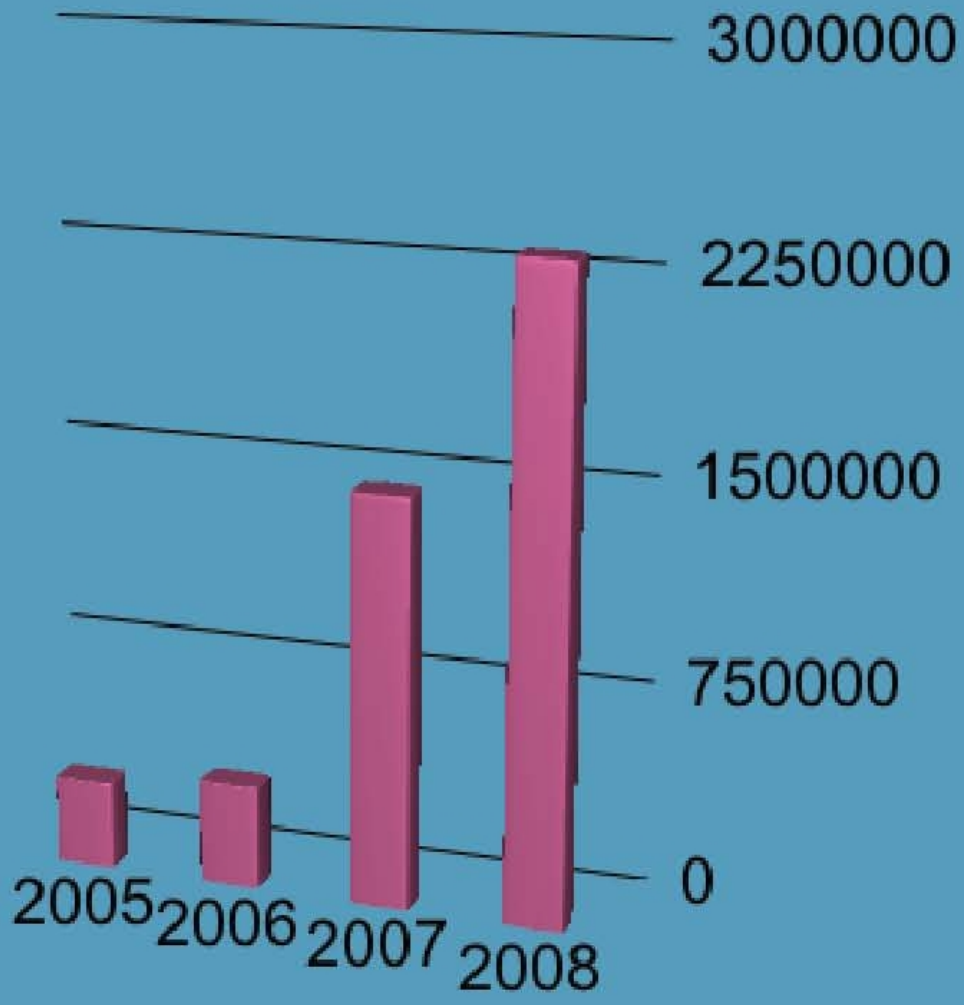
Diversity

- Beyond LEED
- Beyond Building Professionals
- Partnerships and outreach
- Collaboration
- Strength in range of perspectives
- Reverse diversity – get our members on others' Boards

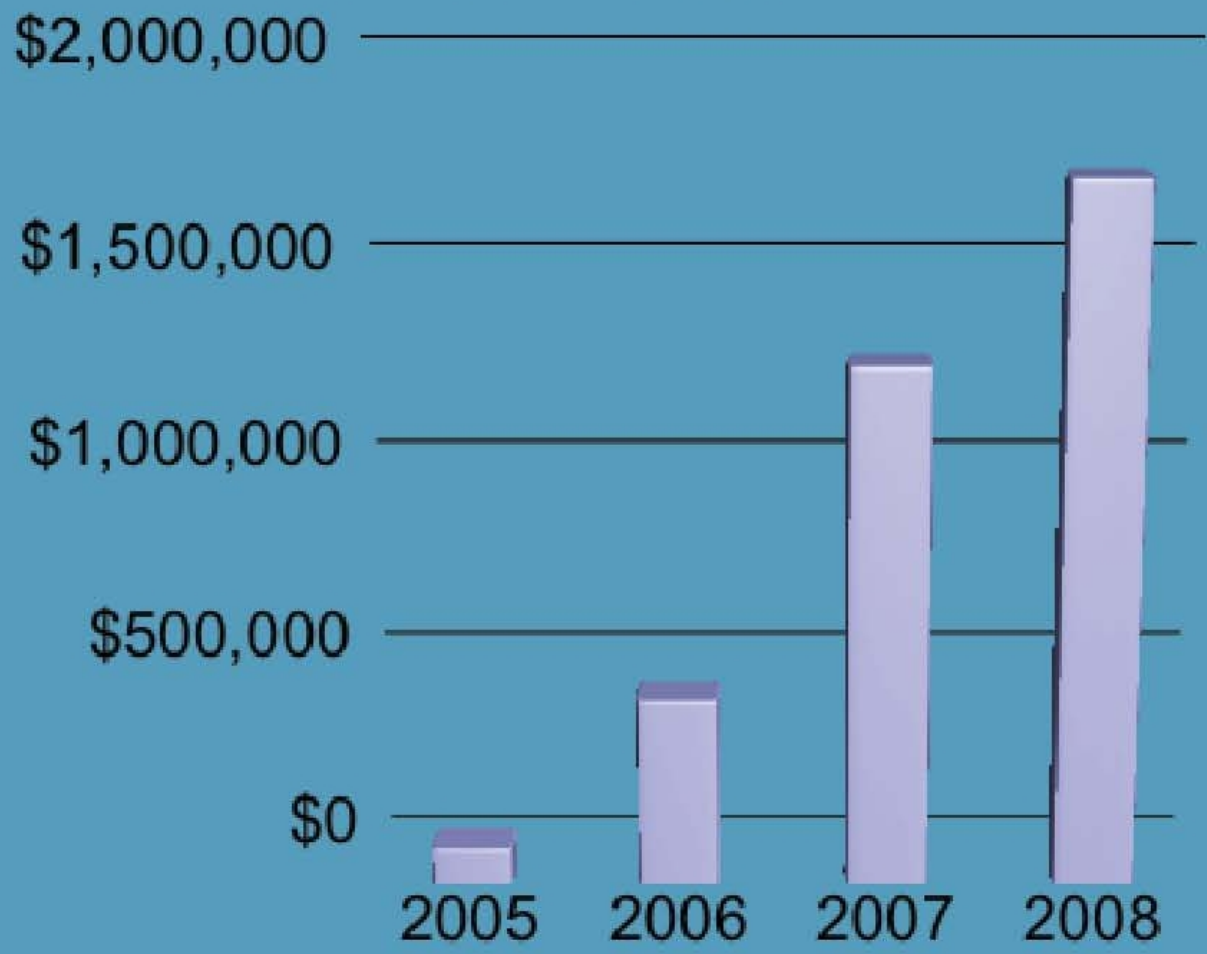
Building on Success

- Challenge Grant Program
- Chapter Extranet and Helpdesk
- Increased Training and Development
- Chapter Retreat
- 9 Chapter growth consultants
- 4 Regional advocacy consultants
- National staff of 10 including a dedicated EGB staff person
- Higher touch – more travel to chapters

National's Expense Allocation for Chapters



National Membership Revenue Share



Workshop Revenue Share



Resources for Chapters



Chapter Achievements

- Chapters continue to play an active role in state and local green building policy adoptions
- Chapters held approximately 40% of all LEED workshops
- More than 700 chapter-developed educational sessions held
- More than 1,000 media hits reported by chapters
- Nearly 200 EGB events held by chapters

Prepared by

Bruce Hostetter, USGBC Chapter Leader

Janet Gibson, USGBC Chapter Development Associate

With Resources of the USGBC



Prepared by

Bruce Hostetter, USGBC Chapter Leader

Janet Gibson, USGBC Chapter Development Associate

With Resources of the USGBC

WORLD GREEN BUILDING COUNCIL

Argentina Green Building Council

United States Green Building Council

USGBC-Orange County Chapter

EGYPT GREEN BUILDING COUNCIL

YCC INTERNATIONAL

Kickoff Meeting & Round Table Egyptian Green Building Council (EGBC) Initiation

Cairo, Egypt—January 25-27, 2009

Drivers of CHANGE towards SUSTAINABILITY from a GLOBAL PERSPECTIVE

Elsa Yasukawa, AIA Int Assoc/LEED AP

YCC International, Principal

WorldGBC Special Representative for Latin America

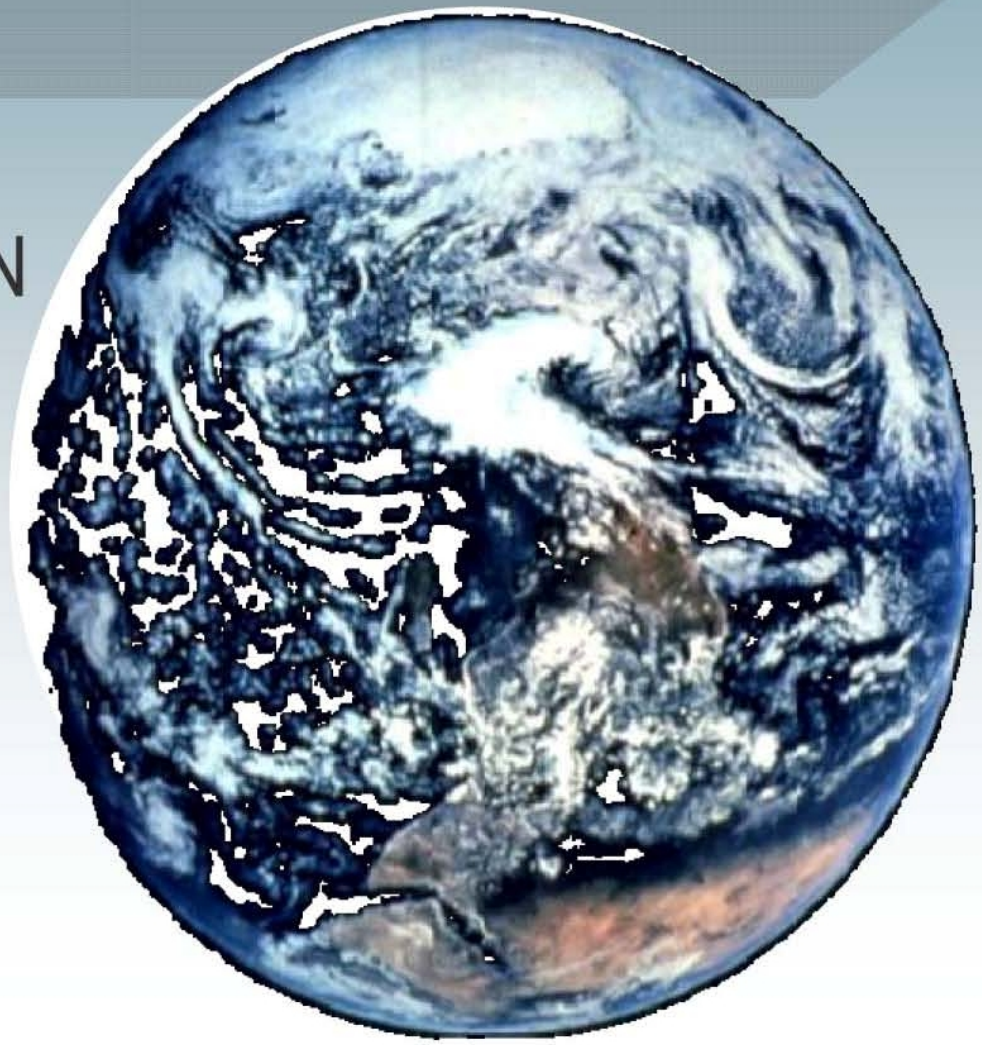
ArgentinaGBC, Founding Board Member

USGBC-OC Board Member, Education Chair

EgyptGBC Advisory Board Member

GLOBAL CONCERNS

- POPULATION
- POVERTY
- HUNGER
- HIV / AIDS
- WATER
- *CLIMATE*



The Big Issue: Climate Change



WORLD GREEN BUILDING COUNCIL



Climate Change

We have roughly 3,650 days
To do something very drastic
about this climate change
problem or else hundreds of
thousands, millions of people,
our children, our grand children
will be displaced by catastrophes
that will occur.

Ira Magaziner
Director,
Clinton Climate Initiative

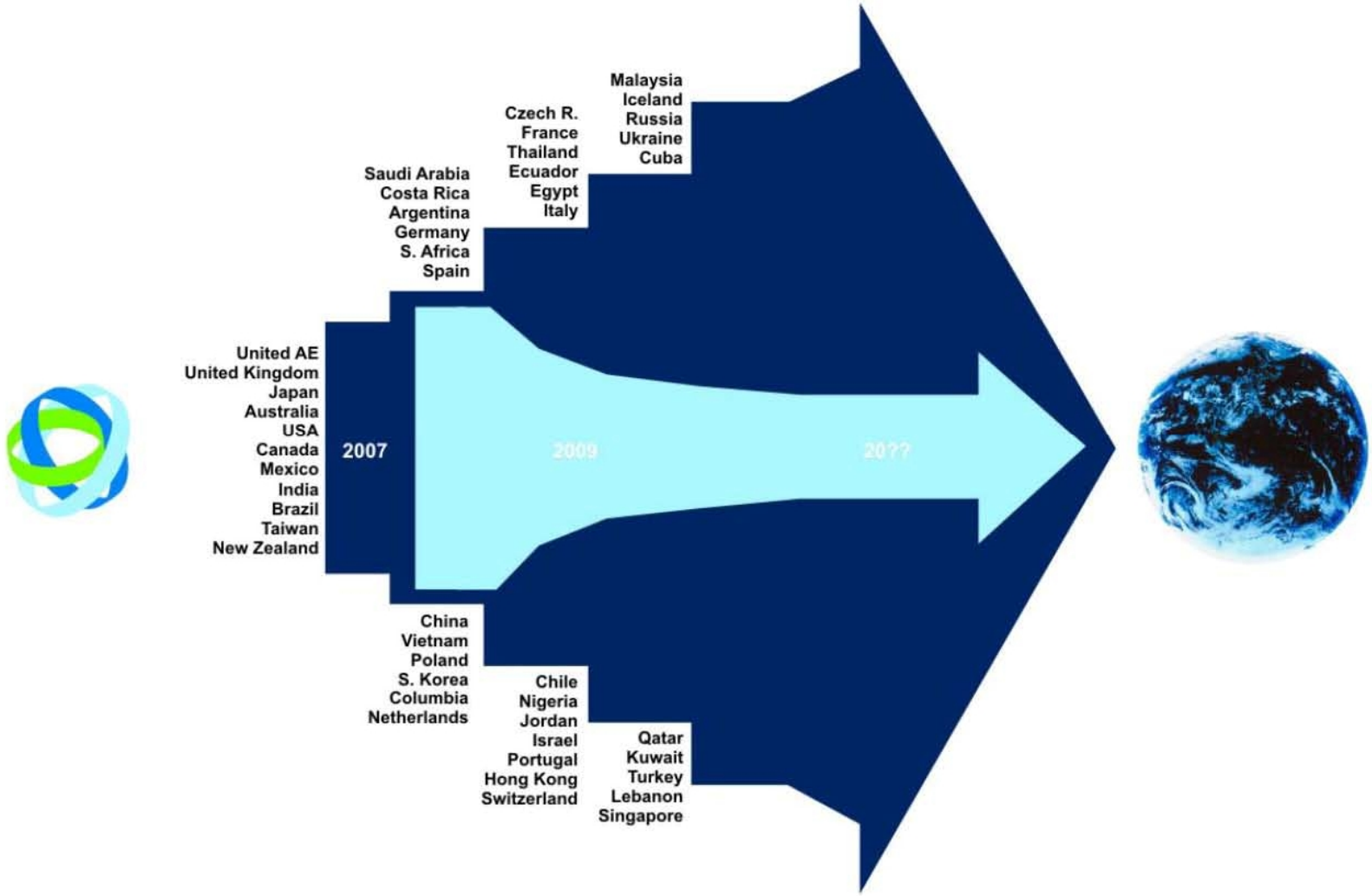

GREEN BUILDING
AN IMPORTANT PART OF THE
SOLUTION



change @ a global scale


WORLD GREEN BUILDING COUNCIL
Vision
Through leadership collaboration the global property industry will transform traditional building practices and fully adopt sustainability as the means by which our environments thrive, economies prosper, and societies grow to ensure the future health of our planet.

Creating Depth and Breadth: Applying the Resources of the World Green Building Council



Breadth: WorldGBC Supporting GBC Development

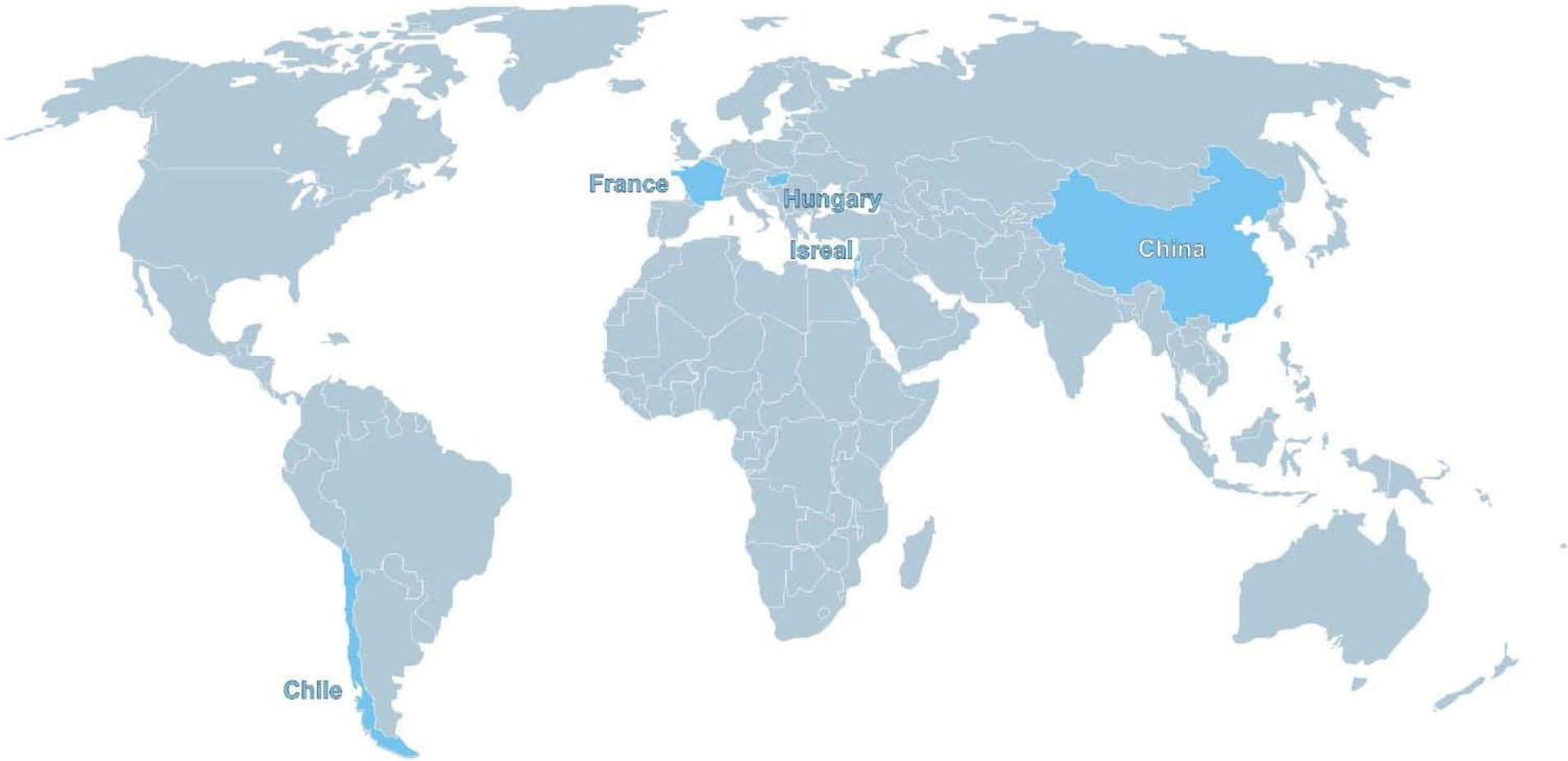
Depth: WorldGBC Supporting Secretariat Development



full Members -13



emerging Members -8



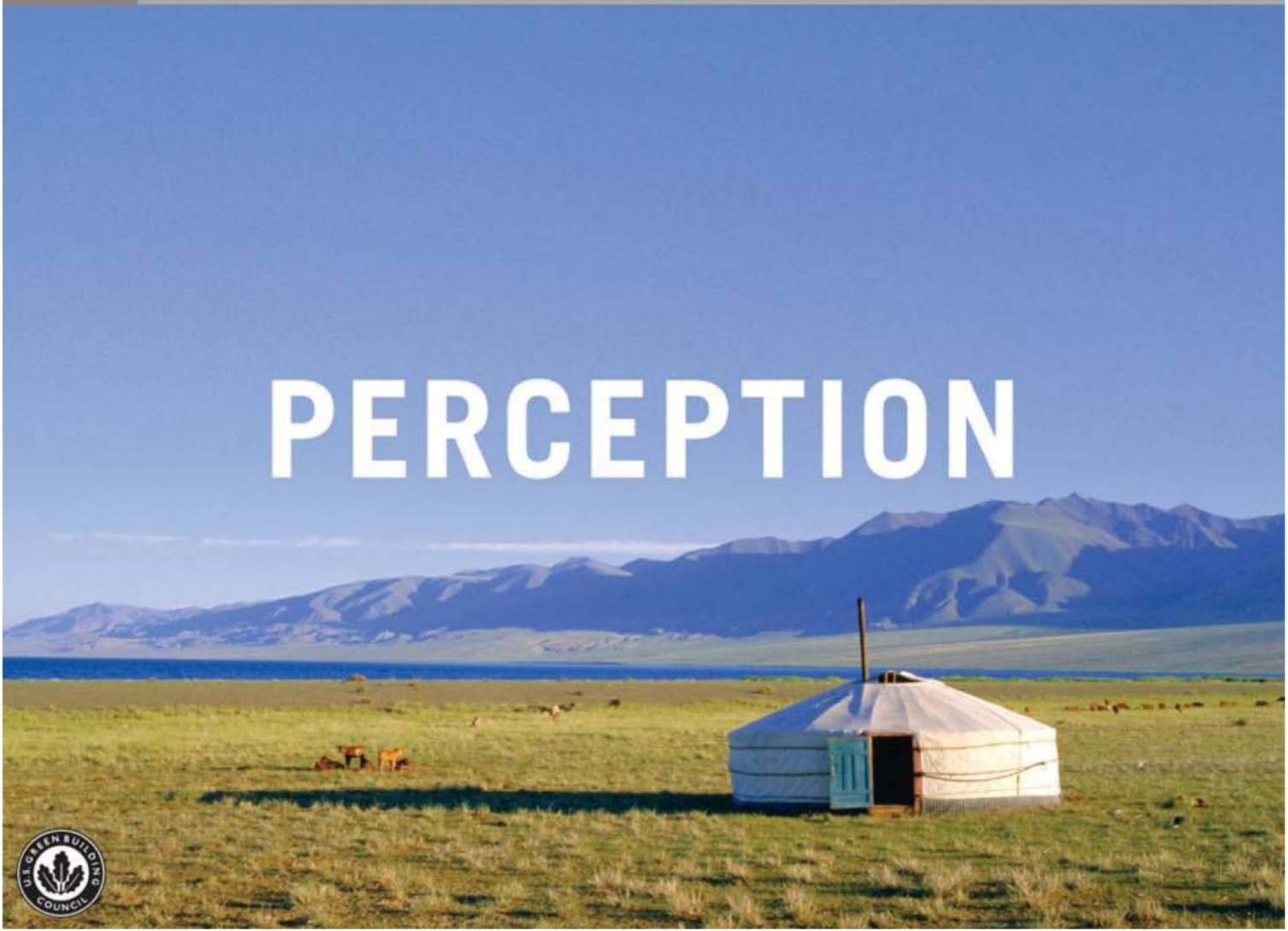
formal Expressions of Interest -5



developing Interest - 9


green building council australia
DGNB
Deutsche Gesellschaft für nachhaltiges Bauen e.V.
German Sustainable Building Council
Japan Sustainable Building Consortium
CANADA GREEN BUILDING COUNCIL
CONSEIL DU BÂTIMENT DURABLE DU CANADA
CONSEJO MEXICANO DE CONSTRUCCION SUSTENTABLE
EmiratesGBC
Emirates Green Building Council
Construcciones Sustentables
ARGENTINA
GREEN BUILDING COUNCIL
TAIWAN GREEN BUILDING COUNCIL
UK GREEN BUILDING COUNCIL
NZGBC
NEW ZEALAND GREEN BUILDING COUNCIL
U.S. GREEN BUILDING COUNCIL
GREEN BUILDING COUNCIL BRASIL


CHANGE
U.S. GREEN BUILDING COUNCIL
USGBC


PERCEPTION
U.S. GREEN BUILDING COUNCIL


REALITY
Bank of America Tower
at One Bryant Park
The Durst Organization
Cook+Fox Architects
New York NY
LEED-NC Registered:
Platinum Certification goal

Menara Mesiniaga
Subang Jaya, Malaysia

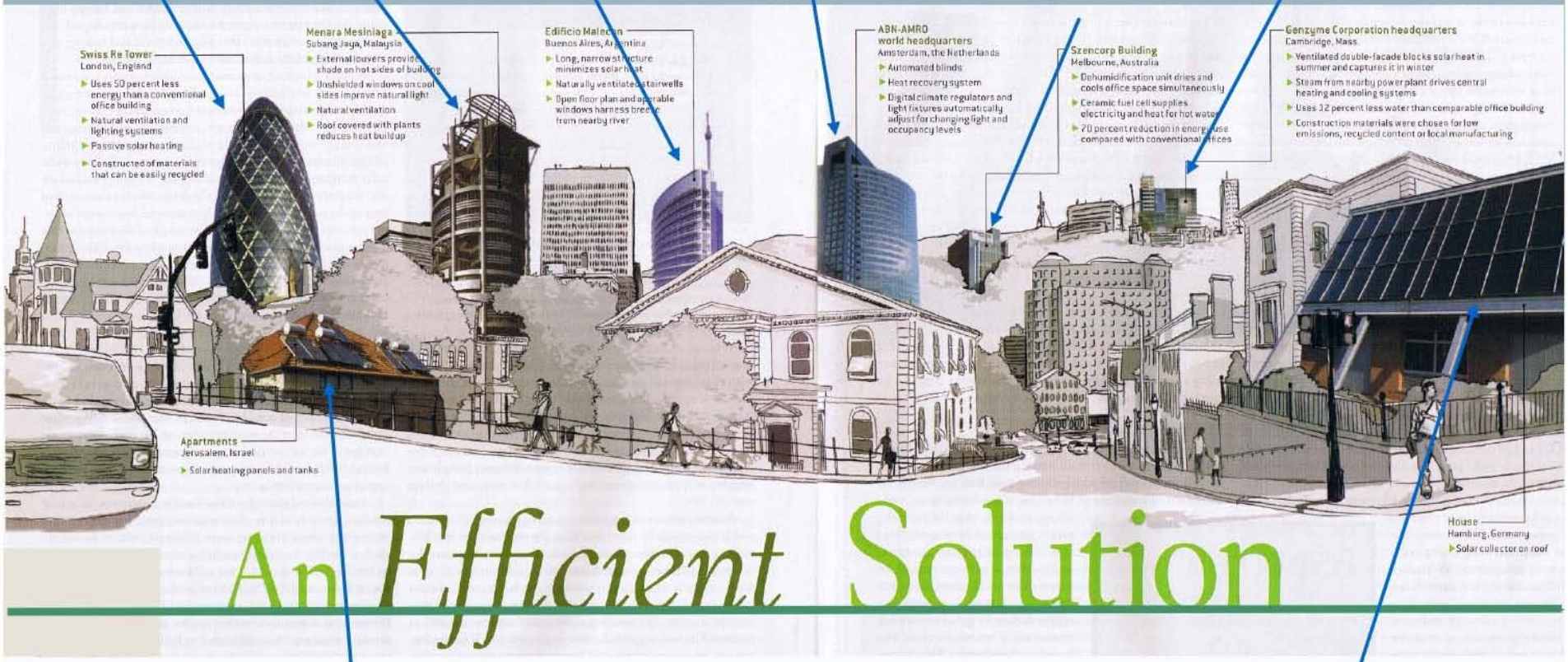
ABN-AMRO HQ
Amsterdam, the Netherlands

Genzyme Corp. HQ
Cambridge, Mass. USA

Swiss Tower
London, England

Edificio Malecon
Buenos Aires, Argentina

Szencorp Building
Melbourne, Australia



An *Efficient* Solution

Green Apartments

Solar House


START YOUR OWN HEDGE FUND • THE FUTURE OF COMPUTING
FORTUNE
WAL-MART SAVES THE PLANET
Well, not quite. But CEO LEE SCOTT's green campaign, which started as PR, is becoming a force of nature.


The Economist
What I've learned
An essay by Tony Blair
Activist shareholders
Another day, another new exoplanet
How Chechnya changed Russia
Cleaning up
A 15-page report on how business is tackling climate change



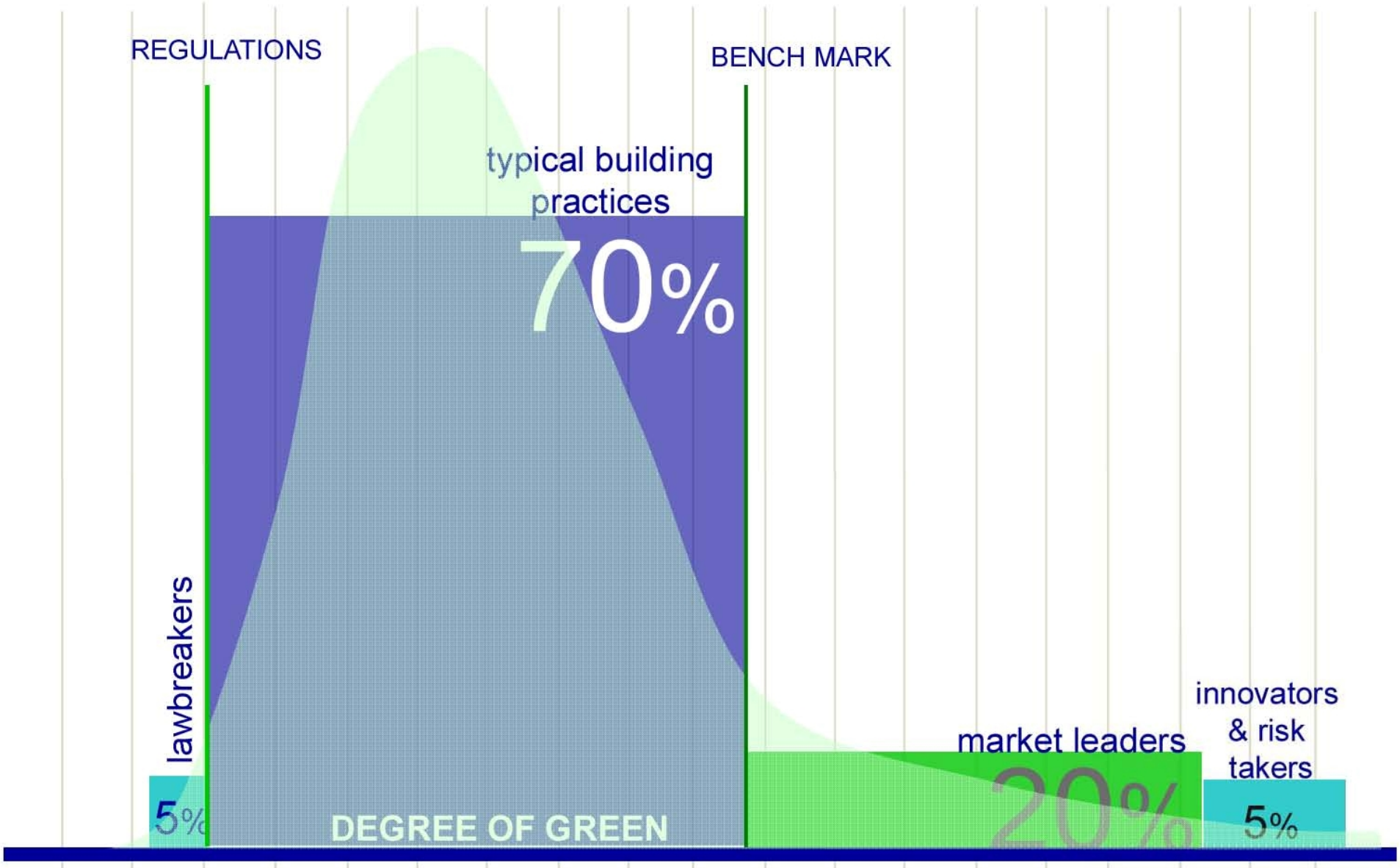

TIME TO WAKE UP: A 14-PAGE SPECIAL REPORT ON MEXICO
The Economist
America's new thinking on the Middle East
Why hedge-fund fees need clipping
Can the PlayStation 3 revive Sony?
The soaring price of luxury assets
The kidney market
Green dreams
The risky boom in the clean-energy business


REAL ESTATE
Is Green Building Budding?

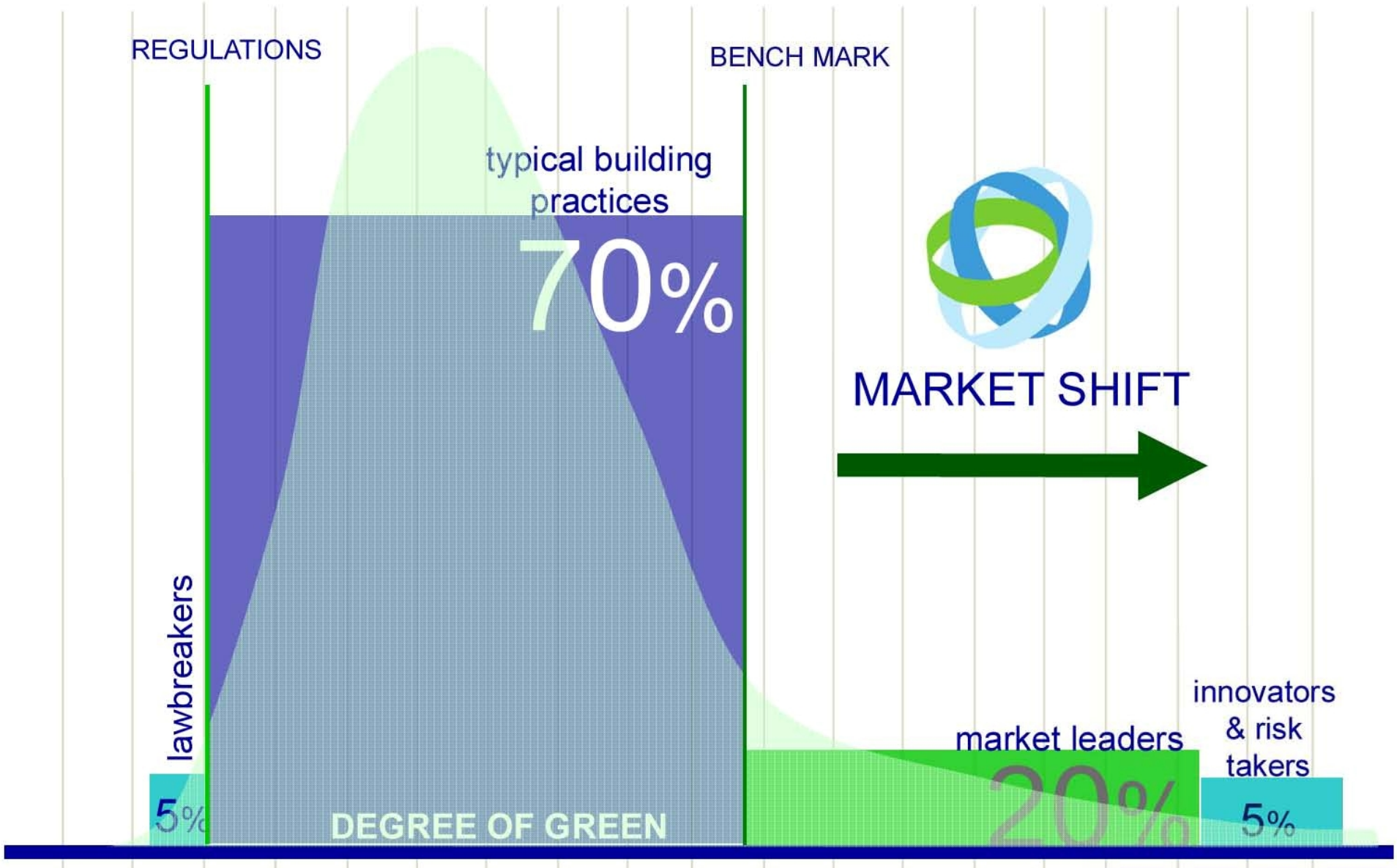

The iPhone Effect: How Touch Screens Became the Future of Computing
Iraq: Hacker Insurgents and Remote-Control Mayhem
Funny Business: Why Comedies Are King This Summer
TIME
Who Needs Washington?
How a billionaire mayor and a celebrity governor are showing what it takes to get things done
BY MICHAEL GRUNWALD
Also: Who Will Have the Courage To Be the President We Need?
BY JOE KLEIN


FORTUNE
The Coolest Company On The Planet
The story of how patagonia founder Yvon Chouinard took his passion for the outdoors and turned it into an amazing business.
BY SUSAN CASEY
PLUS
Who's to Blame for the Subprime Mortgage Mess?

market transformation.



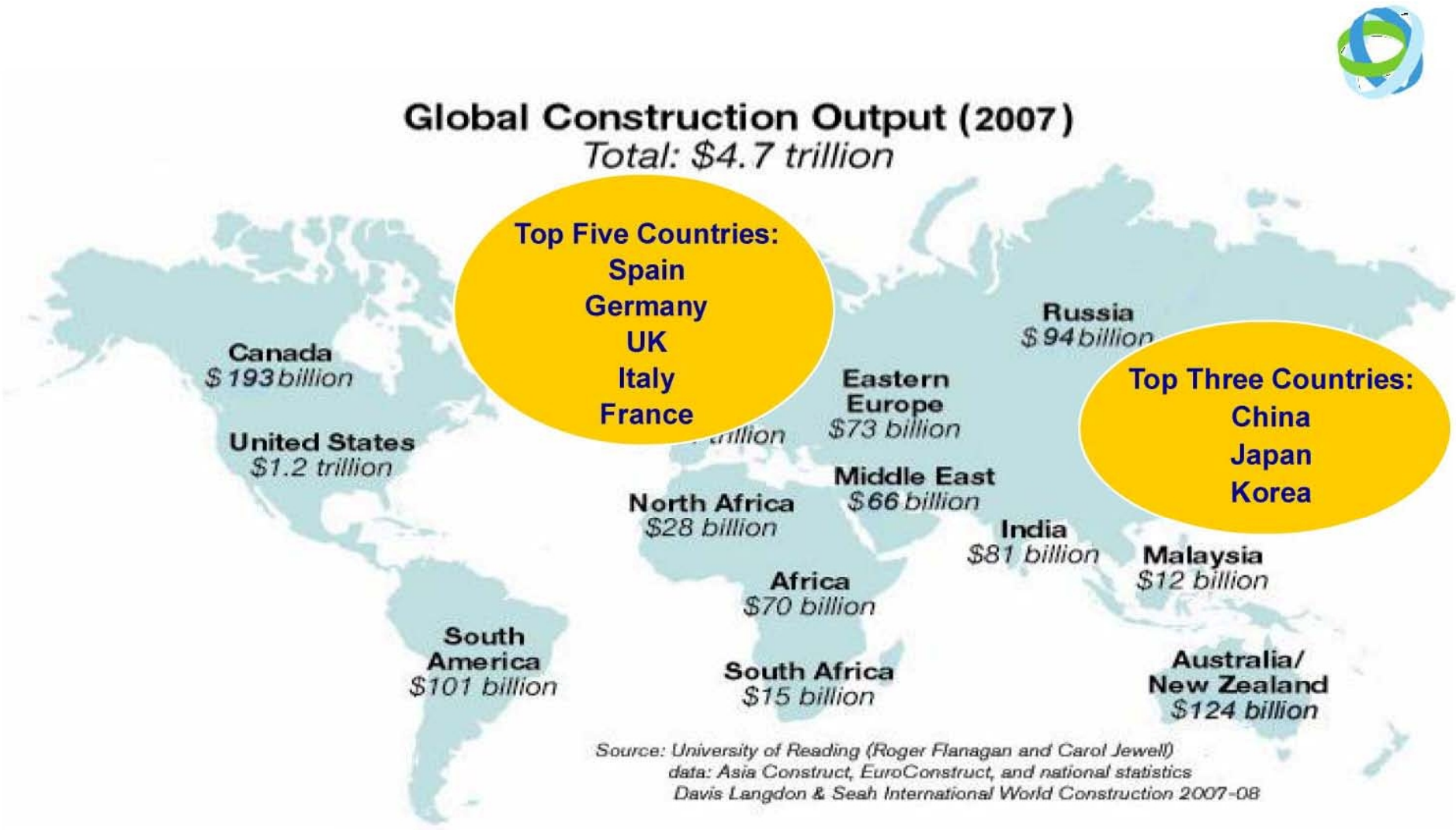
market transformation.





WORLD GREEN BUILDING COUNCIL

We currently represent 50% of the global property industry and affect more than 10000 companies world wide.



- *$4.7 Trillion Global Construction Industry (2007)*
- More Than 100 Million Employed Worldwide
- *Contributes 10% of Global GDP*



Driver of Change #1

Convene all stakeholders – be inclusive


Architects
Federal,
Local,
and State
Governments
Product
Manufacturers
Building
Owners
Nonprofit Leaders
IT'S ALL ABOUT
THE PEOPLE
Engineers
Financial
Planners
Utility
Managers
Interior
Designers
Landscape
Architects
Building
Tenants
Property
Managers
Code
Officials



Driver of Change #2

Identify the impacts

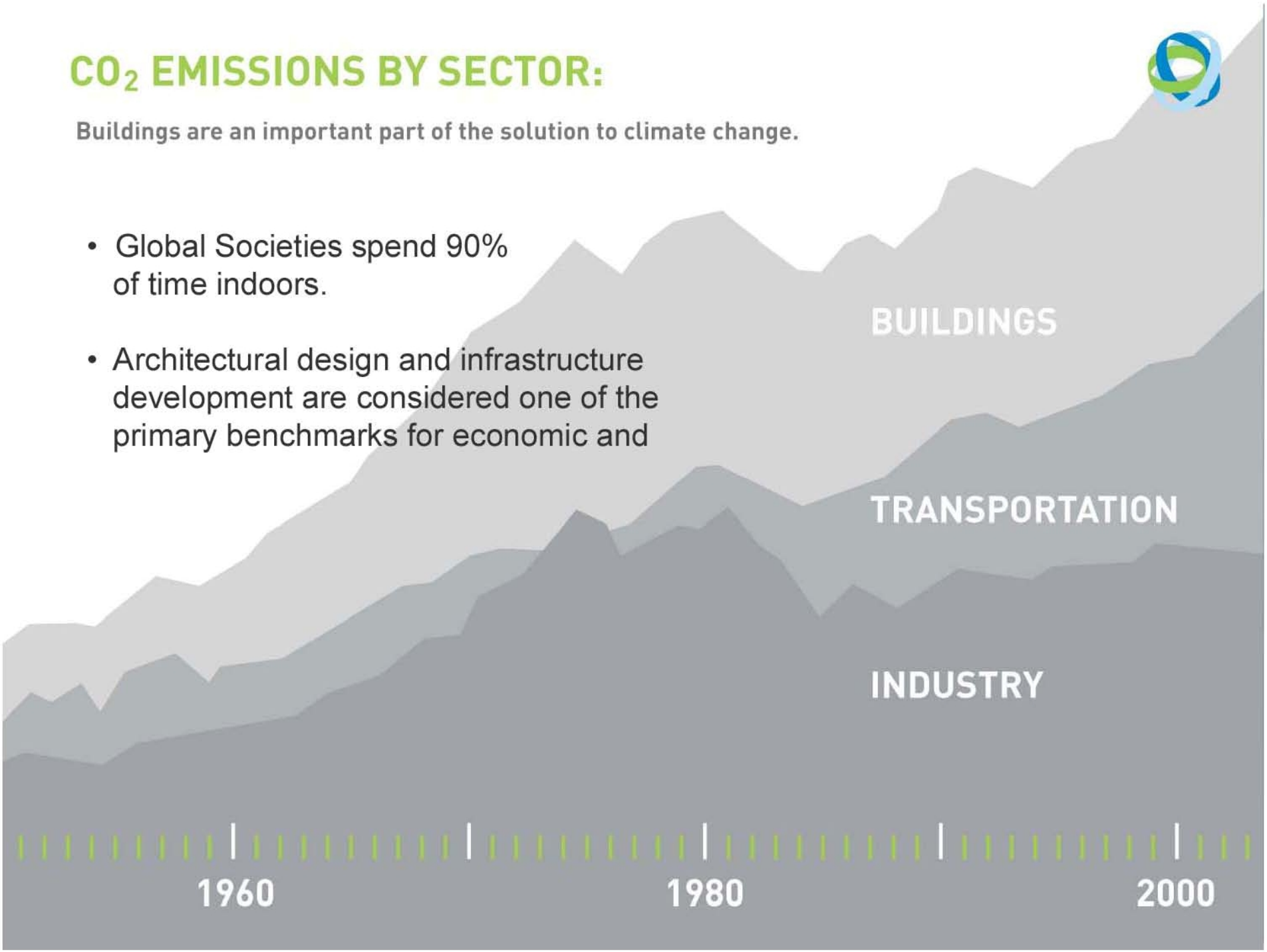
WORLDWIDE, BUILDINGS ACCOUNT FOR:



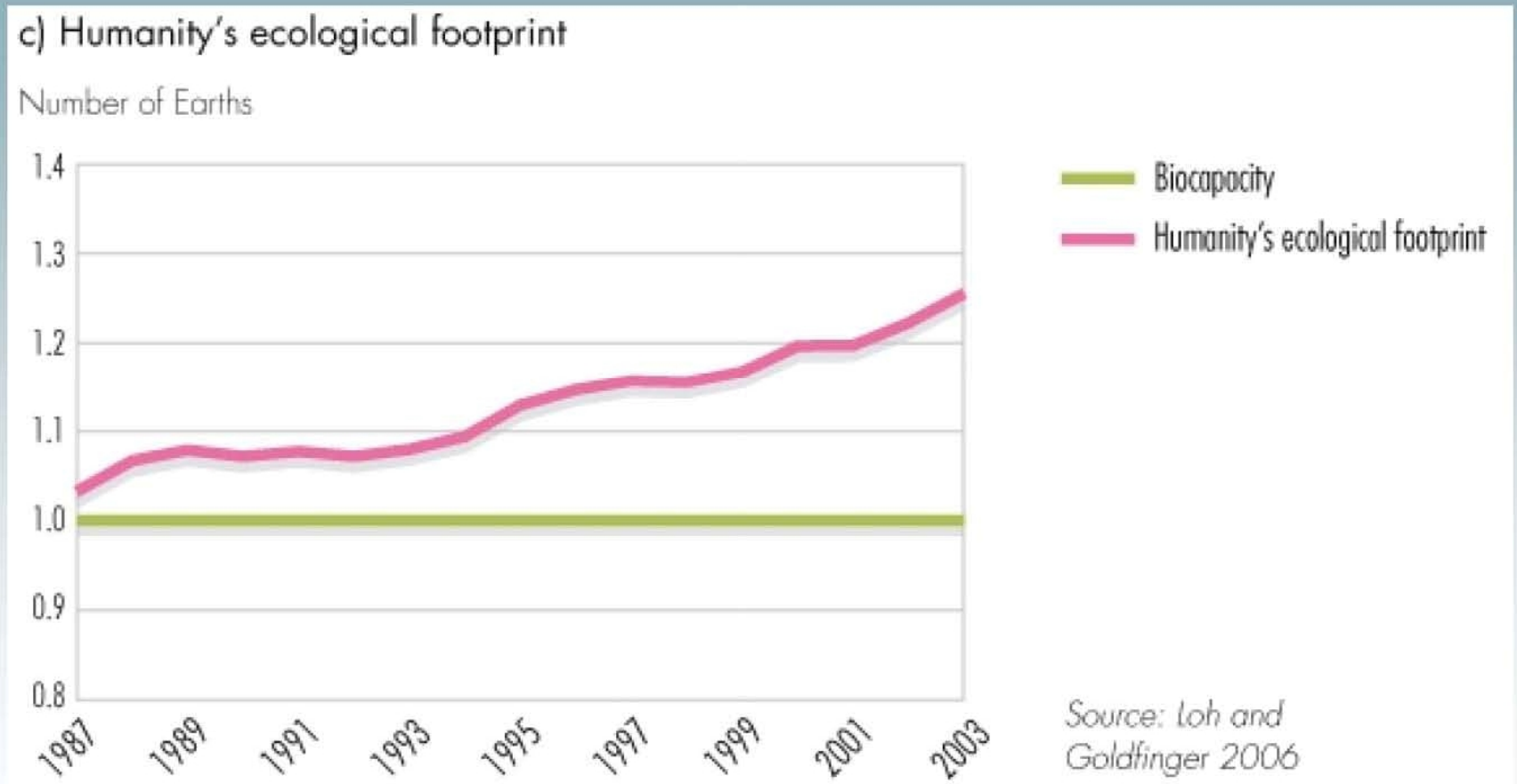
CO_2 EMISSIONS BY SECTOR:

Buildings are an important part of the solution to climate change.

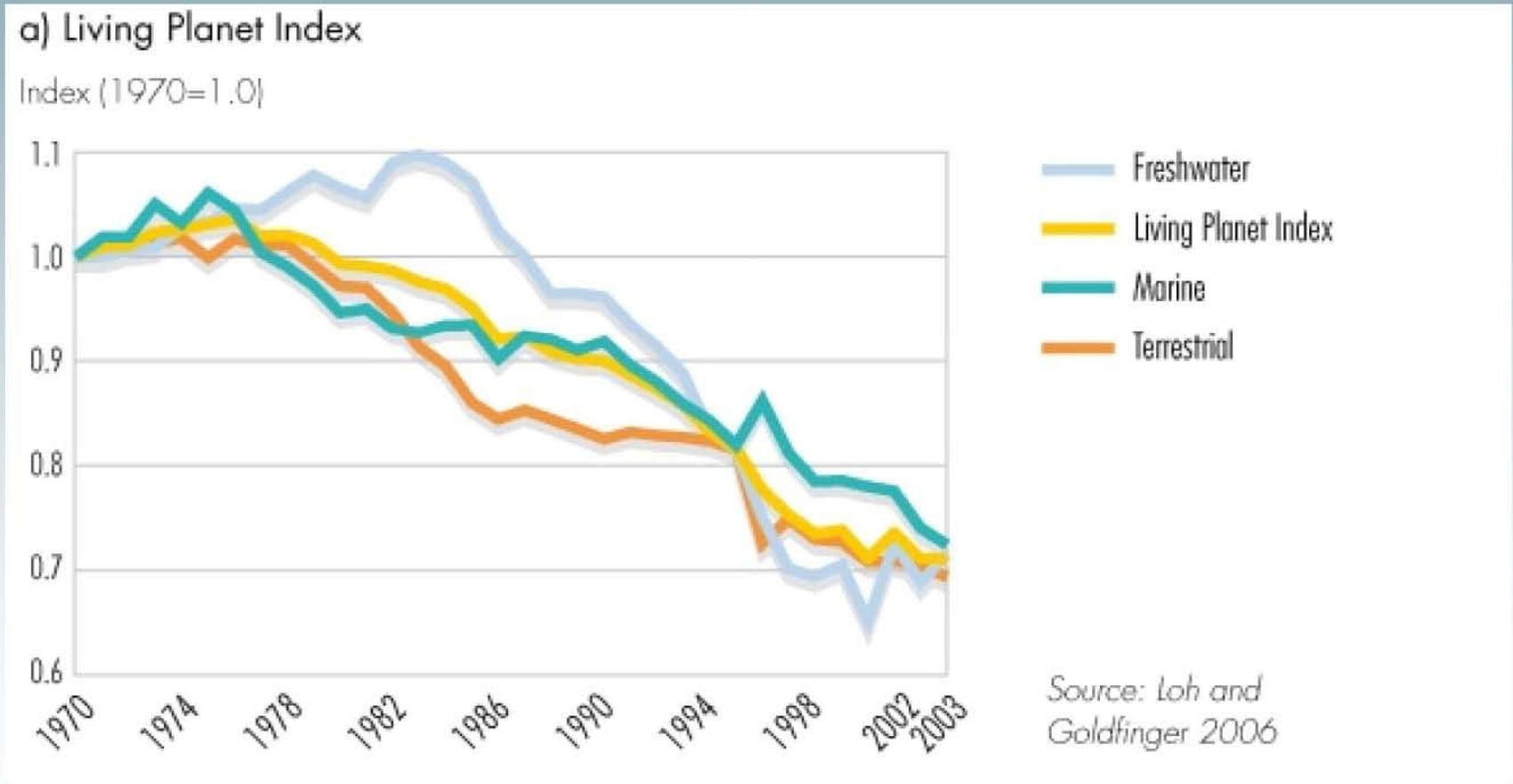
- Global Societies spend 90% of time indoors.
- Architectural design and infrastructure development are considered one of the primary benchmarks for economic and

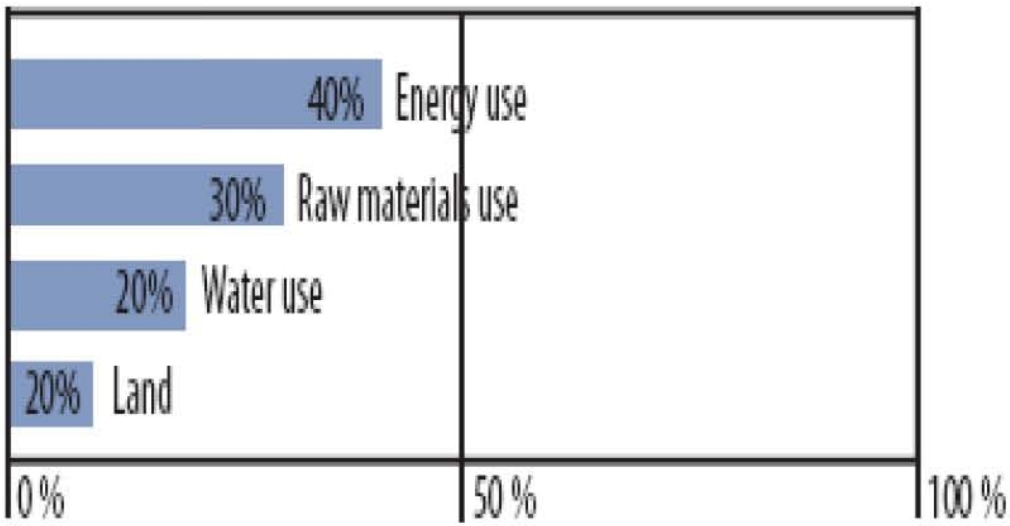


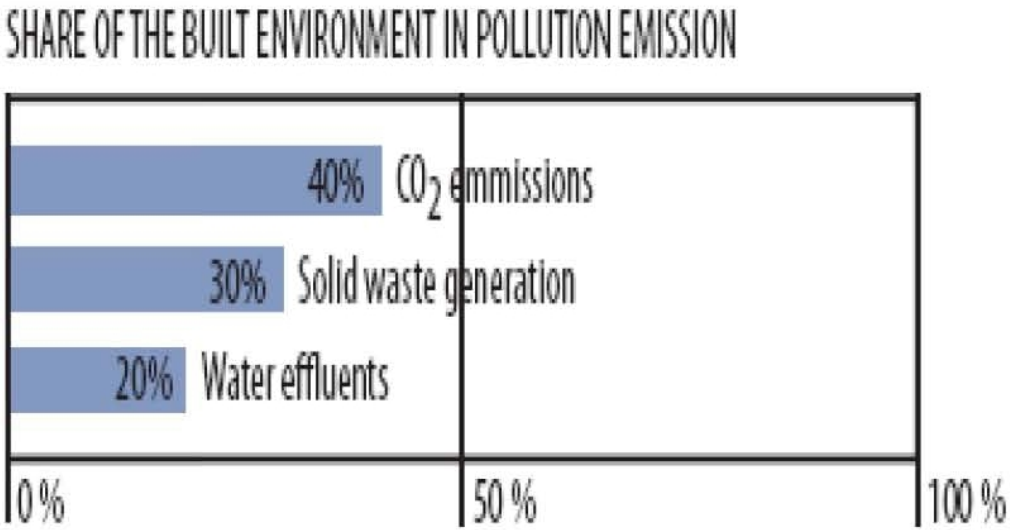
Our Consumption Continues to Increase …



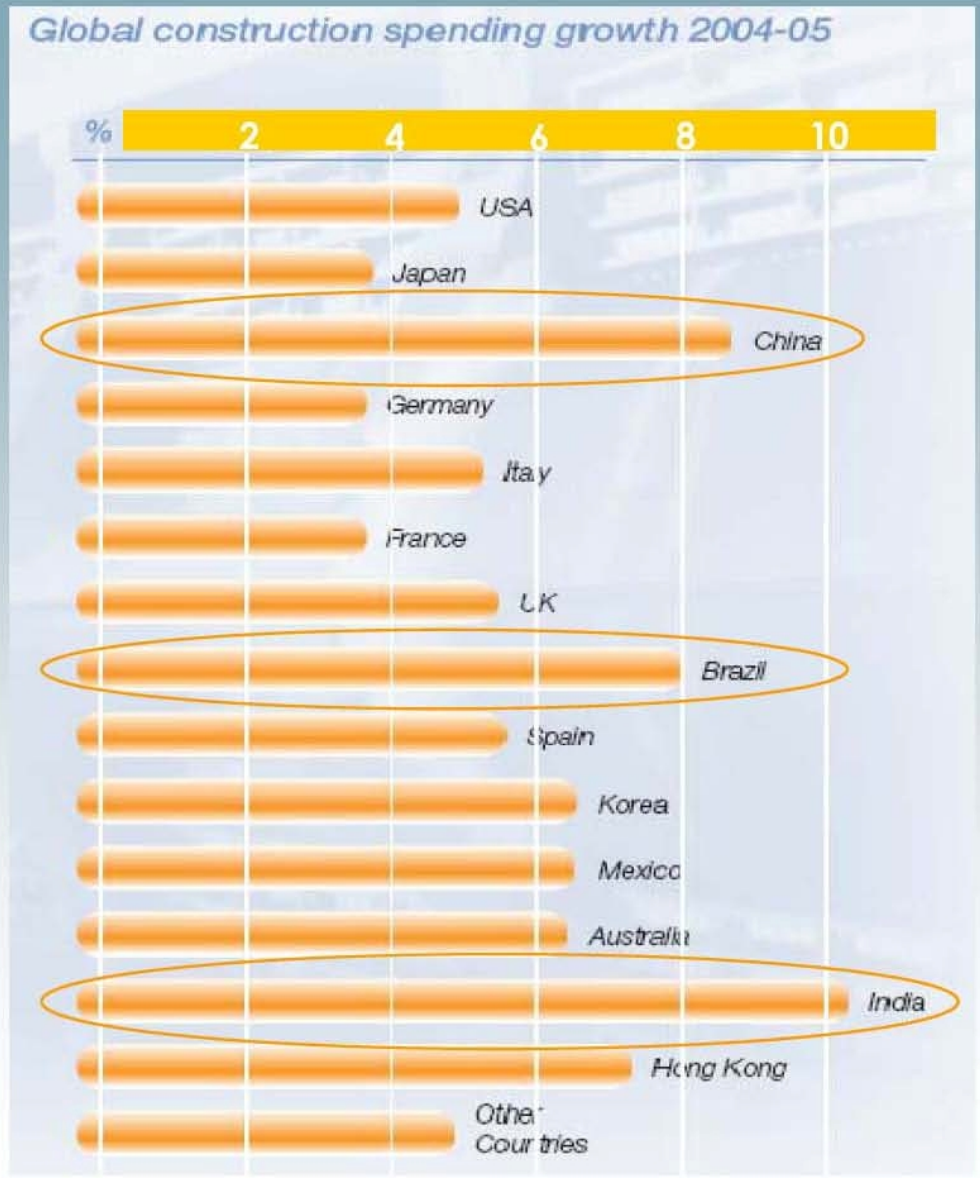
While Earth's capacity to support us continues to decrease …







The built environment creates significant impacts …



Investment in building is increasing…

rapidly in developing countries

SBCi, 2007

Driver of Change #3

Establish a system for measurement & reward



CERTIFICATION SYSTEMS

What is the LEED System?

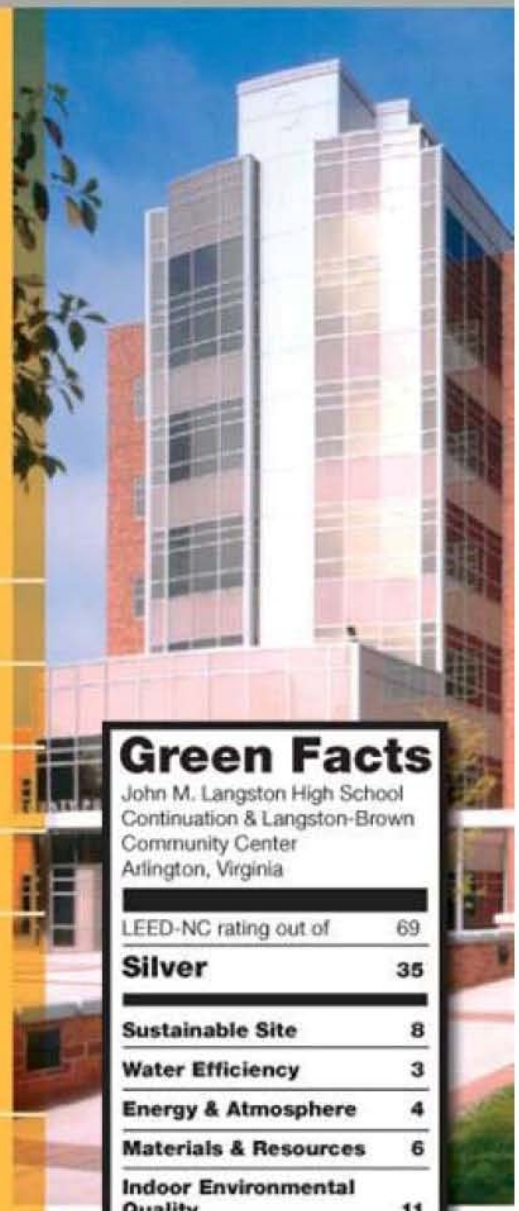
LEADERSHIP in ENERGY and ENVIRONMENTAL DESIGN

A leading-edge system for certifying **DESIGN & CONSTRUCTION** of the greenest buildings in the world

Scores are tallied for different aspects of efficiency and design in appropriate categories.

For instance, LEED-NC (New Construction) is assessed in detail for its:

1. Site Planning
2. Water Management
3. Energy Management
4. Material Use
5. Indoor Environmental Quality
6. Innovation & Design Process



Green Facts

John M. Langston High School Continuation & Langston-Brown Community Center
Arlington, Virginia

LEED-NC rating out of	69
Silver	**35**
Sustainable Site	**8**
Water Efficiency	**3**
Energy & Atmosphere	**4**
Materials & Resources	**6**
Indoor Environmental Quality	**11**
Innovation & Design	**3**

USGBC LEED-NC rated Sept. 3, 2003.

LEED Is Consensus-Based




ANIMALS
HIPPOPOTAMUS
ZEBRA
Nutrition F cts
Serving Size 8 crackers (28c
Servings Per Container Abo 2
Amount Per Serving
Calories 120 Cal es From Fat 30
% Daily Value*
Total Fat 3.5g 5%
Satu ed Fat 1g 5%
Trans Fat 0g
Polyunsaturated Fat 1.5g
Monounsaturated Fat 0.5g
Cholesterol 0mg 0%
Sodium 140mg 6%
Total Carbohydrate 22g 7%
Dietary Fiber Less than 1g 3%
Sugars 7g
Protein 2g
Vitamin A 0% • Vitamin C 0%
Calcium 10% • Iron 4%
* Percent Daily Values are based on a 2,000 calorie diet.
CONTINUED ON OTHER SIDE


immediate
& measurable

USGBC has four levels of LEED:




U.S. GREEN BUILDING COUNCIL
LEED PLATINUM
2006

Driver of Change #4

Address “conventional” economics

Results of the California Study

33 Diverse Buildings

Built over the last **10** years

Cost construction premiums of **1.8%**

Additional constructions costs for LEED-certified buildings

Average for offices and schools, based on 40 buildings



Average Bottom Line Savings



The William and Flora Hewlett Foundation
Menlo Park CA
LEED Gold

Driver of Change #5

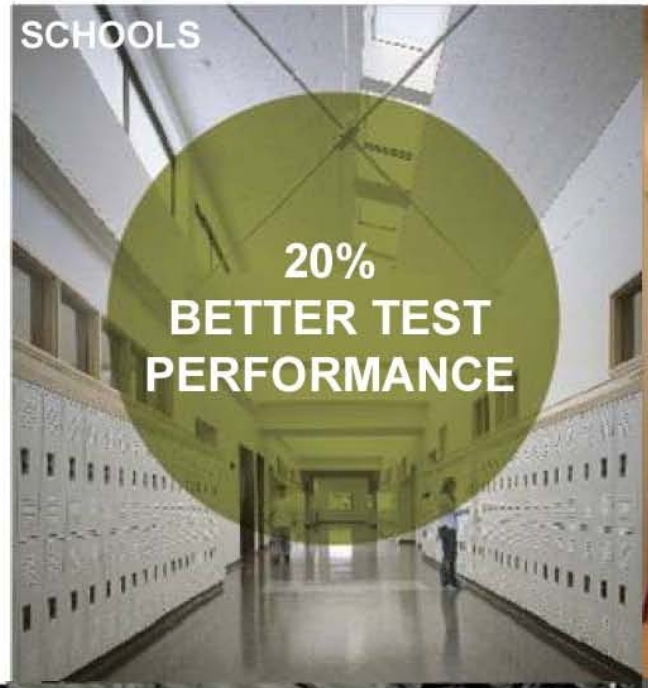
Adopt public policy

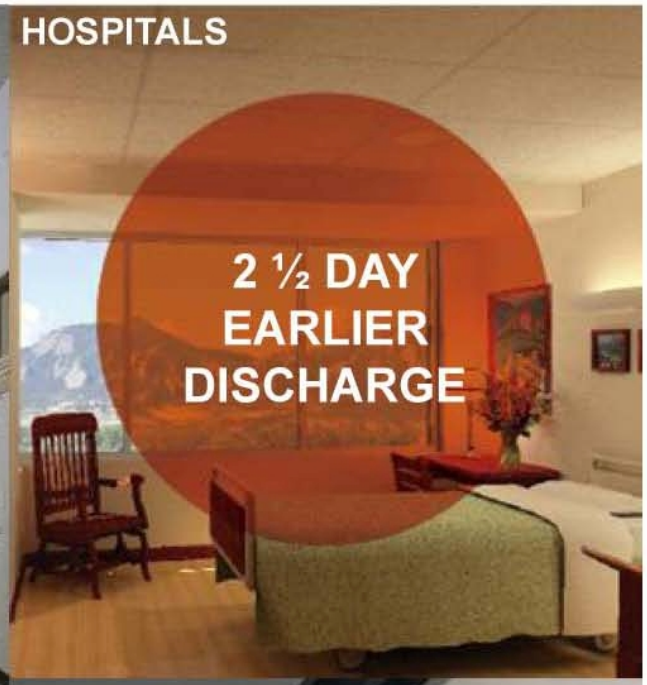

LEED ADOPTIONS
8 Countries
19 States
67 Cities
33 Schools
11 Federal Agencies
U.S. GREEN BUILDING COUNCIL
USGBC

Driver of Change #6

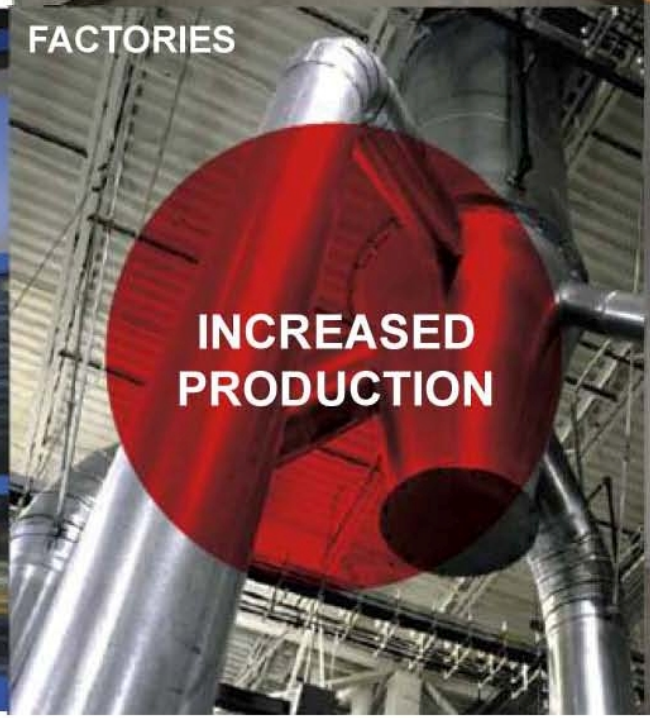
Discover the human benefits

Increased Productivity.



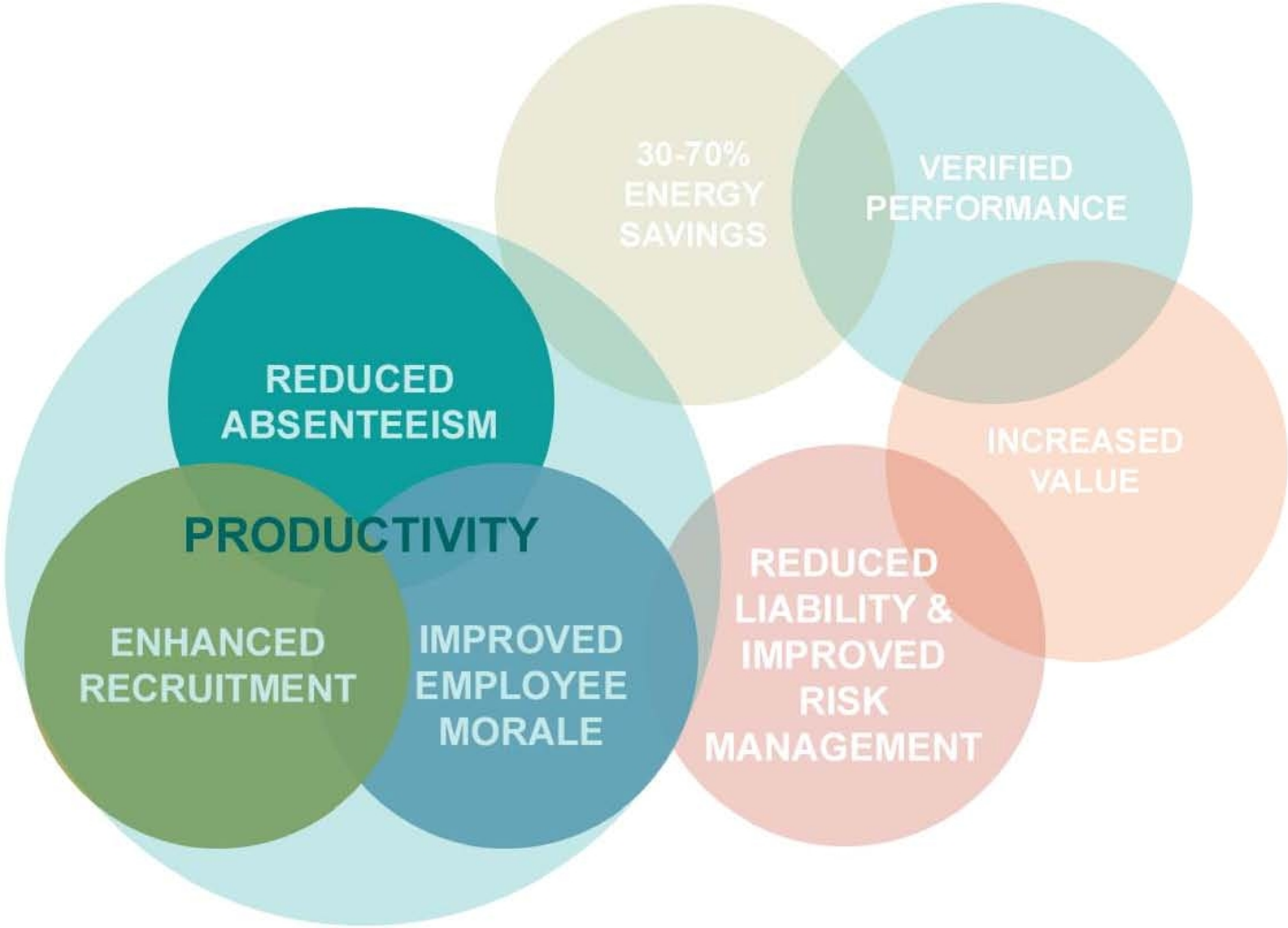








Improved Bottom Line.



Driver of Change #7

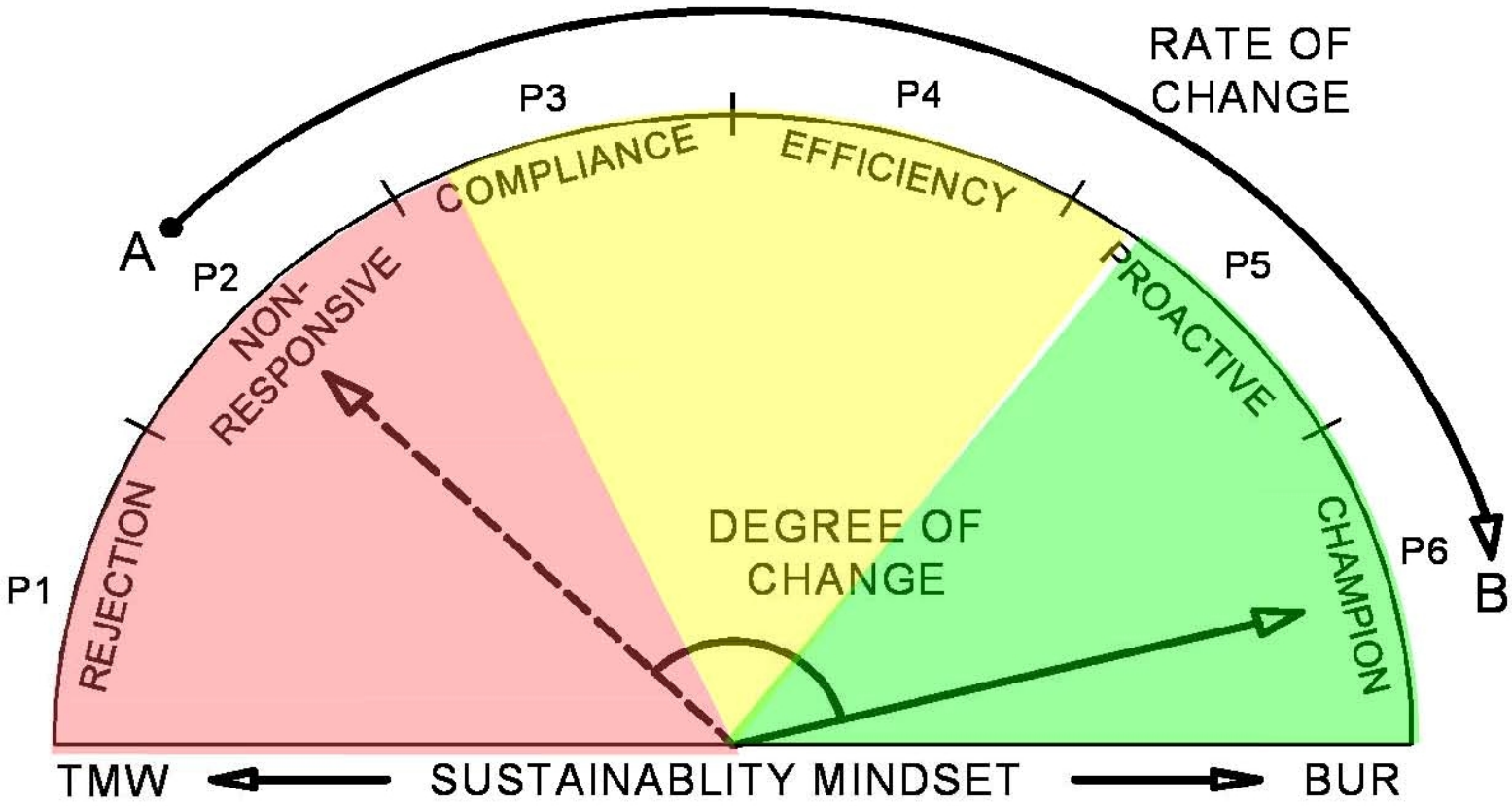
It's all about the people!



Green Building gets people climbing the ladder of awareness



Change Model



Source: Pivotal Experiences and Championing Sustainability in the Building Industry
Josette Plaut, 2006

a common language



Driver of Change #8

Create Partnerships

2030 ^{0}Challenge

http://www.architecture2030.org
ge/index.html

architecture
2030

New Buildings - 50%

2010 – 60%

2015 – 70%

2020 – 80%

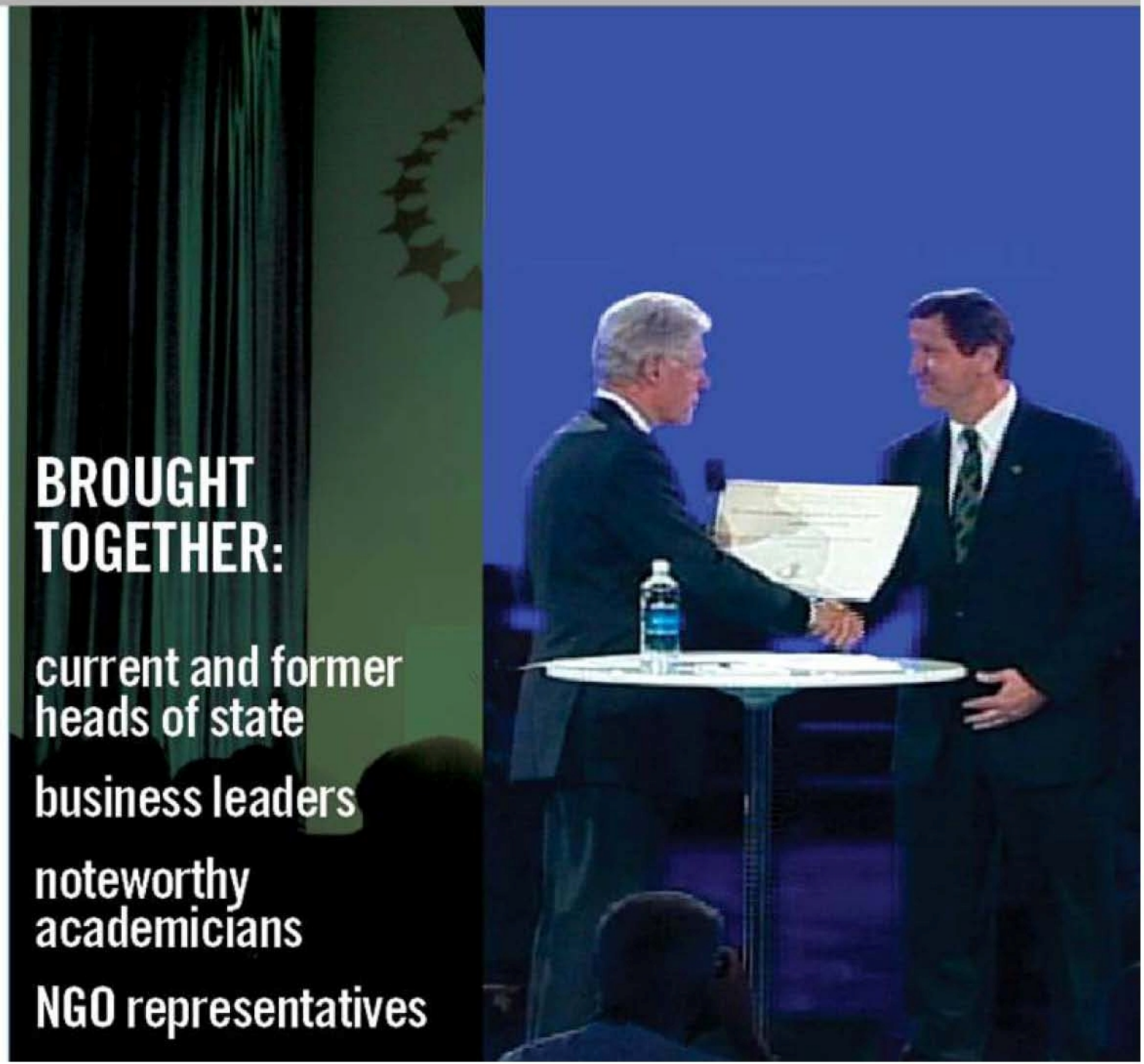
2025 – 90%

2030 - Carbon Neutral

(no fossil fuel energy to operate)

architecture 2030

Clinton Global Initiative Conference
September 2005



CLINTON GLOBAL INITIATIVE

Clinton Foundation – C40 and USGBC

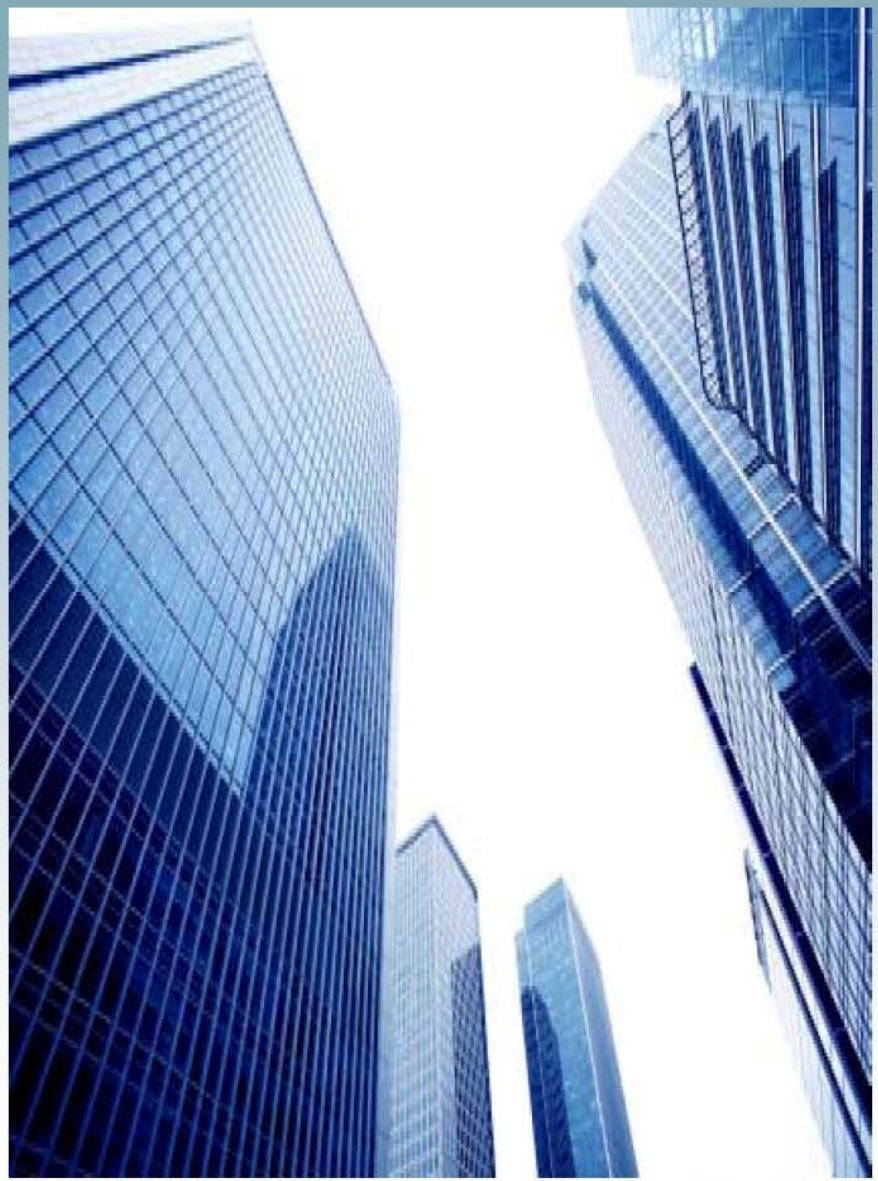






“Nobody should ever build a building again in America that doesn’t meet LEED standards.”

Clinton Climate Initiative



Climate Change

UNEP SBCI

Sustainable Buildings & Construction Initiative

SBCI is a global partnership between UNEP and worldwide leading companies, to promote and support sustainable solutions in the buildings and construction sector

Kyoto Protocol

- Provides the essential architecture for any new international agreement or set of agreements on climate change.
- The first commitment period of the Kyoto Protocol expires in 2012.
- By then, a new international framework needs to have been negotiated and ratified which can deliver the stringent emission reductions the IPCC tells us are needed.

Driver of Change #9



UNITED STATES
GREEN BUILDING COUNCIL
USGBC

USGBC MEMBERSHIP



USGBC membership growth reflects the expansion of green buildings in the market.

*As of December 2008

© U.S. Green Building Council, 2008



GREEN BUILDING NEAR YOU

USGBC Chapters are passionate advocates for green building in communities all across the country.



As of December 2008

© U.S. Green Building Council, 2008


GBCI
GREEN BUILDING CERTIFICATION INSTITUTE
HEREBY CERTIFIES THAT
77,434*
HAS ACHIEVED THE DESIGNATION OF
LEED® ACCREDITED PROFESSIONAL
BY DEMONSTRATING THE KNOWLEDGE OF GREEN BUILDING PRACTICE
REQUIRED FOR SUCCESSFUL IMPLEMENTATION OF THE LEADERSHIP IN ENERGY
AND ENVIRONMENTAL DESIGN (LEED®) GREEN BUILDING RATING SYSTEM™.
© U.S. Green Building Council, 2008
LEED AP
*As of December 2008

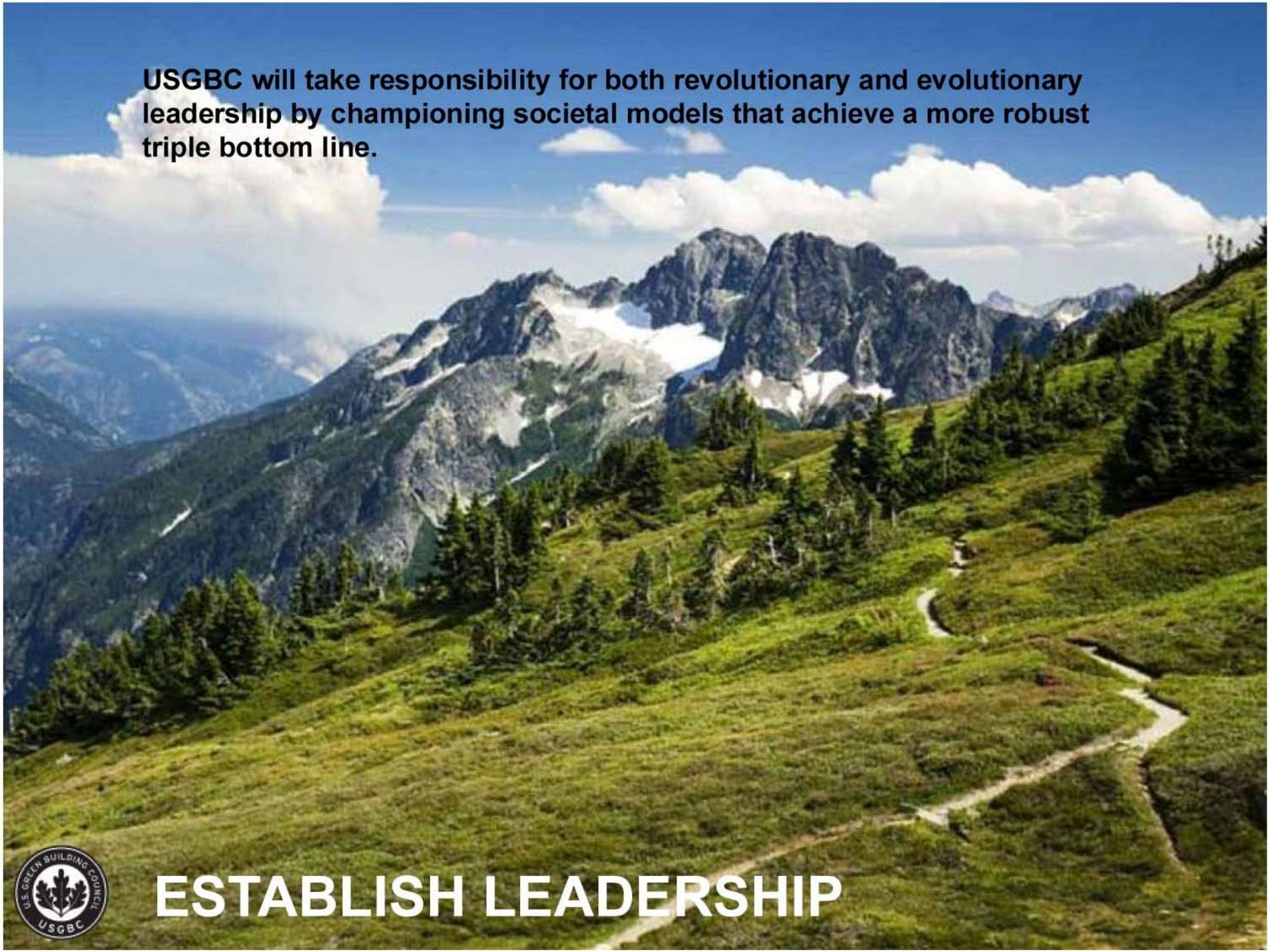
USGBC will pursue robust triple bottom line solutions that clarify and strengthen a healthy and dynamic balance between environmental, social, and economic prosperity.







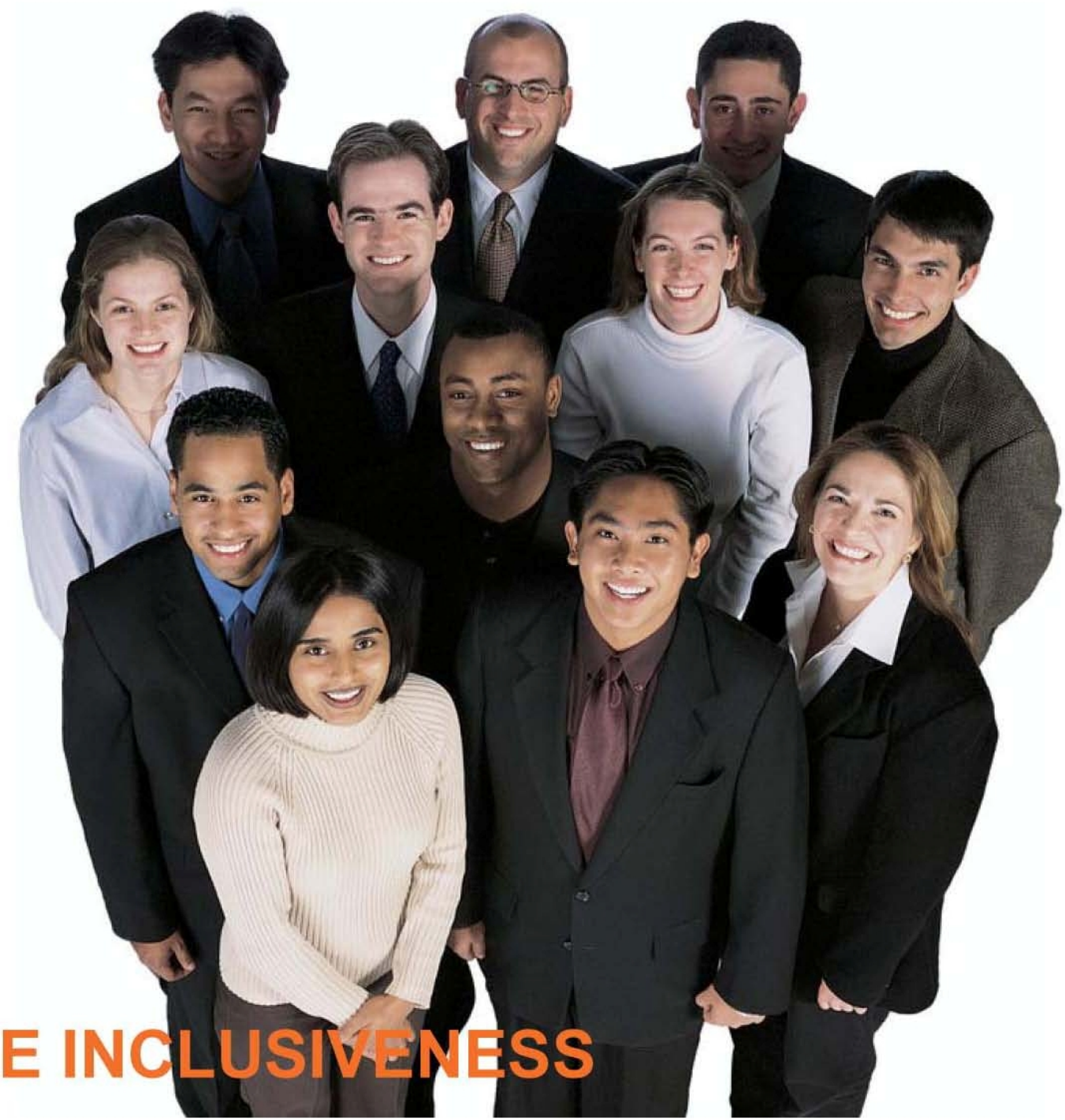
PROMOTE THE TRIPLE BOTTOM LINE


USGBC will take responsibility for both revolutionary and evolutionary leadership by championing societal models that achieve a more robust triple bottom line.
ESTABLISH LEADERSHIP


USGBC will endeavor to create and restore harmony between human activities and natural systems.
RECONCILE HUMANITY WITH NATURE


USGBC will be guided by the precautionary principle in utilizing technical and scientific data to protect, preserve, and restore the health of the global environment, ecosystems, and species.
MAINTAIN INTEGRITY

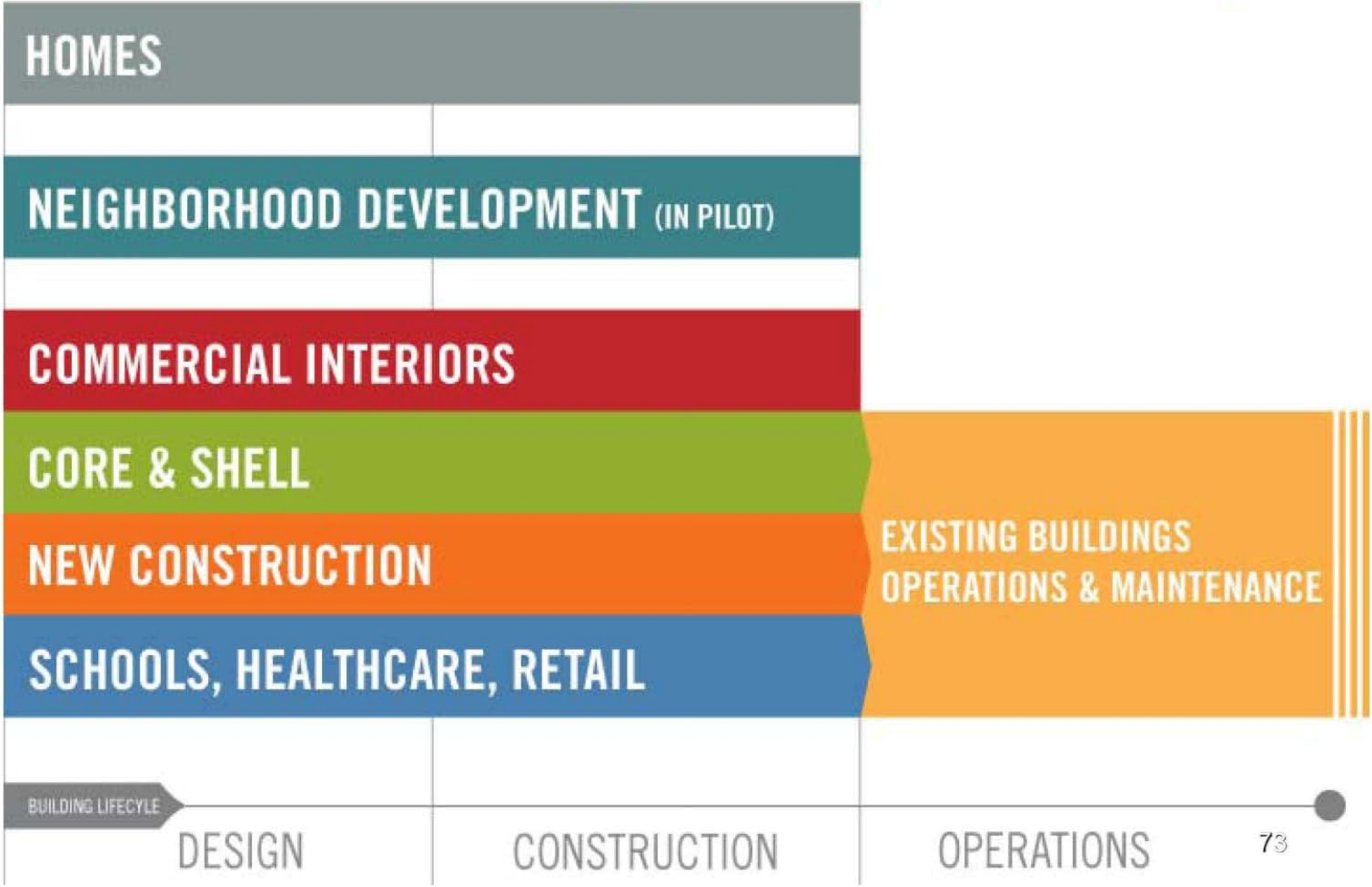
USGBC will ensure inclusive, interdisciplinary, democratic decision-making with the objective of building understanding and shared commitments toward a greater common good.



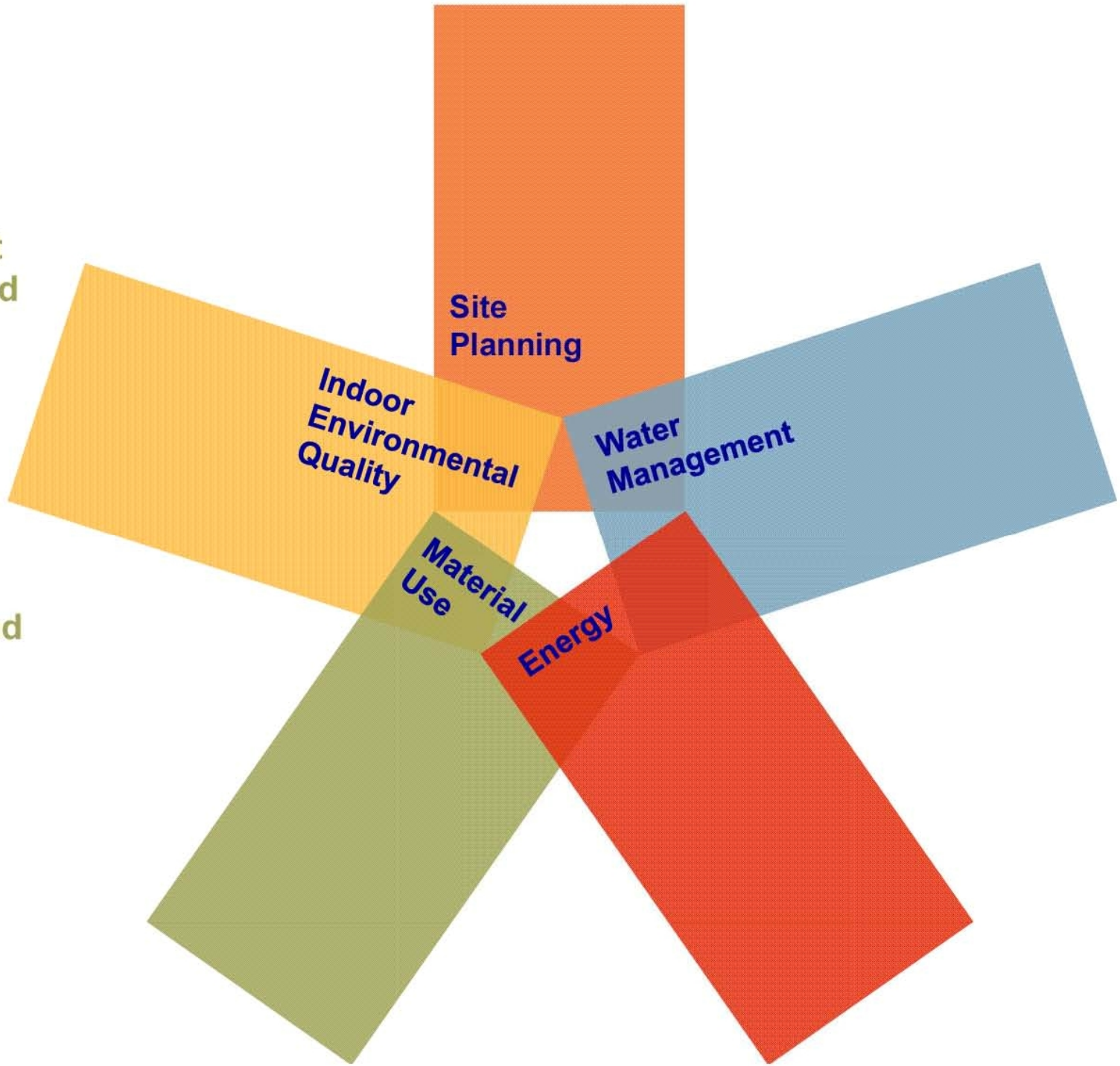
ENSURE INCLUSIVENESS


USGBC shall strive for honesty, openness, and transparency.
EXHIBIT TRANSPARENCY
U.S. GREEN BUILDING COUNCIL
USGBC

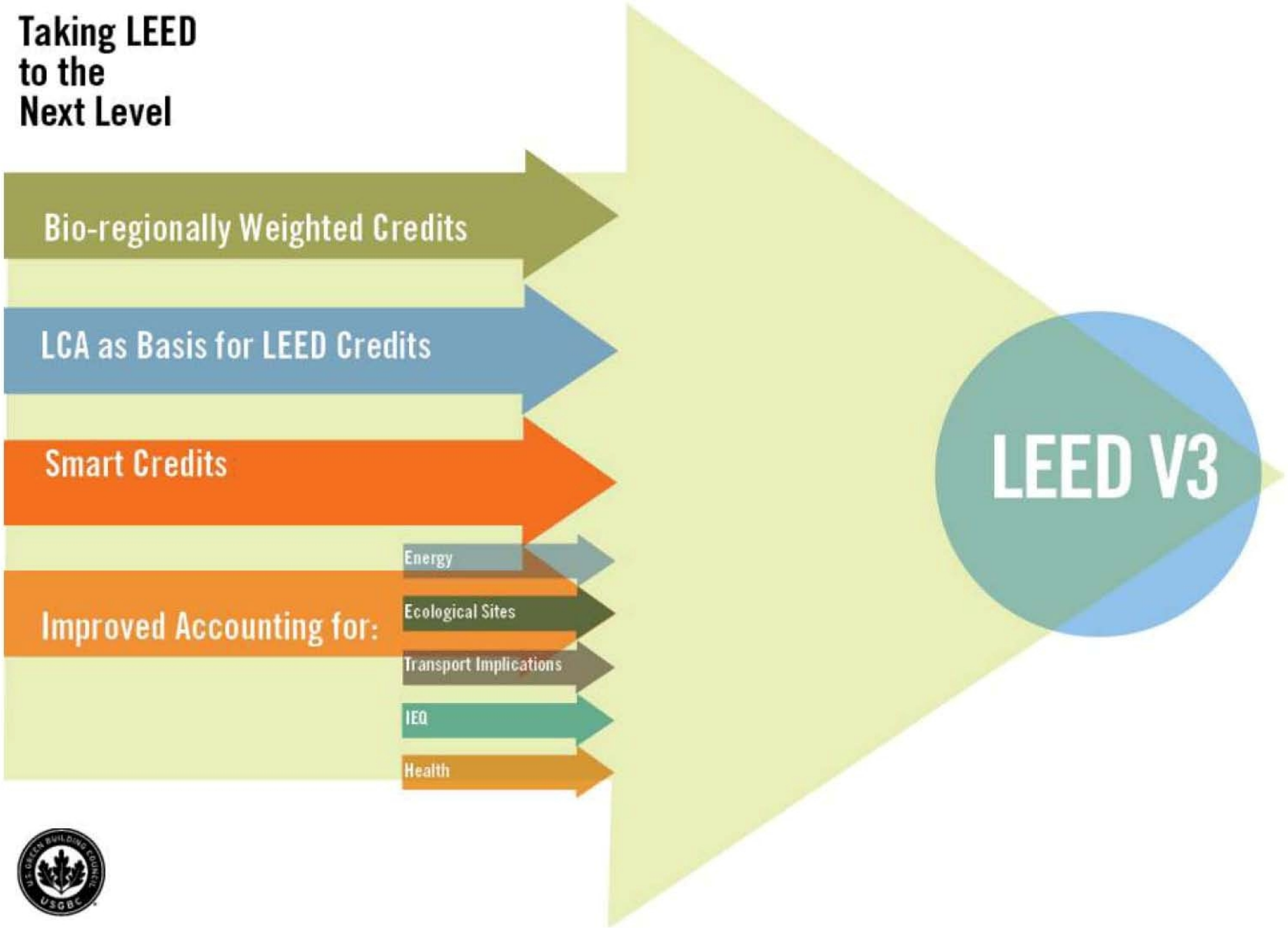
LEED address the complete lifecycle of buildings:



Design and construction practices that meet specified standards, resolving much of the negative impact of buildings on their occupants and on the environment.



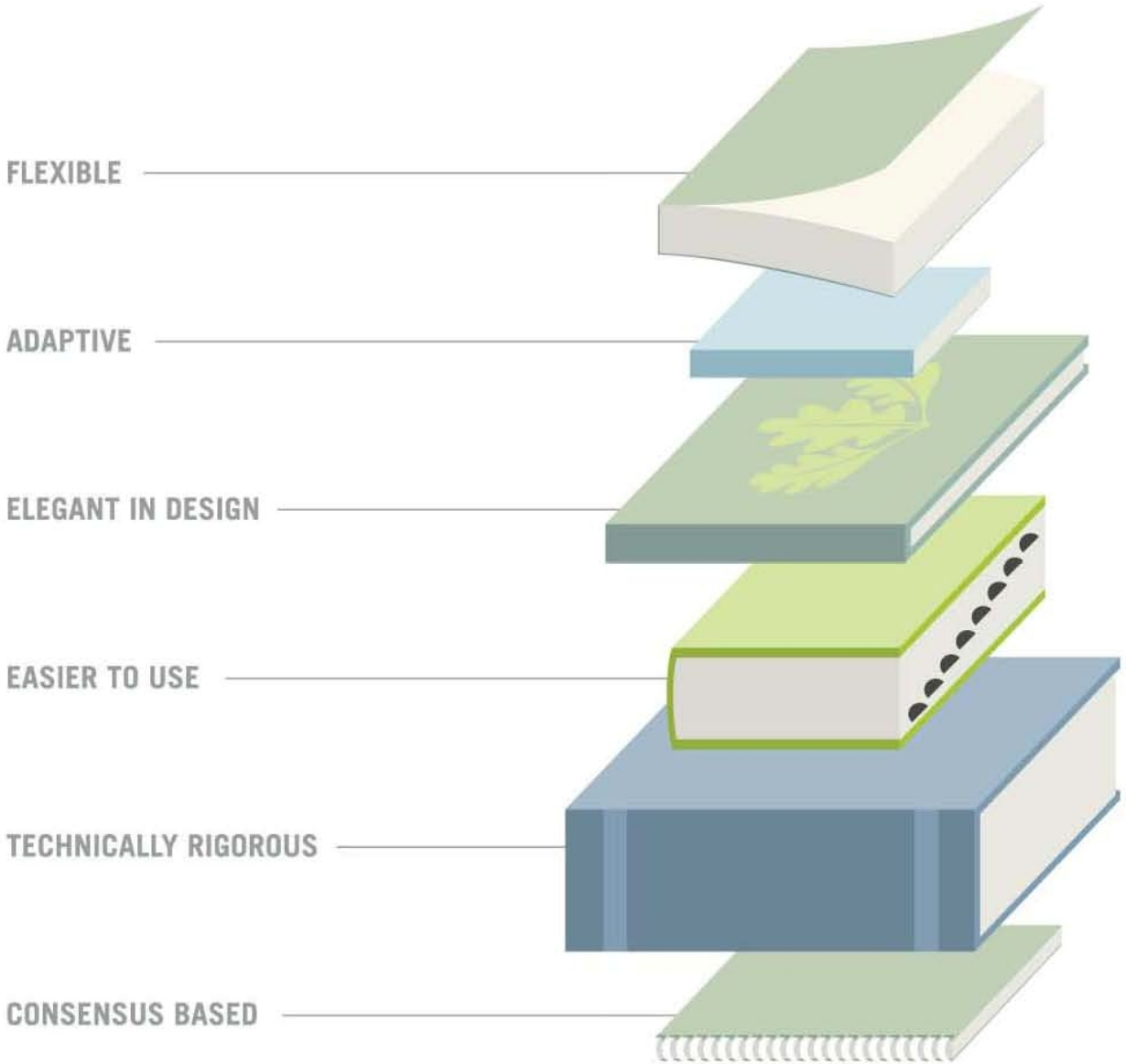
Taking LEED to the Next Level

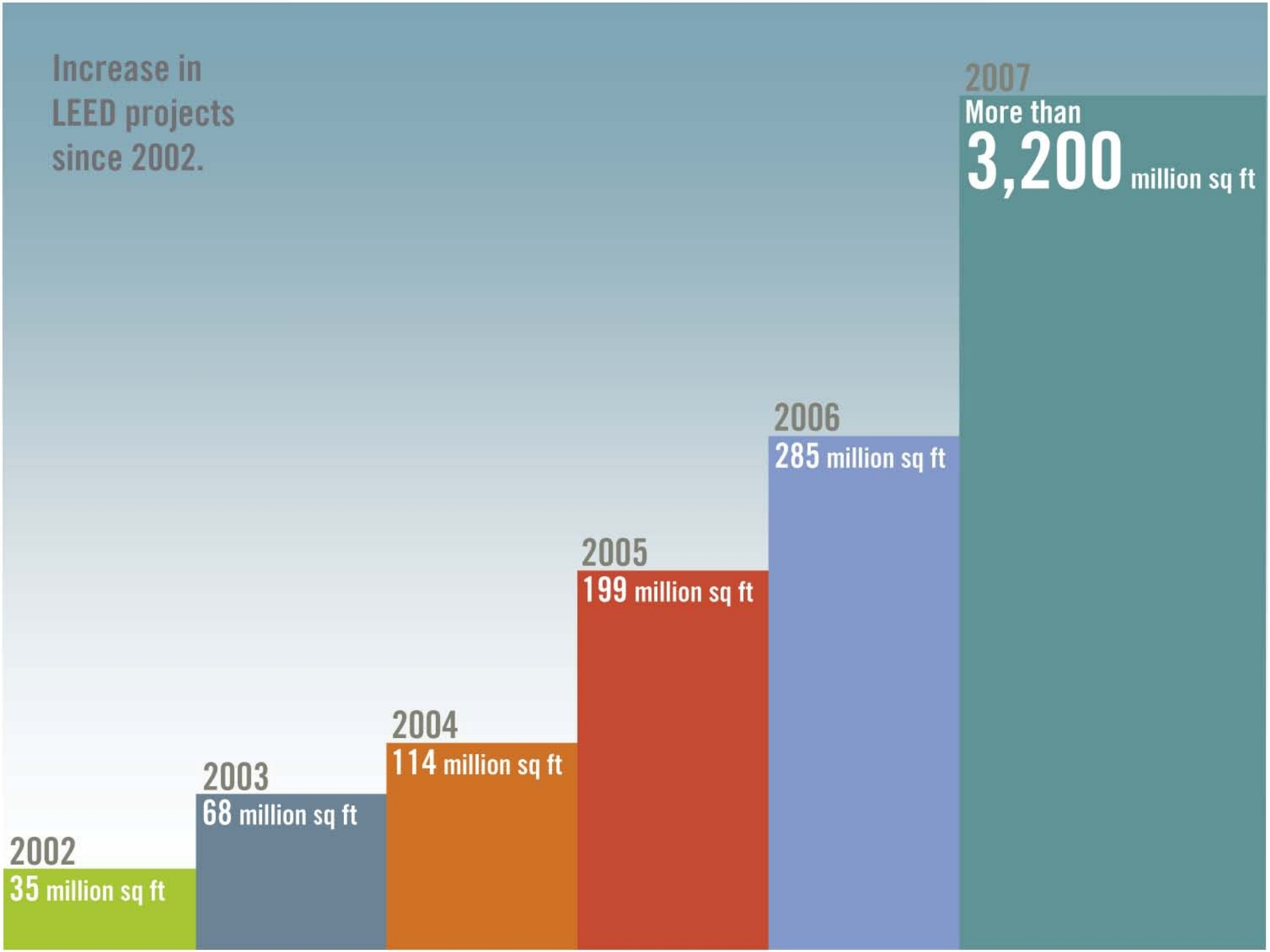



PERFORMANCE
CAPACITY
SPEED

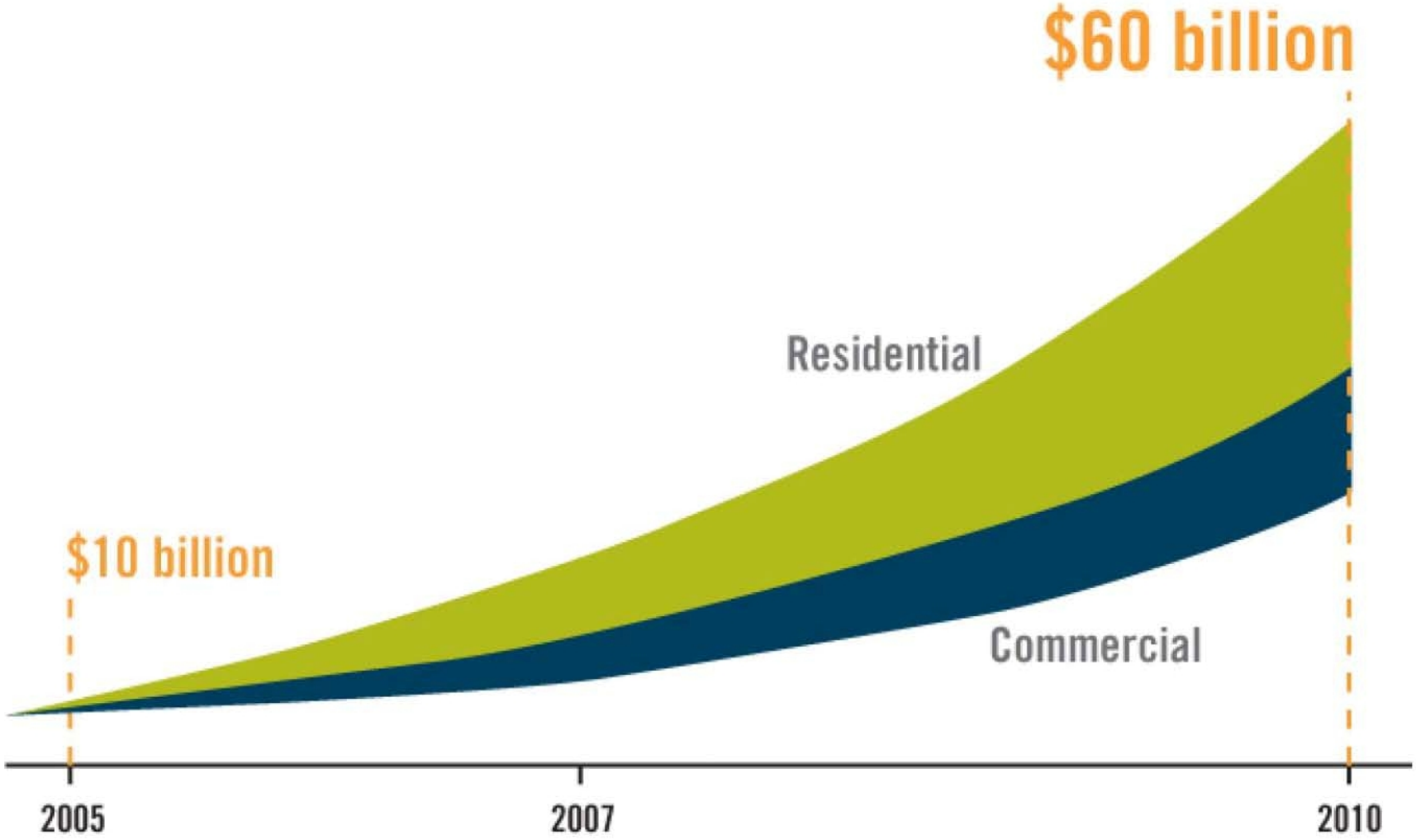



U.S. GREEN BUILDING COUNCIL
LEED
USGBC
TM


FLEXIBLE
ADAPTIVE
ELEGANT IN DESIGN
EASIER TO USE
TECHNICALLY RIGOROUS
CONSENSUS BASED


Increase in
LEED projects
since 2002.
2002
35 million sq ft
2003
68 million sq ft
2004
114 million sq ft
2005
199 million sq ft
2006
285 million sq ft
2007
More than
3,200 million sq ft

Green Building is an Industry Trend Not a Fad



2009 Greenbuild Theme



PERCEIVED ADVANTAGES OF BUILDING GREEN

8-9% decrease in operating costs

7.5% increase in building values

6.6% improvement in roi

3.5% increase in occupancy

3% rent increase

Drivers of change

1. Convene all stakeholders - inclusiveness
2. Identify the impacts
3. Establish a system for measurement and reward
4. Address conventional economics
5. Adopt public policy
6. Discover the human benefits
7. It's all about the people – focus on mindsets
8. Create Partnerships
9. USGBC and LEED

Conclusions and thoughts

GREEN is a great design partner

Rating Systems are more than a checklists

GOING BEYOND a prescriptive methodology

Sustainable design provides **ADDED VALUE** not Added Cost

HOLISTICALLY DESIGNED ENVIRONMENTS inspired by sustainable intent

Integrated design that goes **FROM INTUITION TO INFORMED**

Sustainability is a small to not cost increase and is a **MANAGEABLE COST** to the building

THE NEXT GENERATION'S PERSPECTIVE WILL INCREASE GREEN BUILDING

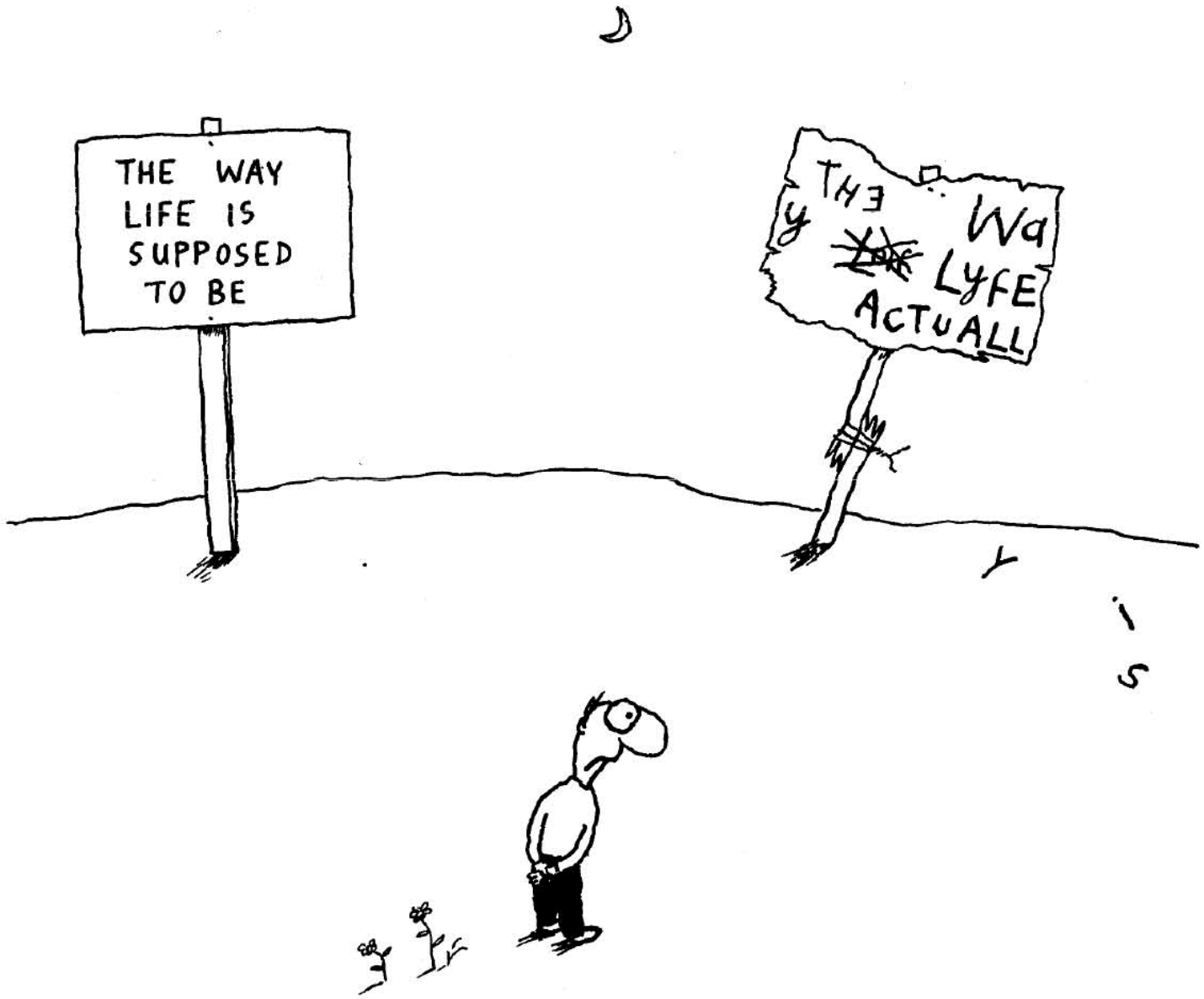
89% choose brands aligned with social cause

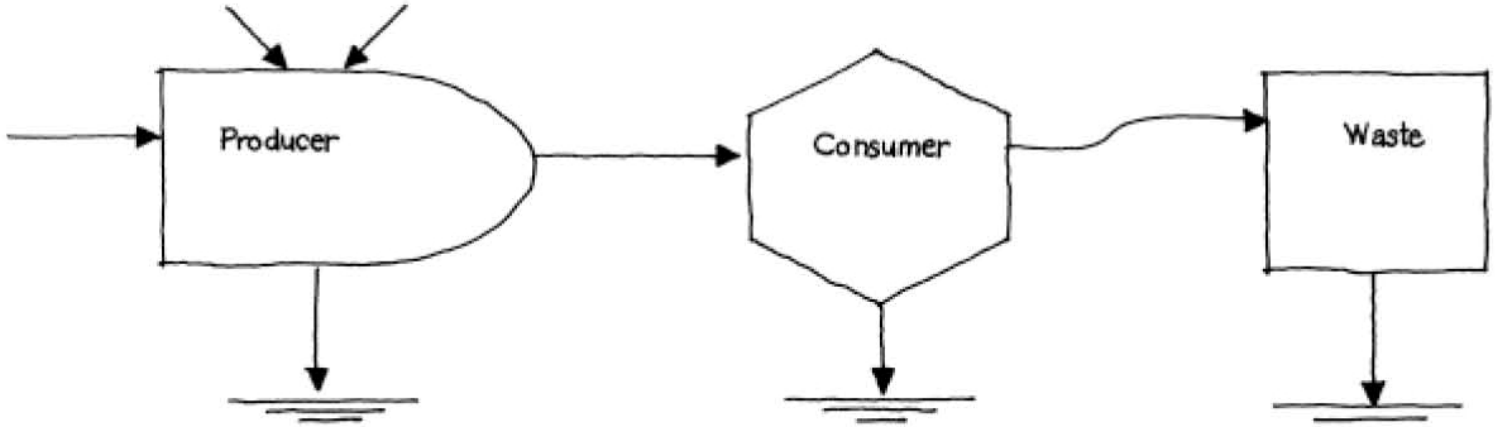
74% listen to brands aligned with social cause

69% shop for brands aligned with social cause

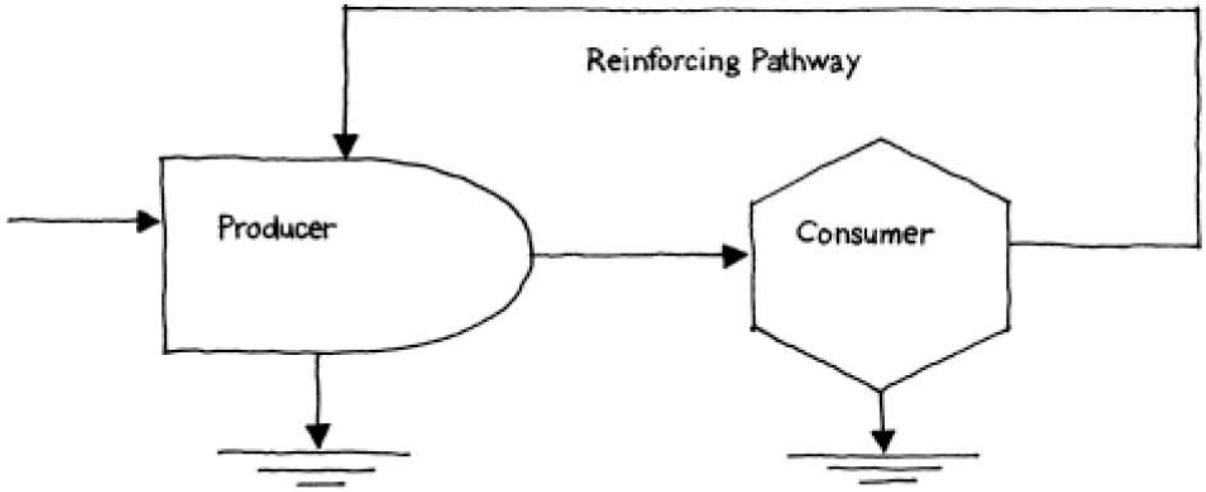
66% recommend brands aligned with social cause



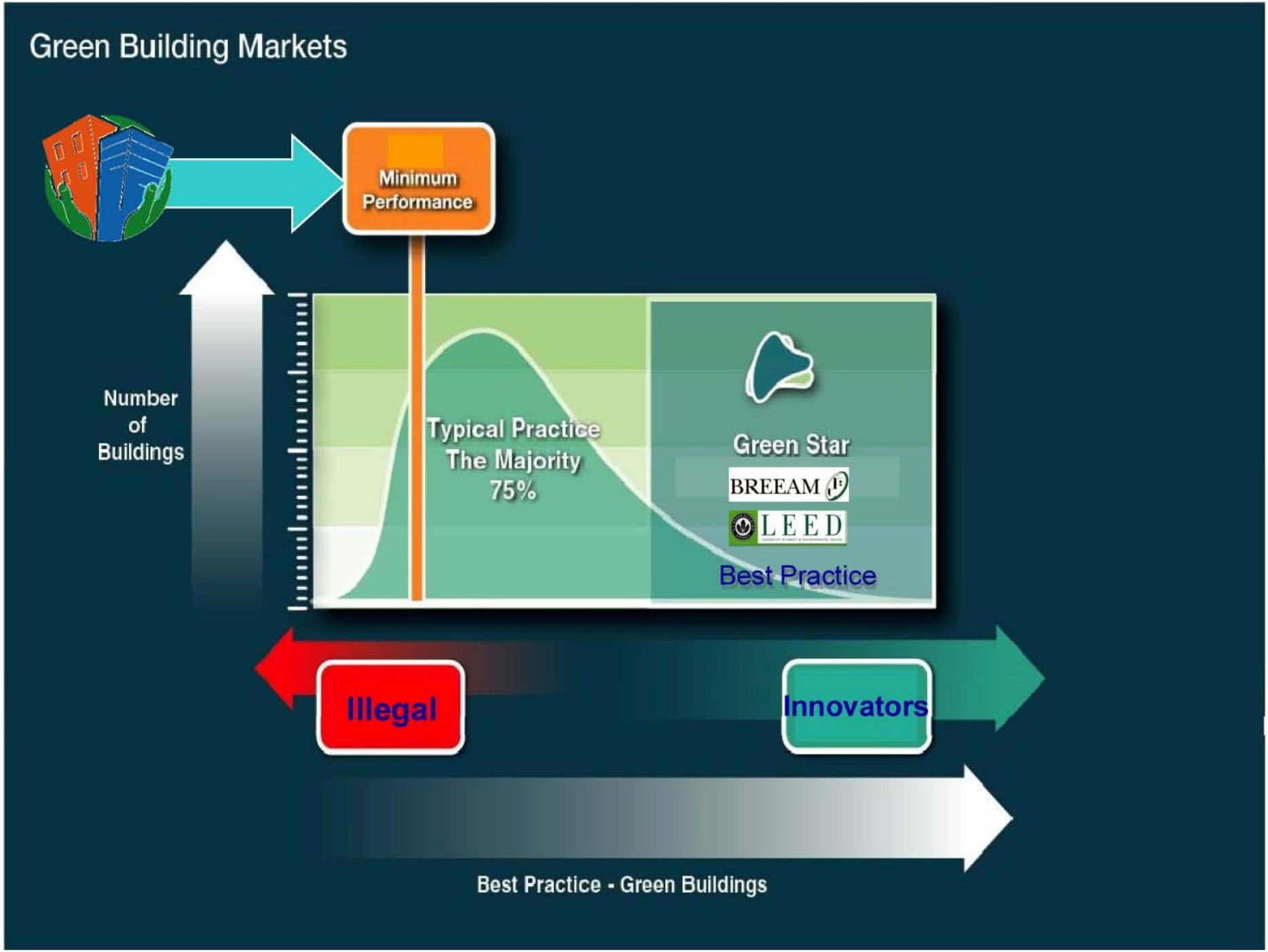

THE WAY LIFE IS SUPPOSED TO BE
THE WAY LYFE ACTUALL

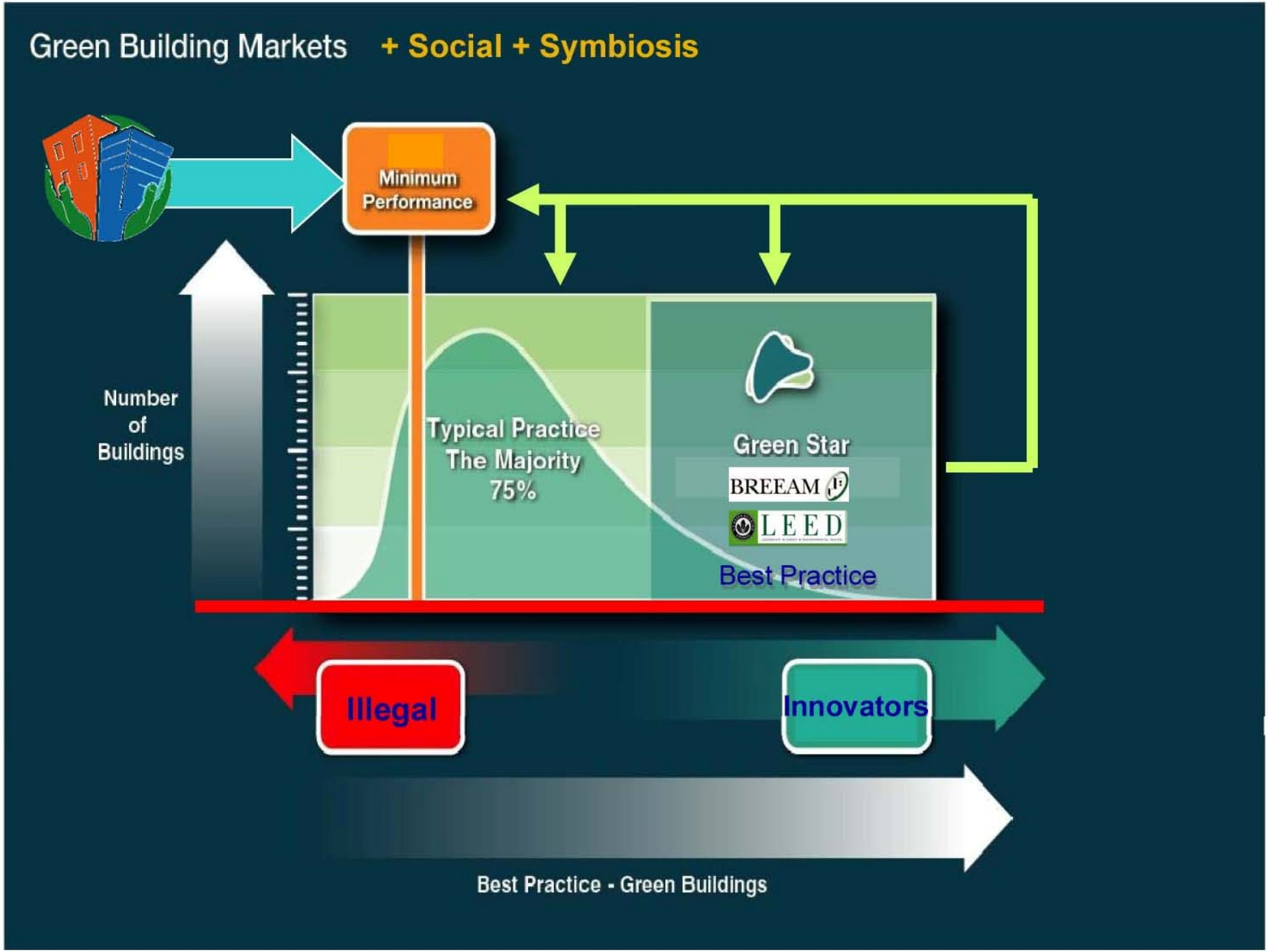


(a) UNSUSTAINABLE CONSUMPTION PATTERN



(b) SUSTAINABLE CONSUMPTION PATTERN


Green Building Markets
Minimum Performance
Number of Buildings
Typical Practice
The Majority
75%
Green Star
BREEAM
LEED
Best Practice
Illegal
Innovators
Best Practice - Green Buildings


Green Building Markets
+ Social + Symbiosis
Minimum Performance
Number of Buildings
Typical Practice
The Majority
75%
Green Star
BREEAM
LEED
Best Practice
Illegal
Innovators
Best Practice - Green Buildings



Believe!

How the WorldGBC is changing the World

and

How EgyptGBC is part of the change


QUESTIONS
ANSWERS

WORLD GREEN BUILDING COUNCIL

Argentina Green Building Council

United States Green Building Council

USGBC-Orange County Chapter

EGYPT GREEN BUILDING COUNCIL

YCC INTERNATIONAL

THANK YOU

Elsa Yasukawa, AIA Int Assoc/LEED AP

YCC International, Principal

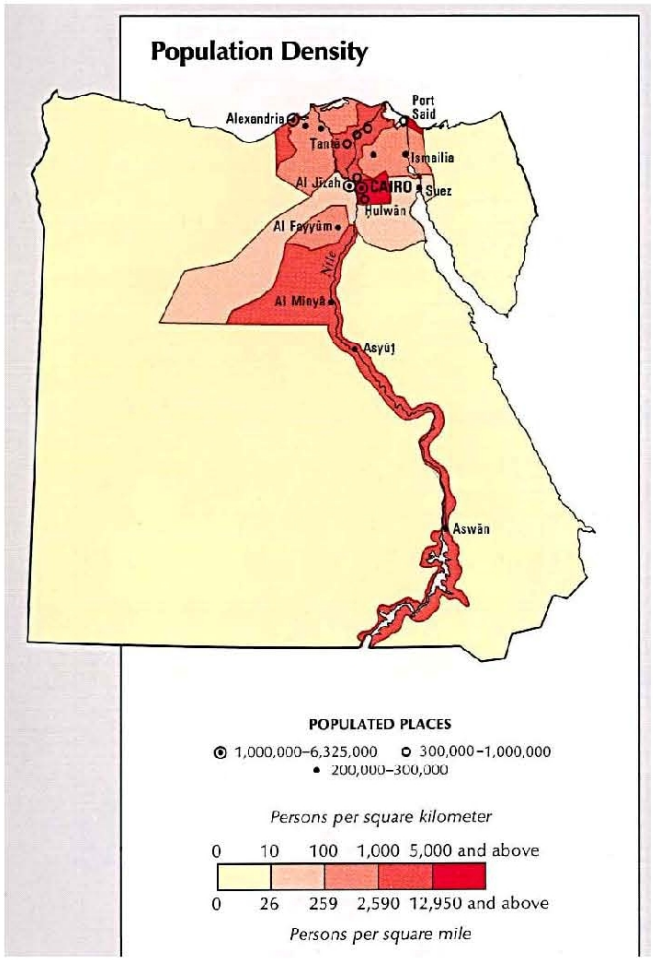
WorldGBC Special Representative for Latin America

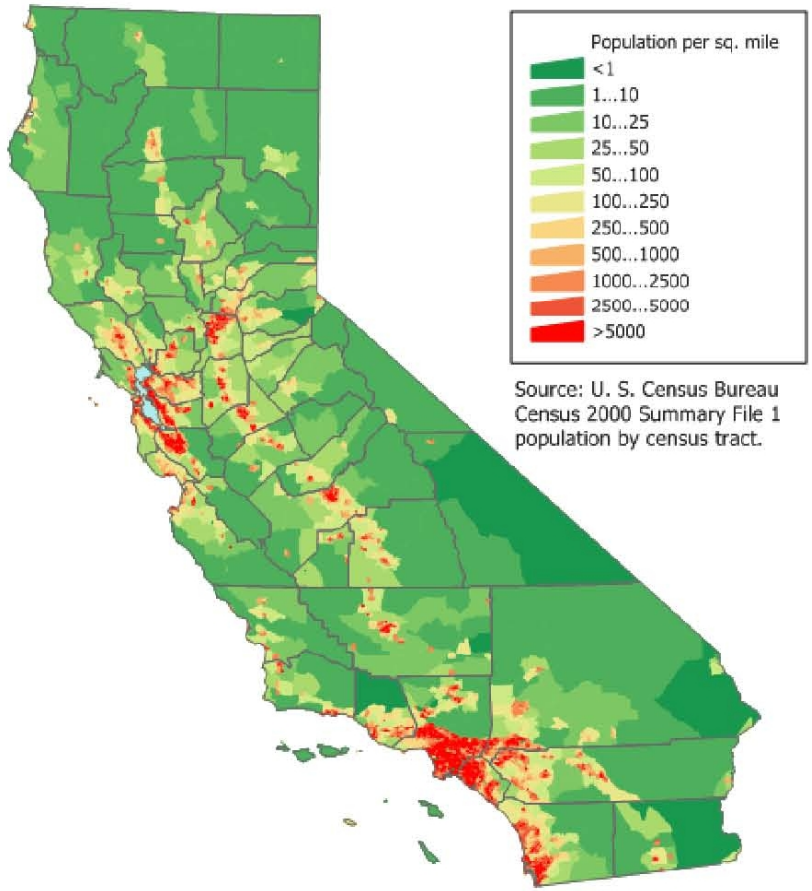
ArgentinaGBC, Founding Board Member

USGBC-OC Board Member, Education Chair

EgyptGBC Advisory Board Member


Government
Role and Green
Building Models
in California,
USA
Ziad Y. Mazboudi, PE, CPSWQ, CPESC
Copyright



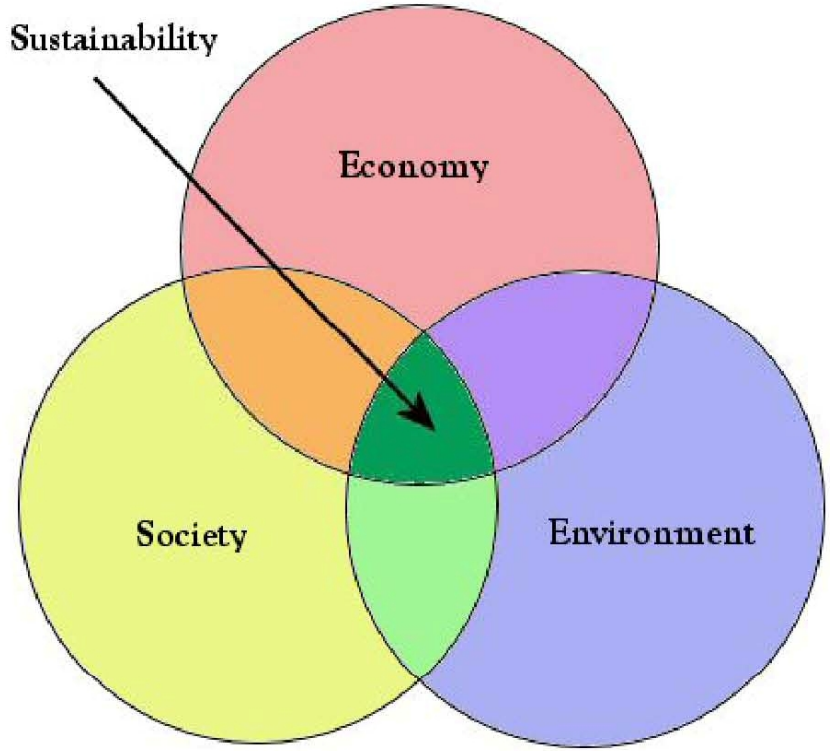


Description	California	Egypt
Population	38,000,000	82,000,000
% of land populated	8.6	4
Area (Sq. Miles)	164,000	385,000

Environmental issues

- Pollution: water, air, groundwater, rivers, ocean
- Increase of use of pesticides & harmful chemicals
- Water shortage
- Energy shortage
- Increase of single use products
- Shortage of natural resources
- Human Health deterioration
- Population increase
- Global warming





The role of Government role

Provide Sustainability:

Enhance resources, prevent harm to the natural environment and human health, and benefit the social and economic well-being of the community for the sake of current and future generations.

Environmental Impacts of Buildings

The construction and operation of buildings have numerous detrimental effects on the local, regional, and global environment:

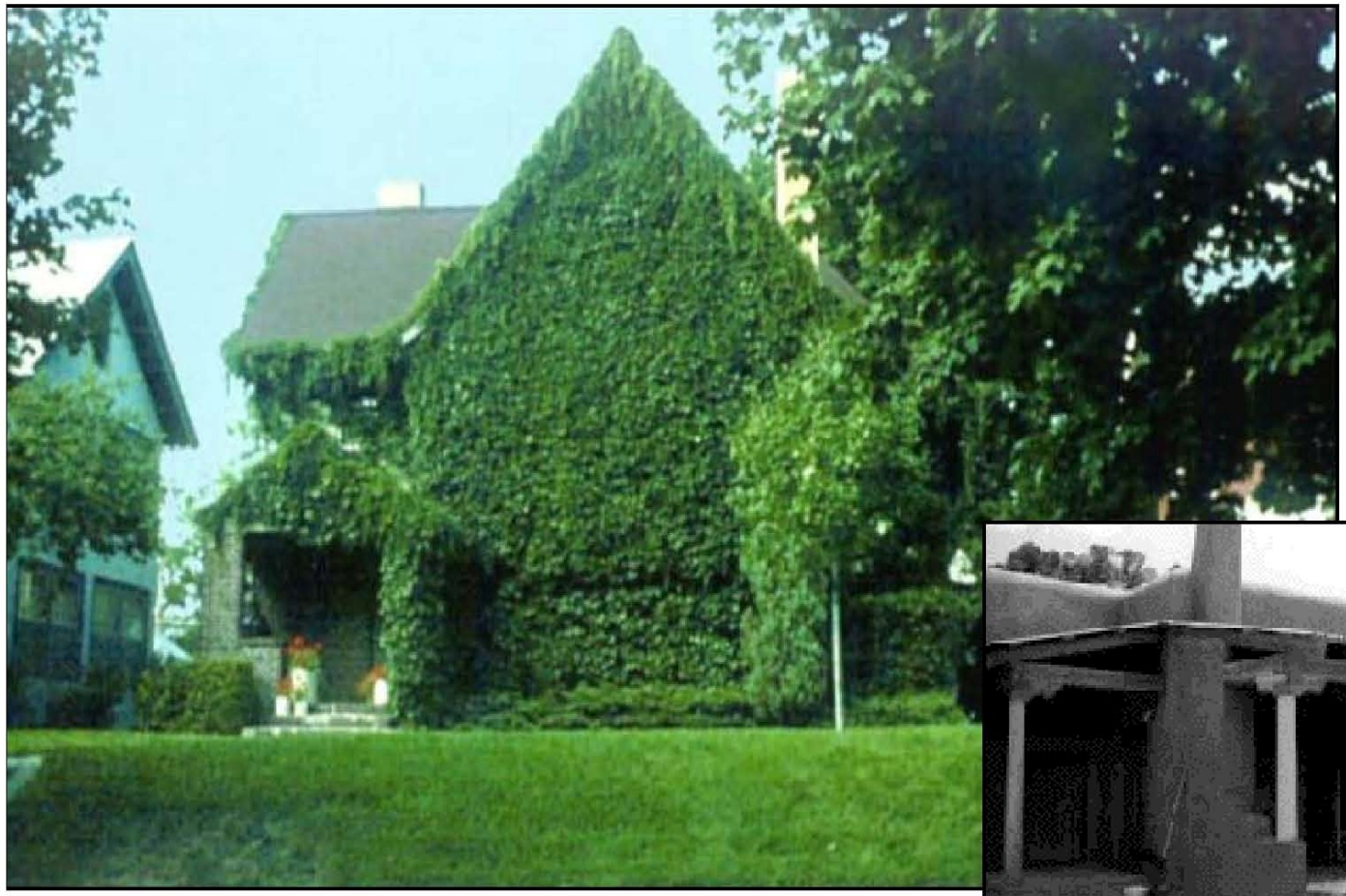
- 40% of annual US energy use
- 30% of US CO2 production
- 25% of water use
- 20% - 40% of solid waste
- 30% of wood and raw materials
- 30%+ of buildings have poor indoor air (people spend 90% of their time indoors)

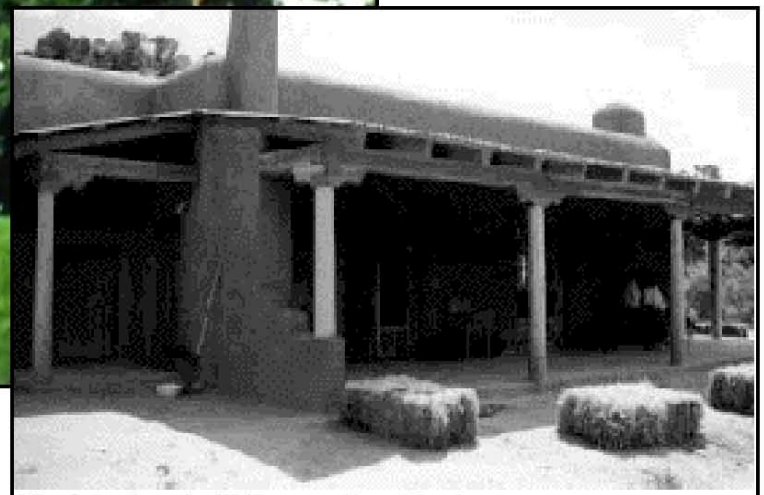
- Air pollution
- Global warming
- Water scarcity
- Landfills
- Deforestation
- Public Health
- Habitat loss
- Ozone layer depletion
- Urban Heat Island

Green Building provides a solution

- "Green building" is quality design construction and maintenance
- It is not something odd or unusual like many of the publicized rarities (straw bale, rammed earth, composting toilets, etc.)
- It is about educating professionals to do a better job
- Green building is about educating consumers about what they are buying and helping them to understand that they do have choices
- Green building can be done at every budget level

Green Building Myth





Virginia Carabelli House, New Mexico

Green Building Reality



Green Building

Balances Consumer's Priorities

- **Durable & Maintainable – Construction materials last longer and do not degrade the environment and in some cases renewable**
- **Aesthetically Pleasing – Enhancing curbside appeal of homes and businesses**
- **Cost Effective – Saves bottom line over the long term**
- **Healthy & Productive – Protects the respiratory health of both children and workers**
- **Minimizes Natural Resource Consumption & Environmental Impact**

Spheres of Green Building Benefits

Energy Savings





Improved Air Quality



Direct Benefit (Individual/Org)

Reduced Maintenance



Spheres of Green Building Benefits

Stormwater Retention



Waste Management/ Recycled Materials



Direct & Indirect Benefit (Regional and Indiv/Org)

Direct Benefit (Individual/Org)

Some of the Questions we ask

- **Do we want a green building program?**
- **What program should we use?**
- **How do we administer the program?**
- **Who will enforce it and track it ?**

Too many Green Programs

- Self Regulated and Private programs
  - Communities and Corporations
- Government programs
  - City, County, and other jurisdictions
- For-profit programs
  - CA Green Builder
- Non-profit programs
  - LEED, GreenPoint Rated, Energy Star

Green Programs issues

- Validation with 3rd party verification
- Validation with certified green professionals vs. licensed professionals or owners
- Validation with as-built vs. plans
- Testing

NAHB

- NAHB – National Green Building Standard

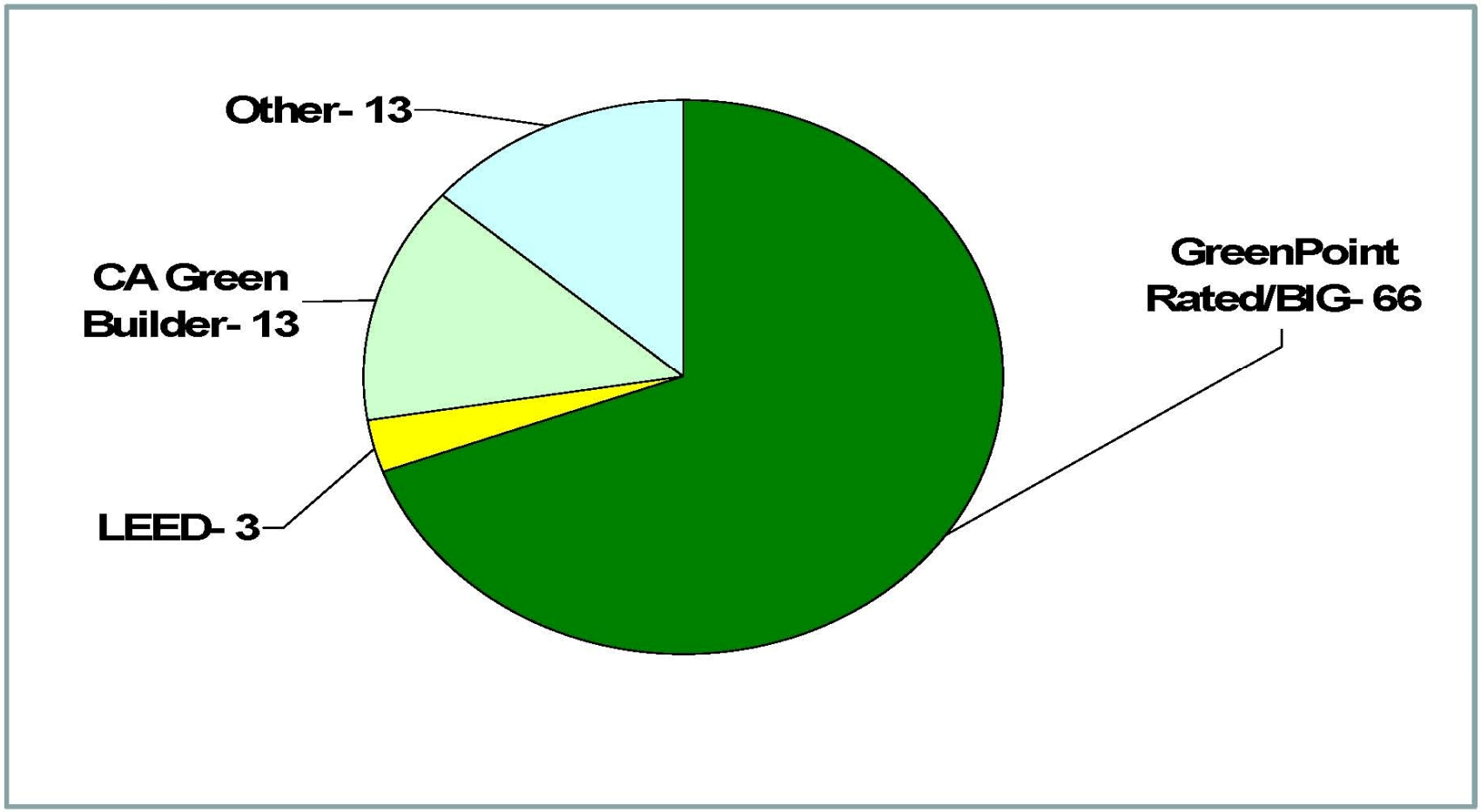
- NGBS has completed second Public Review, currently under ANSI for Final Review.

- Competing tiers as LEED:
  - Bronze, Silver, Gold, Emerald

- Chapter 3 for Planned Subdivions

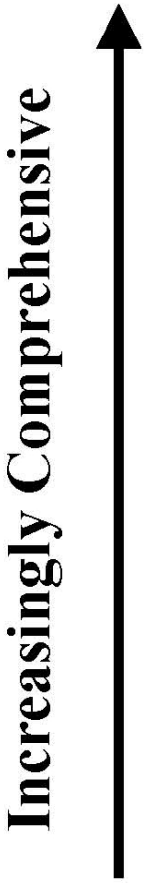
- Chapters 5-10 with a total of 625 points

Local Government Residential Green Building Programs in CA



Voluntary GB Programs

Increasingly Comprehensive









CA Green Builder

Requirements for both IEQ and Energy Efficiency

- 15% better then T24 and HERS inspection
- IEQ - Best Management Practices
- QII (Quality Installation of Insulation)

50% Construction Waste Diversion

- Required by AB 939 in CA

Water reduction of 20,000 gal. annually

- Can be accomplished with installation of ET Controller, if lawn is apart of equation.

Costs:

- $400 application fee for each subdivision

GreenPoint Rated

- **Ratings reflect practices ABOVE code in CA**
- **At least 50 pts overall with minimum levels within 5 categories**
- **Costs:**
  - **Certification Cost $400+**
  - **GreenPoint Rater fees**



GreenPoint Rated Minimum Requirements

50% Waste Diversion from landfill

- **Required by AB 939 in CA**

Perform 15% better then Title 24

GPR Checklist in Blueprints

Multifamily Projects:

- **3-Year roof guarantee with roof contractor**
- **20-year roof manufacturer warranty**

	Single-family		Multifamily	
Category	Min. Pts	Available Pts.	Min. Pts	Available Pts.
Total	50	376	50	253

LEED-H

Minimum credit level for certification

17 prerequisites

Pass HERS Rater inspection/testing

Costs:

- **$450 for application**
- **Energy Group - Review fee**
- **Documentation**



LEED-NC

Designed for Commercial buildings

Minimum credit level for certification

7 prerequisites

- **Energy modeling**
- **Commissioning**
- **Blower Door Test or Non-smoking**

Costs:

- **$450 for application**
- **$1,700 - $22,000 for certification**

Green Building Programs

HOME/PROJECT TYPES	LEED for Homes	GreenPoint Rated	CA Green Builder
New custom single-family	✓	✓	✓
New production single-family	✓	✓	✓
New multi-family low- & mid-rise	✓	✓	
New multi-family high-rise	LEED-NC	✓	
Gut rehab	✓	✓	
Remodel	USGBC guidelines	✓	

Green Building Programs

LEVEL	LEED for Homes	GreenPoint Rated	CA Green Builder
High-performance	✓	✓	
Mid-level green		✓	
Entry-level		✓	✓
GEOGRAPHIC SCOPE			
California	✓	✓	✓
National	✓		
SPONSOR	US Green Building Council	Build It Green	

Green Building Programs

TOPIC AREAS	LEED for Homes	GreenPoint Rated	CA Green Builder
Site	✓	✓	
Water	✓	✓	✓
Energy	✓	✓	✓
Materials	✓	✓	limited
Indoor environment	✓	✓	limited
Education	✓	✓	

California Green Building Standard Code

- California adopted in 2008 a Standard Green Building Code. The code includes both voluntary and mandatory measures.
- The California Building Standards Code applies to all occupancies in the State of California.
- Categories:

  1.Planning and design.

  2.Energy efficiency.

  3.Water efficiency and conservation.

  4. Material conservation and resource efficiency.

  5. Environmental air quality.

California State Facilities-LEED

- The California Governor issued a Green Building Order challenging state government to demonstrate leadership by becoming a model of energy and resource efficiency at state-owned buildings.
- The Green Building Order directs that future construction and renovation projects larger than 10,000 square feet meet LEED-New Construction Silver criteria in order to assure their energy and environmental performance.
- The same criteria are to be met for buildings smaller than 10,000 square feet, but certification is not required.

Mandatory vs Voluntary

- Green market demand and long term operation and maintenance savings, incentives and rebates promote voluntary measures.
- Government should mandate certain basic green measures that are uniformly accepted as beneficial to the environment, promote conservation in energy, water or that improve the health of occupants.

Mandatory

- Public facilities, government offices, schools, hospitals, etc..
- Large facilities: commercial building over 50,000 s.f. These facilities will house daily large number of employees.
- Minimum level of:
  - Water conservation
  - Energy conservation
  - Recycling
  - Storm water BMPs

Preventing the use of harmful chemicals, pollutant control, and promoting a healthy environment

So, what is the Best program to adopt?

- This presentation provides an overview of some of the Green Building Programs adopted and some of the protocols used in California and the US.
- It is recommended that the Egyptian Green Building Council reviews available codes and models and adopts, modifies or cherry picks portions of codes to meet local conditions.
- Based on available resources and funding, determine how will enforcement and tracking be performed.

Questions





Ziad Yassine Mazboudi, PE, CPSWQ, CPESC
Environmental Division Manager, City of San Juan Capistrano,
Orange County, California, USA
zmazboudi@sanjuancapistrano.org www.sanjuancapistrano.org

San Juan Capistrano Green Building Program

HOW TO BUILD A COMMERCIAL GREEN BUILDING

The San Juan Capistrano Green Building Program has developed criteria for building commercial and retail projects to become "Green Certified." To qualify as a Green Building, the project must score at least 50 points and include the ten required items (see asterisked items in the scoring chart).



50 POINTS = SAN JUAN CAPISTRANO GREEN BUILDING	60 POINTS = SAN JUAN CAPISTRANO GREEN BUILDING PLUS	75 POINTS = SAN JUAN CAPISTRANO GREEN BUILDING PREMIUM

Applicant:_____	Property Owner:_____
Address:_____	Address:_____
_____	_____
Phone No.:_____	Phone No.:_____
E-mail:_____	E-mail:_____
Contact:_____	Contact:_____

Plan Check #:_____ Date:_____

Project Address(es):_____

_____ Tract No.:_____ Lot No.:_____

Introduction to Sustainable Design and LEED Certification



Egyptian Green Building Council Initiative
Cairo, Egypt



January 25-27, 2009

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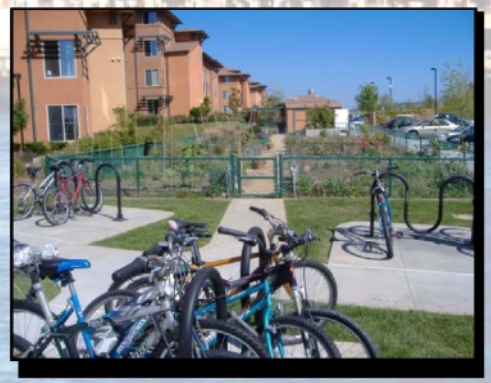
Agenda

- Sustainability
- Project Certification – LEED NC
- LEED AP and the Test
- Status of LEED ND
- Questions and Answers



University of California
Palo Verde Student Housing
Irvine, California

Sustainability

To sustain is to endure without



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Balancing the Natural and Built Environment

"Sustainability meets the needs of the present

without compromising the ability of future generations to meet their own needs."

United Nations World Commission on Environment and Development



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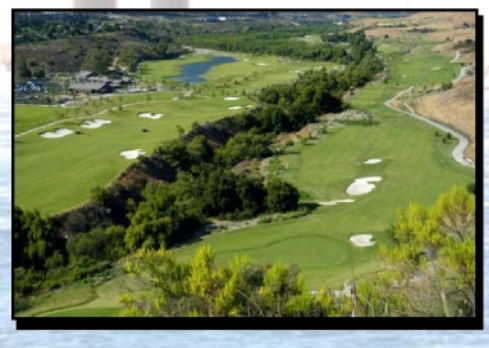
"Sustainability refers to the ability of a society,

ecosystem, or any such ongoing system to continue functioning into the indefinite future without being forced into decline through exhaustion…of key resources."

Robert Gilman, President of Context Institute





Arroyo Trabuco Golf Course
Mission Viejo, California

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Environmental Impact of Buildings

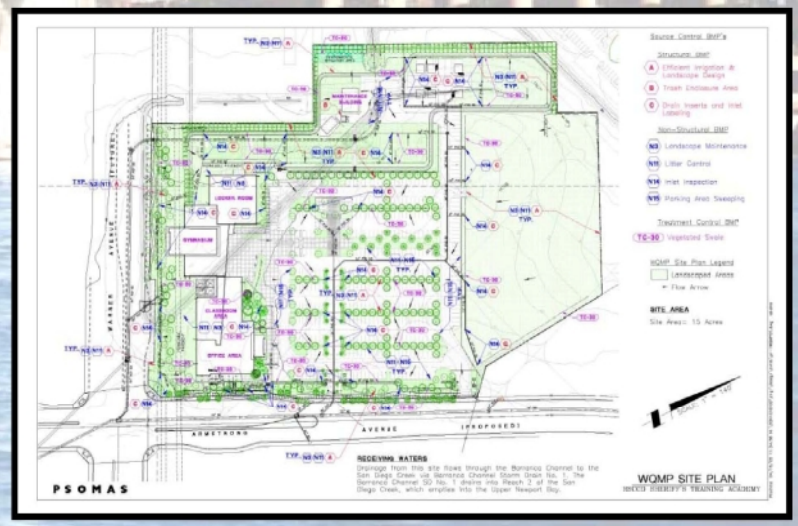
- 70% of total U.S. electricity consumption
- >39% of total U.S. primary energy use
- 30% of total U.S. greenhouse gas emissions
- 136 million tons of construction and demolition waste in the U.S. (approx. 2.8 lbs/person/day)
- 12.2% of potable water in the U.S. (15 trillion gallons per year)
- 40% (3 billion tons annually) of raw materials use globally
- California schools are spending nearly $450 million on energy, more than the combined cost of supplies and books
- Construction generates 30% of our state's solid waste stream
- Buildings use two thirds of U.S. electricity and produce two thirds of U.S. greenhouse gas emissions

Sustainability – The Ultimate Goal

- **Reduce Environmental Impacts**
- **Conserve Resources**
- **Improve Health**
- **Reduce Cost in the Long Run (cost vs. benefit)**



Environmental Nature Center
Newport Beach, California



Rancho Santiago Community College District Sheriff's
Training Academy, Tustin, California

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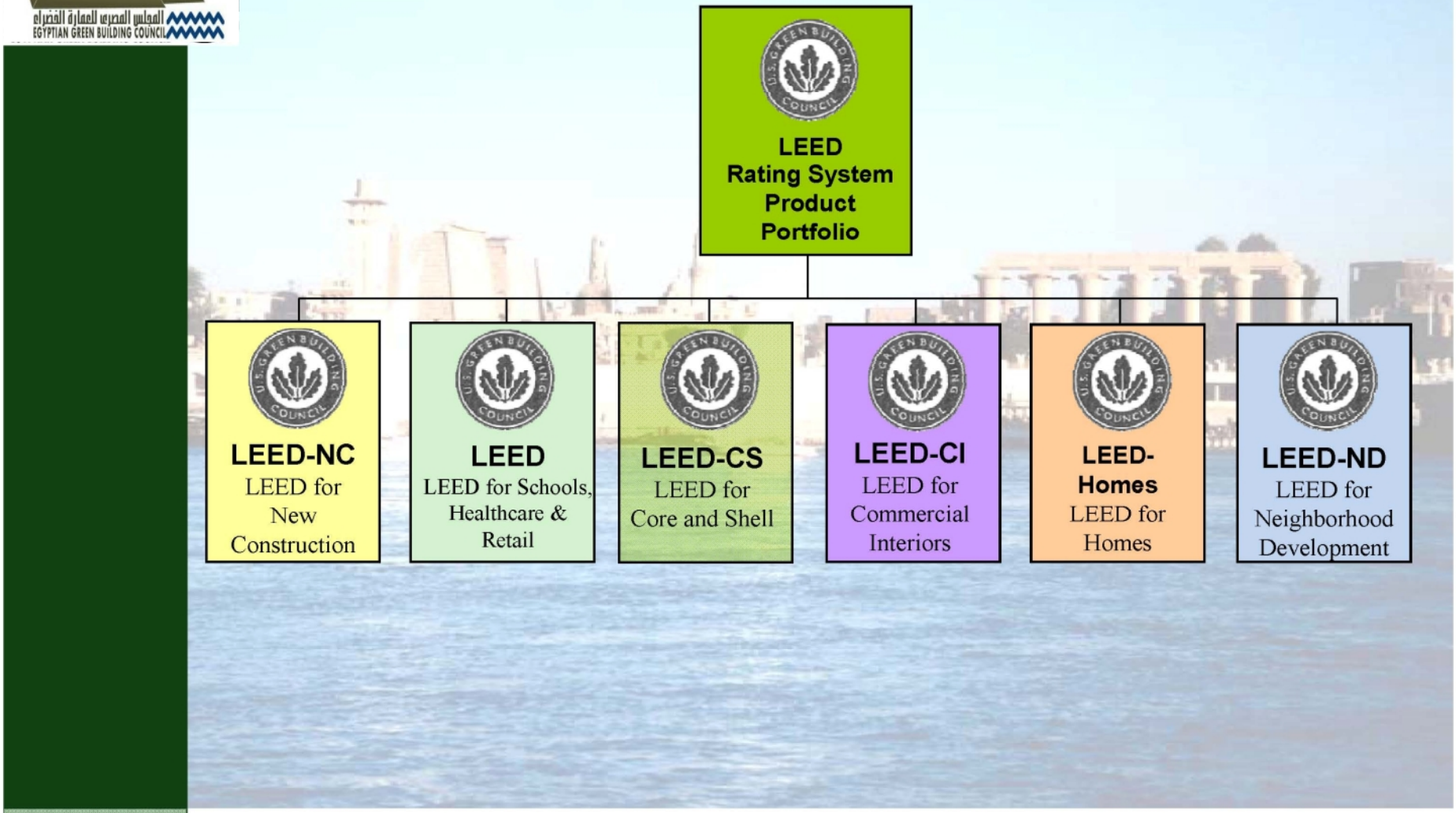
What is LEED?

- A city in England?
- Late Evening Engineering Dance?
- Lovely Entertaining Engineer Dudes?
- Leadership in Energy and Environmental Design?

Rating System Product Portfolio



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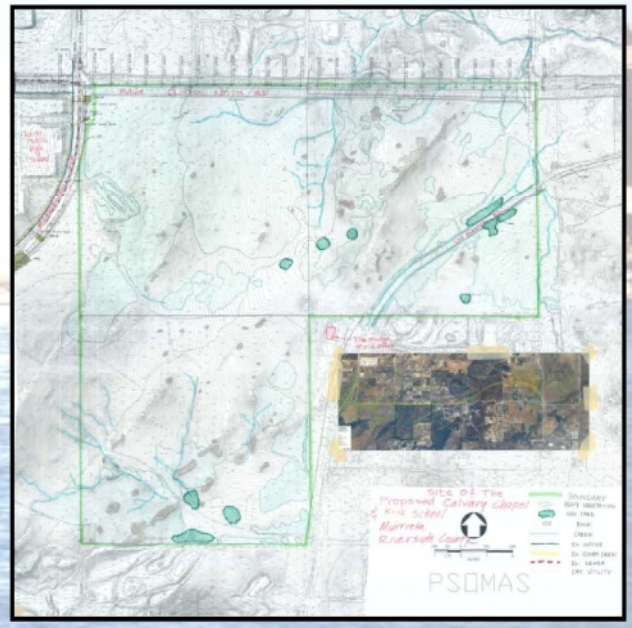
Project Certification LEED New Construction







Calvary Chapel High School Site
Murrieta, California

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Technical Overview of LEED New Construction

Four levels of LEED NC certification

- Certified Level 26 – 32 points
- Silver Level 33 – 38 points
- Gold Level 39 – 51 points
- Platinum Level 52 – 69 points





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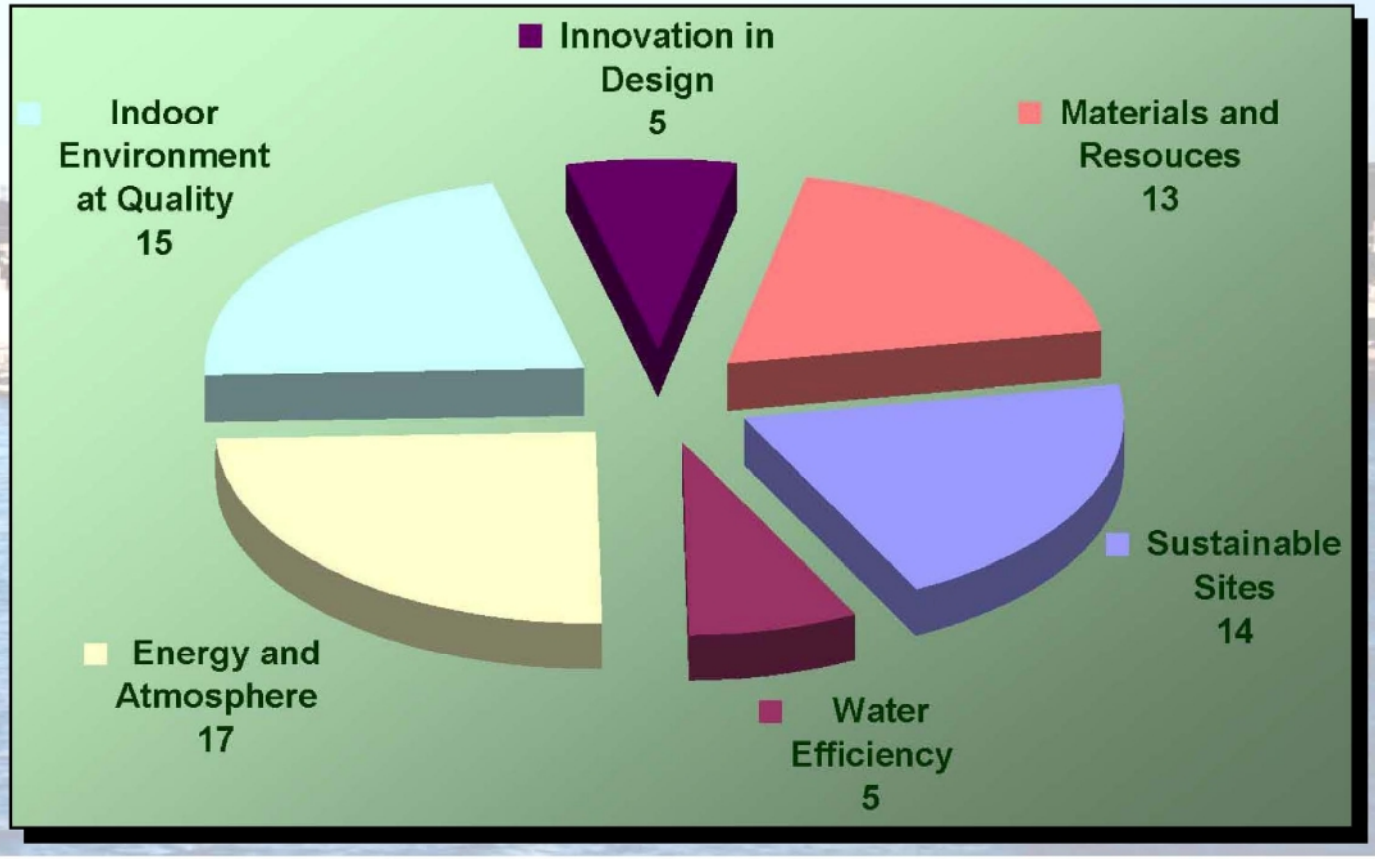
LEED NC Point Distribution

69 POINTS TOTAL



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LEED NC Project Checklist

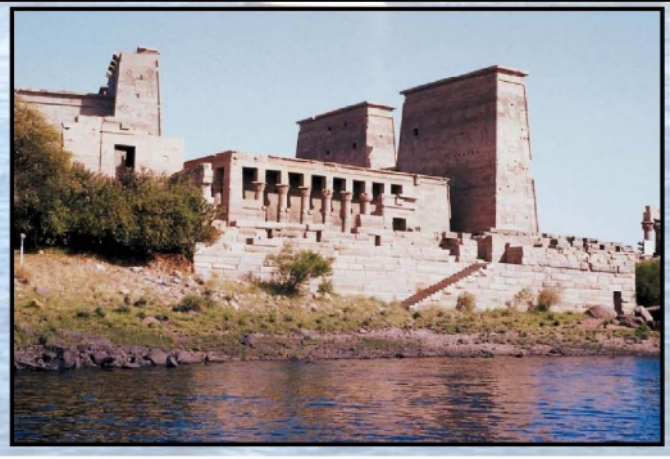
Sustainable Sites — 14 Possible Points

Prereq 1	**Construction Activity Pollution Prevention**	Required
Credit 1	**Site Selection**	1
Credit 2	**Development Density & Community Connectivity**	1
Credit 3	**Brownfield Redevelopment**	1
Credit 4.1	**Alternative Transportation,** Public Transportation Access	1
Credit 4.2	**Alternative Transportation,** Bicycle Storage & Changing Rooms	1
Credit 4.3	**Alternative Transportation,** Low Emitting & Fuel Efficient Vehicles	1
Credit 4.4	**Alternative Transportation,** Parking Capacity	1
Credit 5.1	**Site Development,** Protect or Restore Habitat	1
Credit 5.2	**Site Development,** Maximize Open Space	1
Credit 6.1	**Stormwater Design,** Quantity Control	1
Credit 6.2	**Stormwater Design,** Quality Control	1
Credit 7.1	**Heat Island Effect,** Non-Roof	1
Credit 7.2	**Heat Island Effect,** Roof	1
Credit 8	**Light Pollution Reduction**	1

LEED NC Project Checklist

Water Efficiency — 5 Possible Points

Credit 1.1	**Water Efficient Landscaping**, Reduce by 50%	1
Credit 1.2	**Water Efficient Landscaping,** No Potable Use or No Irrigation	1
Credit 2	**Innovation Wastewater Technologies**	1
Credit 3.1	**Water Use Reduction,** 20% Reduction	1
Credit 3.2	**Water Use Reduction,** 30% Reduction	1



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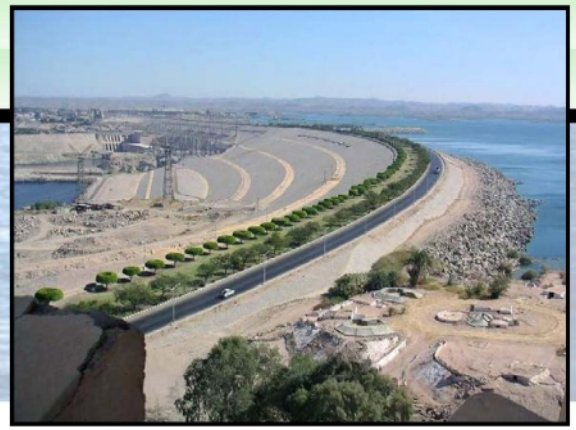
LEED NC Project Checklist

Energy & Atmosphere — 17 Possible Points

Prereq 1	**Fundamental Commissioning of the Building Energy Systems**	Required
Prereq 2	**Minimum Energy Performance**	Required
Prereq 3	**Fundamental Refrigerant Management**	Required
Credit 1	**Optimize Energy Performance**	1-10
Credit 2	**On-Site Renewable Energy**	1-3
Credit 3	**Enhanced Commissioning**	1
Credit 4	**Enhanced Refrigerant Management**	1
Credit 5	**Measurement & Verification**	1
Credit 6	**Green Power**	1





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LEED NC Project Checklist

Materials & Resources — 13 Possible Points

Prereq 1	**Storage & Collection of Recyclables**	Required
Credit 1.1	**Building Reuse,** Maintain 75% of Existing Walls, Floors & Roof	1
Credit 1.2	**Building Reuse,** Maintain 95% of Existing Walls, Floors & Roof	1
Credit 1.3	**Building Reuse,** Maintain 50% of Interior Non-Structural Elements	1
Credit 2.1	Construction Waste Management, Divert 50% from Disposal	1
Credit 2.2	**Construction Waste Management,** Divert 75% from Disposal	1
Credit 3.1	**Materials Reuse,** 5%	1
Credit 3.2	**Materials Reuse,** 10%	1
Credit 4.1	**Recycled Content,** 10% (post-consumer + 1/2 pre-consumer)	1
Credit 4.2	**Recycled Content,** 20% (post-consumer + 1/2 pre-consumer)	1
Credit 5.1	**Regional Materials,** 10% Extracted, Processed & Manufactured Regionally	1
Credit 5.2	**Regional Materials,** 20% Extracted, Processed & Manufactured Regionally	1
Credit 6	**Rapidly Renewable Materials**	1
Credit 7	**Certified Wood**	1

LEED NC Project Checklist

Indoor Environmental Quality 15 Possible Points

Prereq 1	**Minimum IAQ Performance**	Required
Prereq 2	**Environmental Tobacco Smoke (ETS) Control**	Required
Credit 1	**Outdoor Air Delivery Monitoring**	1
Credit 2	**Increased Ventilation**	1
Credit 3.1	**Construction IAQ Management Plan,** During Construction	1
Credit 3.2	**Construction IAQ Management Plan,** Before Occupancy	1
Credit 4.1	**Low-Emitting Materials,** Adhesives & Sealants	1
Credit 4.2	**Low-Emitting Materials,** Paints & Coatings	1
Credit 4.3	**Low-Emitting Materials,** Carpet Systems	1
Credit 4.4	**Low-Emitting Materials,** Composite Wood & Agrifiber Products	1
Credit 5	**Indoor Chemical & Pollutant Source Control**	1
Credit 6.1	**Controllability of Systems,** Lighting	1
Credit 6.2	**Controllability of Systems,** Thermal Comfort	1
Credit 7.1	**Thermal Comfort,** Design	1
Credit 7.2	**Thermal Comfort,** Verification	1
Credit 8.1	**Daylight & Views,** Daylight 75% of Spaces	1
Credit 8.2	**Daylight & Views,** Views for 90% of Spaces	1

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LEED NC Project Checklist

Innovation & Design Process 5 Possible Points

Credit 1.1	**Innovation in Design**	1
Credit 1.2	**Innovation in Design**	1
Credit 1.3	**Innovation in Design**	1
Credit 1.4	**Innovation in Design**	1
Credit 2	**LEED Accredited Professional**	1



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LEED AP and the Test

Credit Interpretation Rulings are or provide all of the following, except:

A. Posted in response to written requests for interpretations of credit requirements
B. Determination of whether a particular strategy can be used to satisfy two different credits at once
C. Precedents for interpretation of LEED credits regarding specific strategies and applications
D. Accessible to USGBC members and registered project teams

Each of the following are available on the BuildingGreen website, except:

A. Environmental Building News
B. LEED Reference Guide
C. A directory of articles, products, and case studies related to LEED
D. Green Spec Directory

The USGBC website provides which of the following information for most LEED Certified projects (select 2):

A. Final LEED scorecard
B. Project statistics, including design and construction costs
C. Comparison with other projects
D. Brief case-study description (in some cases)

What do I need to know to pass the LEED Professional Accreditation Exam?

- **Section 1: Knowledge of LEED Credit Intents and Requirements**
- **Section 2: Coordinate Project and Team to support LEED Process**
- **Section 3: Implement LEED Process**
- **Section 4: Verify, Participate In and Perform Technical Analyses Required for LEED Credits**

For more information on becoming an LEED Accredited Professional visit:
http://usgbc.org/LEED/Accredited_Pros/professionalaccred.asp

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LEED NC Test Study Materials

- LEED NC Reference Guide, Version 2.2 First Edition, Oct. 2005
- LEED Professional Accreditation Candidate Handbook 2, Dec. 2006
- LEED NC Green Building Rating System for New Construction & Major Renovations, Oct. 2005
- Register through: www.USGBC.org
- Sample Test
- Passing Score = 170



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Status of LEED Neighborhood Development

Physical characteristics of our community affects who we are and how we relate to one another and our surroundings.



NBC Universal Studios
Studio City, California



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Overview of LEED Neighborhood Development

- **USGBC Partners with NRDC and Congress for New Urbanism in 2002**
- **Core Committee started in 2004**
- **Purpose – develop rating system that emphasizes:**
  - Revitalization of urban areas
  - Reduction of land consumption
  - Reduction on automobile dependence
  - Promotion of pedestrian activity
  - Improvement in air quality
  - Improvement in stormwater quality
  - Efficient water use

LEED ND Pilot

Neighborhood is broadly defined

(pilot projects range from 0.20 to 12,800 acres)

Staged Certification Process

- **Stage 1 – Optional pre-review**
  - Prior to any approvals
- **Stage 2 – Approved plan**
  - Prior to construction
- **Stage 3 – Completed neighborhood**
  - Post construction



Sahuarita

Psomas LEED ND Pilot Project

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LEED ND Pilot

4 Major Categories of Credits

- **Smart Location and Linkage**
  - How the project site relates to it's surroundings
- **Neighborhood Pattern and Design**
  - Design intent and features of the project
- **Green Construction & Technology**
  - Sustainable construction techniques proposed
- **Innovation and Design Process**

LEED ND Pilot

Smart Location and Linkage

- **6 Prerequisites**
  - Proximity to existing development and infrastructure
  - Conservation of environmental resources
- **11 Credits (30 points)**
  - Brownfield development
  - Available transportation options
  - Proximity to schools and jobs
  - Habitat preservation or restoration





LEED ND Pilot

Smart Location & Linkage		30 Points Possible
Prereq 1	**Smart Location**	Required
Prereq 2	**Proximity to Water and Wastewater Infrastructure**	Required
Prereq 3	**Imperiled Species and Ecological Communities**	Required
Prereq 4	**Wetland and Water Body Conservation**	Required
Prereq 5	**Farmland Conservation**	Required
Prereq 6	**Floodplain Avoidance**	Required
Credit 1	**Brownfield Redevelopment**	2
Credit 2	**High Priority Brownfields Redevelopment**	1
Credit 3	**Preferred Location**	10
Credit 4	**Reduced Automobile Dependence**	8
Credit 5	**Bicycle Network**	1
Credit 6	**Housing and Jobs Proximity**	3
Credit 7	**School Proximity**	1
Credit 8	**Steep Slope Protection**	1
Credit 9	**Site Design for Habitat or Wetlands Conservation**	1
Credit 10	**Restoration of Habitat or Wetlands**	1
Credit 11	**Conservation Management of Habitat or Wetlands**	1

LEED ND Pilot

Neighborhood Pattern and Design

- **2 Prerequisites**
  - Open community and compact design

- **16 Credits (39 points)**
  - Diversity and affordability
  - Reduced parking and walkability
  - Access to vicinity, public and active spaces
  - Outreach
  - Local food production





LEED ND Pilot

Neighborhood Pattern & Design		39 Points Possible
Prereq 1	**Open Community**	Required
Prereq 2	**Compact Development**	Required
Credit 1	**Compact Development**	7
Credit 2	**Diversity of Uses**	4
Credit 3	**Diversity of Housing Types**	3
Credit 4	**Affordable Rental Housing**	2
Credit 5	**Affordable For-Sale Housing**	2
Credit 6	**Reduced Parking Footprint**	2
Credit 7	**Walkable Streets**	8
Credit 8	**Street Network**	2
Credit 9	**Transit Facilities**	1
Credit 10	**Transportation Demand Management**	2
Credit 11	**Access to Surrounding Vicinity**	1
Credit 12	**Access to Public Spaces**	1
Credit 13	**Access to Active Public Spaces**	1
Credit 14	**Universal Accessibility**	1
Credit 15	**Community Outreach and Involvement**	1
Credit 16	**Local Food Production**	1

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LEED ND Pilot

Green Construction and Technology

- **1 Prerequisite**
  - Construction activity pollution prevention
- **20 Credits (31 points)**
  - LEED certified buildings
  - Energy and water efficiency
  - Building reuse
  - Minimize site disturbance
  - Stormwater & wastewater management
  - Heat Island reduction, solar orientation
  - Onsite energy generation
  - Recycled content in infrastructure
  - Waste management activities





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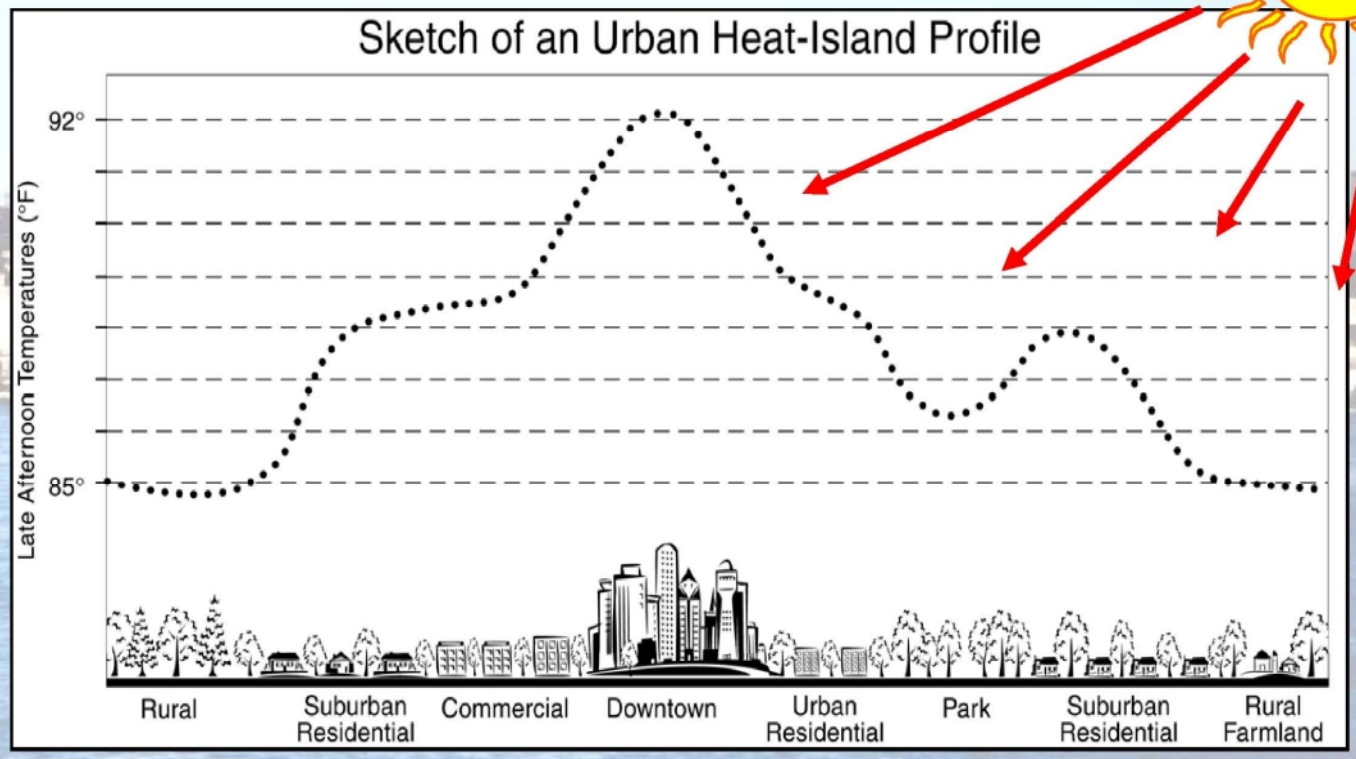
Urban Heat Islands

What parts of LEED do we address:

Sustainable Sites



A heat island is a "reverse oasis"… 2ºF to 10ºF hotter than the countryside.

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Balancing the Natural and Built Environment

LEED ND Pilot

Green Construction & Technology		31 Points Possible
Prereq 1	Construction Activity Pollution Prevention	Required
Credit 1	LEED Certified Green Buildings	3
Credit 2	Energy Efficiency in Buildings	3
Credit 3	Reduced Water Use	3
Credit 4	Building Reuse and Adaptive Reuse	2
Credit 5	Reuse of Historic Buildings	1
Credit 6	Minimize Site Disturbance through Site Design	1
Credit 7	Minimize Site Disturbance during Construction	1
Credit 8	Contaminant Reduction in Brownfields Remediation	1
Credit 9	Stormwater Management	5
Credit 10	Heat Island Reduction	1
Credit 11	Solar Orientation	1
Credit 12	On-Site Energy Generation	1
Credit 13	On-Site Renewable Energy Sources	1
Credit 14	District Heating & Cooling	1
Credit 15	Infrastructure Energy Efficiency	1
Credit 16	Wastewater Management	1
Credit 17	Recycled Content for Infrastructure	1
Credit 18	Construction Waste Management	1
Credit 19	Comprehensive Waste Management	1
Credit 20	Light Pollution Reduction	1

LEED ND Pilot

Innovation and Design Process

- **No prerequisites**
- **2 Credits (6 points)**
  - Innovation and exemplary performance
  - LEED AP involvement







LEED ND Pilot

Innovation & Design Process		6 Points
Credit 1.1	**Innovation in Design**: Provide Specific Title	1
Credit 1.2	**Innovation in Design**: Provide Specific Title	1
Credit 1.3	**Innovation in Design**: Provide Specific Title	1
Credit 1.4	**Innovation in Design**: Provide Specific Title	1
Credit 1.5	**Innovation in Design**: Provide Specific Title	1
Credit 2	**LEED Accredited Professional**	1

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LEED ND Pilot

Total Points and Certifications

Smart Location and Linkage	30 Points
Neighborhood Pattern and Design	39 Points
Green Construction & Technology	31 Points
Innovation and Design Process	6 Points
	106 Points

Certified Silver	40-49 Points
Silver	50-59 Points
Gold	60-69 Points
Platinum	80-106 Points

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LEED ND Pilot

Current program status

- Drafting rating system developed
- Pilot program in progress
  - Approximately 250 projects across the country involved



- Final rating system and full implementation in mid 2009

What the Government Can Do

- California Green Building Standards Code
  - www.bsc.ca.gov/prpsd_stds/default.htm
- Incentive Programs
  - Reduce fees
  - Expedite permitting
  - Allow higher density
- Tax Incentives for Green Technology
- Green Education
- Set an Example

2007 California Green Building Standards Code

TABLE OF CONTENTS

CHAPTER 1 – ADMINISTRATION

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101	General
102	Construction Documents and Installation Verification
103	Building Standards Commission
104	Department of Housing and Community Development
105	Division of the State Architect
106	Office of Statewide Health Planning and Develop

CHAPTER 2 – DEFINITIONS

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201	General
202	Definitions

CHAPTER 3 – GREEN BUILDING

Section	
301	General
302	Mixed Occupancy Buildings

CHAPTER 4 – PLANNING AND DESIGN

Section	
401	General
402	Definitions
403	Site Selection (Reserved)
404	Site Preservation (Reserved)
405	Deconstruction and Reuse of Existing Structures (R
406	Site Development

CHAPTER 5 – ENERGY EFFICIENCY

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501	General
502	Definitions
503	Performance Approach
504	Prescriptive Approach
505	Building Envelope
506	Air Sealing Package
507	HVAC Design, Equipment and Installation
508	Water Heating Design, Equipment and Installation
509	Lighting
510	Appliances
511	Renewable Energy
512	Elevators, Escalators, Controls and Other Equipment
513	Energy Efficient Steel Framing

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602	Definitions
603	Indoor Water Use
604	Outdoor Water Use
605	Recycled (Reclaimed) and Graywater Systems (Reserved)

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701	General
702	Definitions
703	Foundation Systems
704	Efficient Framing Techniques
705	Material Sources
706	Enhanced Durability and Reduced Maintenance
707	Water Resistance and Moisture Management
708	Construction Waste Reduction, Disposal and Recycling
709	Life-cycle Assessment
710	Building Maintenance and Operation

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2007 California Green Building Standards Code

CHAPTER 8 – ENVIRONMENTAL QUALITY

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801	General
802	Definitions
803	Fireplaces
804	Pollutant Control
805	Interior Moisture Control
806	Indoor Air Quality and Exhaust
807	Environmental Comfort
808	Outdoor Air Quality

CHAPTER 9 – REFERENCED STANDARDS

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901	General

CHAPTER 10 – INSTALLER AND THIRD PARTY QUALIFICATIONS

Section	
1001	General
1002	Qualifications
1003	Verifications

CHAPTER 11 – APPLICATION MATRICES AND WORKSHEETS

AM-BSC	California Building Standards Commission
AM-HCD	Department of Housing and Community Development
AM-DSA	Division of the State Architect
AM-OSHPD	Office of Statewide Health Planning and Development
WS 1- BASELINE WATER USE	Baseline Water Use Calculation Table
WS 2- REDUCTION WATER USE	20% Reduction Water Use Calculation Table

APPENDIX A – COMMENTARY OF ADDITIONAL DESIGN CONSIDERATIONS

Section	
A101	General
A201	Definitions
A301	Green Building
A401	Planning and Design
A501	Energy Efficiency
A601	Water Efficiency and Conservation
A701	Material Conservation and Resource Efficiency
A801	Environmental Air Quality

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Balancing the Natural and Built Environment

2007 California Green Building Standards Code

Application Matrix

GREEN BUILDING MEASURE	REQUIRED	VOLUNTARY
PLANNING AND DESIGN		
Site Development (406)		
406.2 A plan is developed and implemented to manage storm water drainage during construction.	2010 CBC[1]	
ENERGY EFFICIENCY		
Performance Approach. (503)		
503.2 Minimum requirements. Low-rise residential buildings shall meet or exceed the minimum standard design required by the California Energy Standards currently in effect.	2010 CBC[1]	
Prescriptive Approach. (504)		
504.6 Minimum requirements. Low-rise residential buildings shall meet or exceed the minimum standard design required by the California Energy Standards currently in effect.	2010 CBC[1]	
AIR SEALING PACKAGE (506)		
506.1 Joints and openings. Joints and other openings at the following locations: 1. Exterior joints around window and door frames, including doors between the house and garage, between interior HVAC closets and unconditioned space, between attic and underfloor access and conditioned space and between wall sole plates, floors, exterior panels and all siding materials. 2. Openings for plumbing, electrical and gas lines in exterior walls and interior wall, ceilings and floors. 3. Openings into the attic. 4. Exhaust ducts from clothes dryers and other exhaust fans shall have a damper. 5. Cuts or notches in exterior wall plates.	2010 CBC[1]	
506.1.1 Other openings. Whole house fan louvers shall close tightly and be insulated or covered to a minimum of R-4.2.		
WATER EFFICIENCY AND CONSERVATION		
Indoor Water Use (603)		
603.2 Indoor water use shall be reduced by 20% using one of the follow methods. 1. Water saving fixtures or flow restrictors shall be used. 2. A 20% reduction in baseline water use shall be demonstrated.	7/01/2011	
603.2.1 Multiple showerheads shall not exceed maximum flow rates.	7/01/2011	
MATERIAL CONSERVATION AND RESOURCE EFFICIENCY		
Construction Waste Reduction, Disposal and Recycling (708)		

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Balancing the Natural and Built Environment

2007 California Green Building Standards Code

Application Matrix cont.

708.3 A minimum of 50% of the construction waste generated at the site is diverted to recycle or salvage. Exception: Alternate waste reduction methods are developed by working with local agencies if diversion or recycle facilities capable of compliance with this item do not exist.	2010 CBC[1]	
Building Maintenance and Operation (710)		
710.2 An operation and maintenance manual shall be provided to the building occupant or owner.	2010 CBC[1]	
INDOOR ENVIRONMENTAL QUALITY		
Pollutant Control (804)		
804.3 Duct openings and other related air distribution component openings shall be covered.	2010 CBC[1]	
804.4.1 Adhesives shall be No- or Low-VOC.	2010 CBC[1]	
804.4.2 Paints, stains and other coatings shall be No- or Low-VOC		
804.4.3 Carpet and carpet systems shall be Low-VOC.		
804.4.4 Particleboard, medium density fiberboard (MDF), and ply used in interior finish systems shall comply with low formaldehyde emission standards.		
Interior Moisture Control (805)		
805.2 Vapor retarder and capillary break is installed at slab on grade foundations.	2010 CBC[1]	
805.3 Moisture content of wood used in wall and floor framing is checked before enclosure.	2010 CBC[1]	
Air Quality and Exhaust (806)		
806.3 Exhaust fans which terminate outside the building are provided in every bathroom.	2010 CBC[1]	
806.4 MERV 6, or higher filters are installed on central air and heating systems.	2010 CBC[1]	

[1] Unless specified otherwise, this measure shall become effective on the effective date of the 2010 California Building Code.

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Balancing the Natural and Built Environment



Triple Bottom Line Performance

	ECONOMIC	ENVIRONMENTAL	SOCIAL
GOALS	$ Higher RATE OF RETURN than conventional non-green development	Minimize demand on natural resources Reduce carbon emissions	☺ Create a pedestrian friendly, healthy and productive workspace ☺ Benefit surrounding communities
TOOLS	$ Value-based proforma $ TPG Financial Filter process $ Government incentives $ Experienced team $ Life cycle assessment $ Green Lease	Sustainability Consultant LEED Certification Education & Green management training Energy Model & Commissioning	☺ Improving air quality & air filtration and ventilation ☺ Access to daylight & views ☺ Improving landscape, sidewalks
RESULTS	$ Top Tier Rental Rate $ Faster lease-up $ Higher Quality Tenants $ Lower Operating Expenses $ Lower Vacancy	Efficient use of natural resources Lower Greenhouse gas emissions	☺ Direct improvements in worker productivity ☺ Decrease employee sickness & absenteeism ☺ Safer, friendlier and more effective pedestrian environment

Balancing the Natural and Built Environment

Sustainable Development is Planning for the Future

- American Society of Heating, Refrigerating and Air-Conditioning Engineers
  - www.ashrae.org
- US Green Building Council
  - www.usgbc.org
- Sierra Club
  - www.sierraclub.com
- Greenpeace
  - www.greenpeace.org
- Global Environmental Management Initiative
  - www.gemi.org
- US Environmental Protection Agency
  - www.epa.gov www.sustainablesites.org
- Sam Ali, PE LEED AP
  - sali@psomas.com



Audubon Center at DEBS Park
(Los Angeles)
LEED PLATINUM
CERTIFIED

PSOMAS

Balancing the Natural and Built Environment

- Sustainability and Global Warming
- Sustainability takes collaborative effort and integrated process
- Cost of LEED Certified Projects
- Engineer Participation in Site Planning
- Greenwashing – a conventional project dressed up with slick nature – oriented marketing
- Education is a must to achieve sustainability



Environmental Nature Center
University of California Irvine Tour


"We are at the tipping point for Sustainable Design. Engineers who are not yet on board with Green Design will be left out since the public is demanding Green Design not only to protect the Environment and Conserve Resources, but also to create a healthier place to live and work."



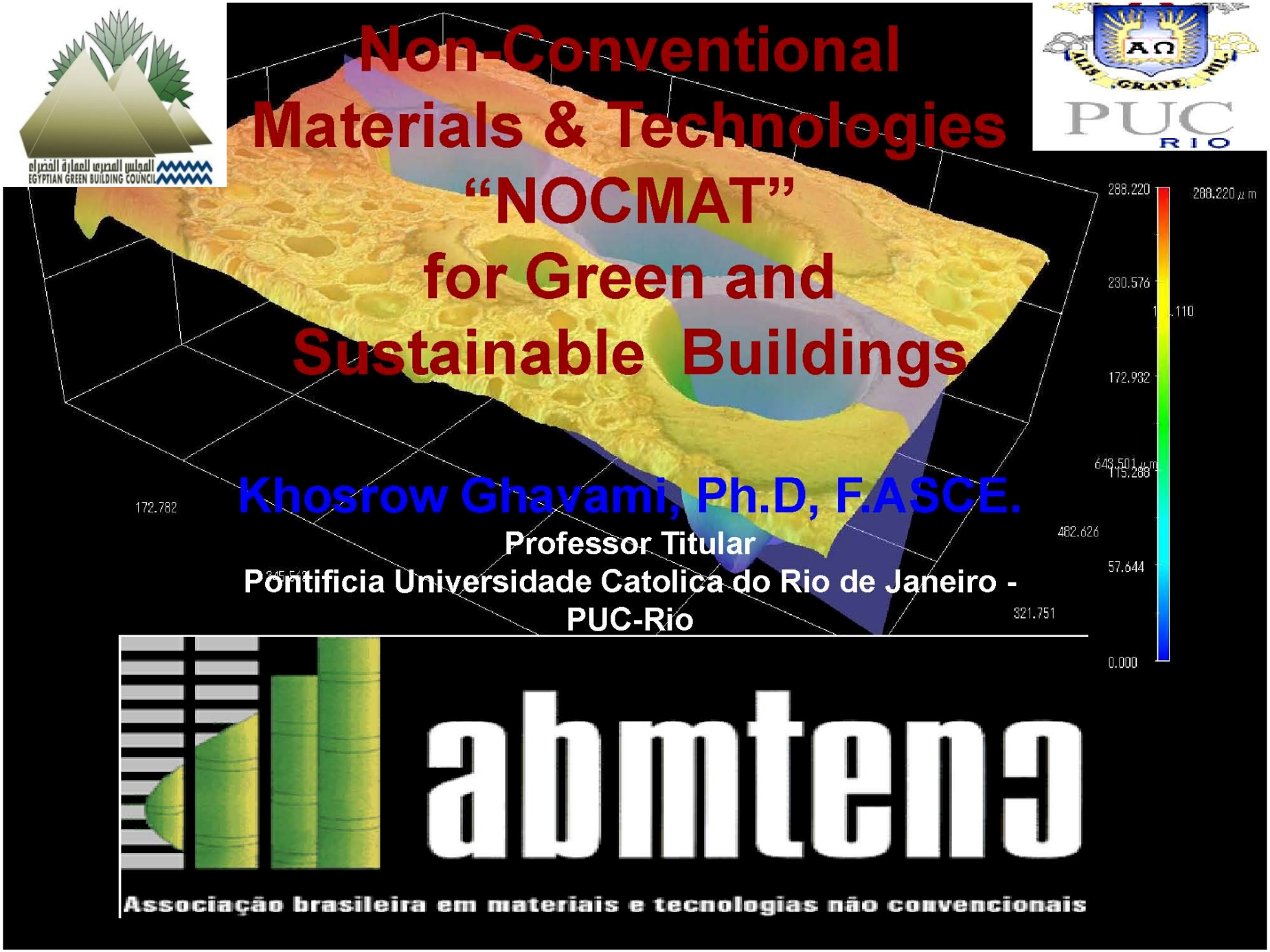
“We shape our buildings and afterwards, our buildings shape us.”

--Winston Churchill--

PSOMAS

Balancing the Natural and Built Environment

Non-Conventional Materials & Technologies "NOCMAT" for Green and Sustainable Buildings



Khosrow Ghavami, Ph.D, F.ASCE.

Professor Titular

Pontificia Universidade Catolica do Rio de Janeiro - PUC-Rio

abmtenc

Associação brasileira em materiais e tecnologias não convencionais

Introduction

- **Post-Industrial era**
  - dictated by cost established by industry and production process;
  - since the beginning of the 20th century, Portland cement and steel become the most used construction materials;
  - more recently new materials such as advanced composites made by high performance polymers (Boron, Nylon, Polyester, Kevlar, carbon fibers, etc.) and new metal alloys are introduced.

Road to Energy Efficiet and Enviromentally Friendly Affordable Construction System

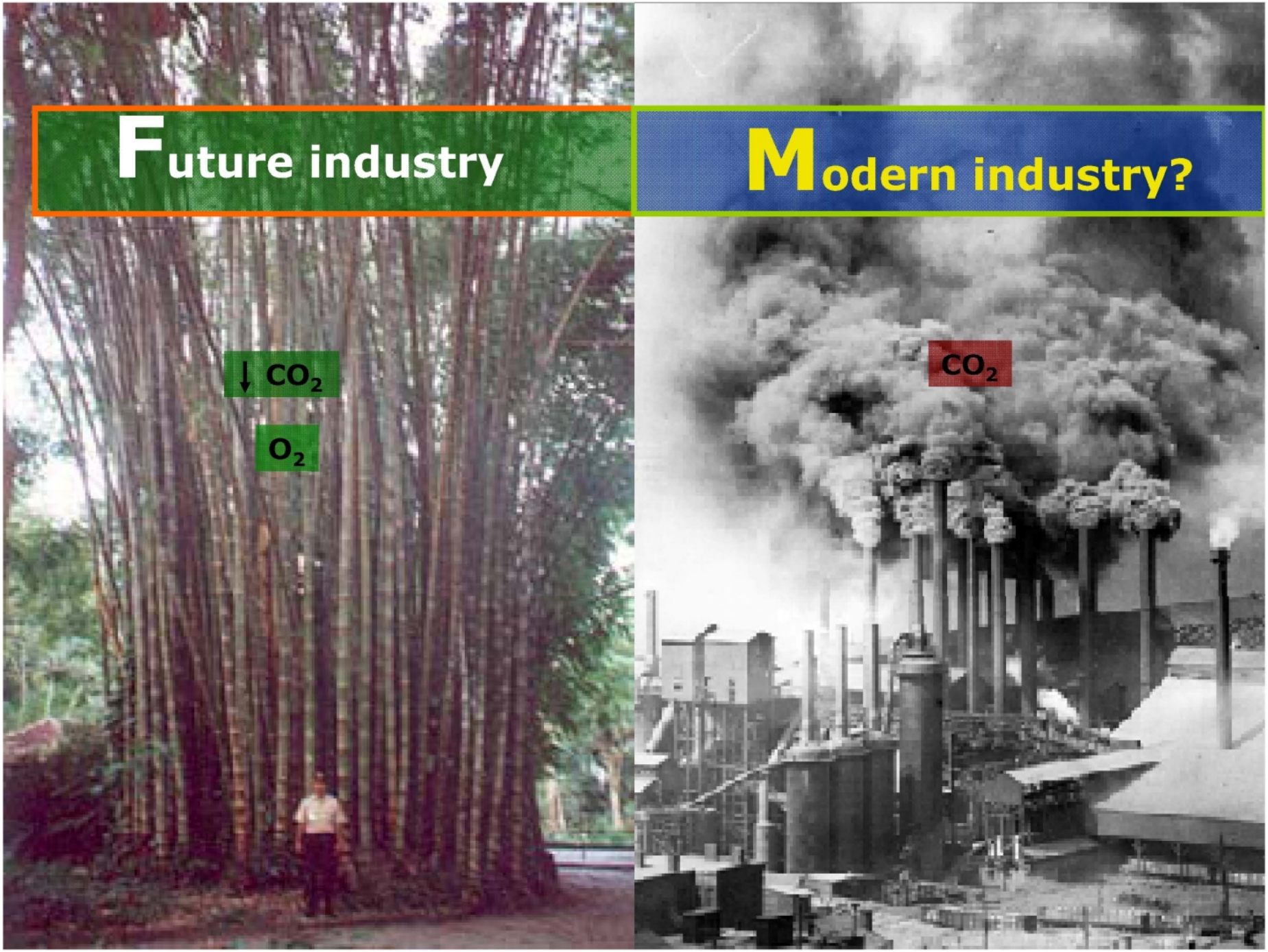
It is hoped that the result of the research at PUC-Rio since 1979 concerning real Sustainable Materials and Technologies could contribute to the:

Kickoff meeting & Round Table Egyptian Building Council (EGBC) Initiation

Cairo-Egypt, January 25-27

2009




Future industry
↓ CO_2
O_2
Modern industry?
CO_2

Bamboo Culm





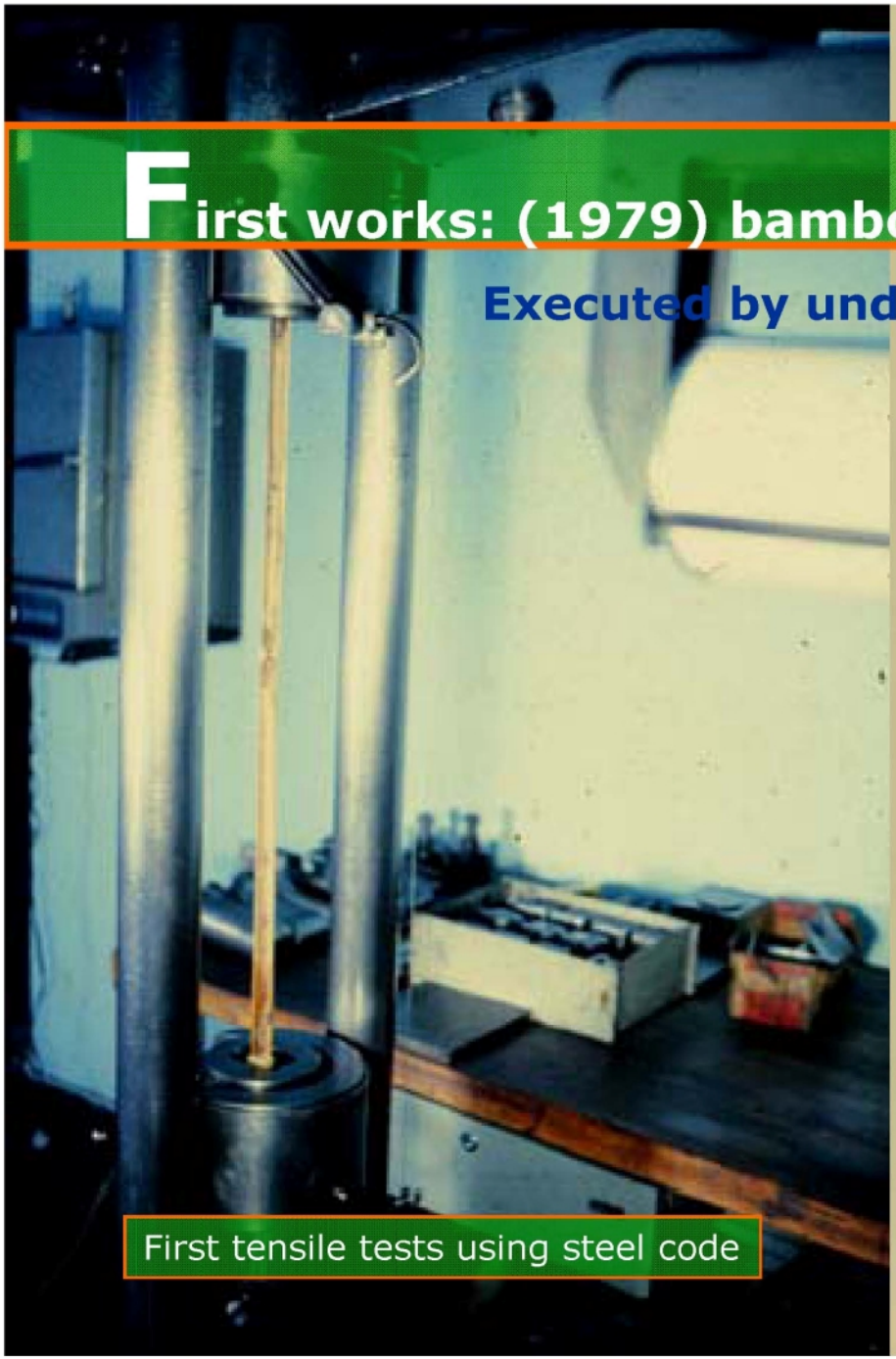




Bambusa Dendrocalamus Guadua

First works: (1979) bamboo as concrete reinforcement

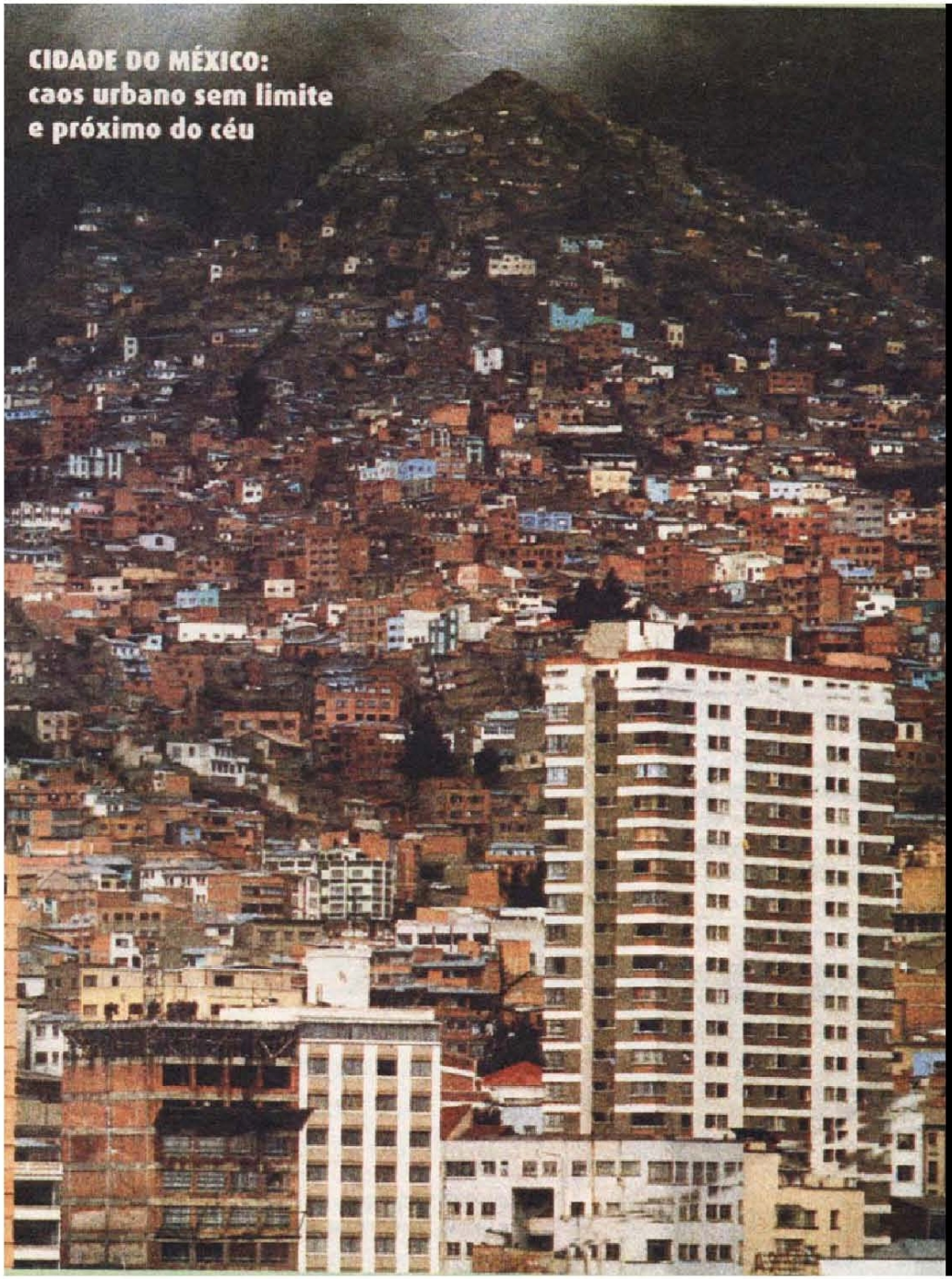
Executed by undergraduate students.



First tensile tests using steel code



Bamboo strips reinforcing concrete



Popular housing Development in big urbane areas like

Mexico City

Similar to the Rocinha-S.Conrado

Rio de Janeiro

Popular housing Development in big urbane areas like

City of Manaus, Capital of Amazon



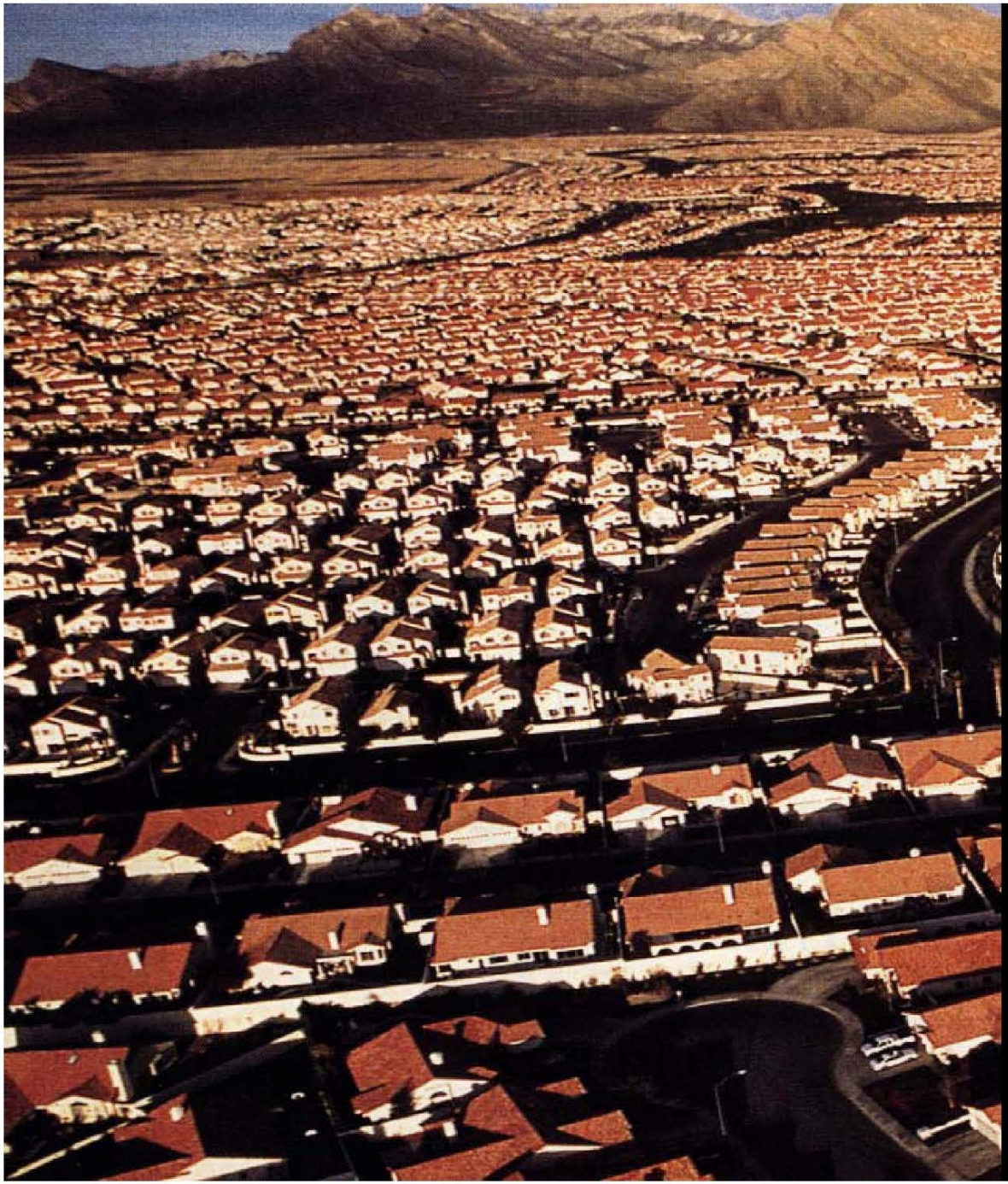
Favelas in the town of Manaus - Amazonas



Center of Manaus, Capital of Amazonas



Amazon Forest



Low cost housing in Las Vegas, USA.

(1999 Journal of civil Engineering)

Streets and Houses in the town of Bam Persia (Iran)
Semi desert Area

Using soil fibers and adapting achitecture of the town according to existing nature



Streets and Houses in the town of Bam Persia(Iran)
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Streets and Houses in the town of Bam Persia (Iran)
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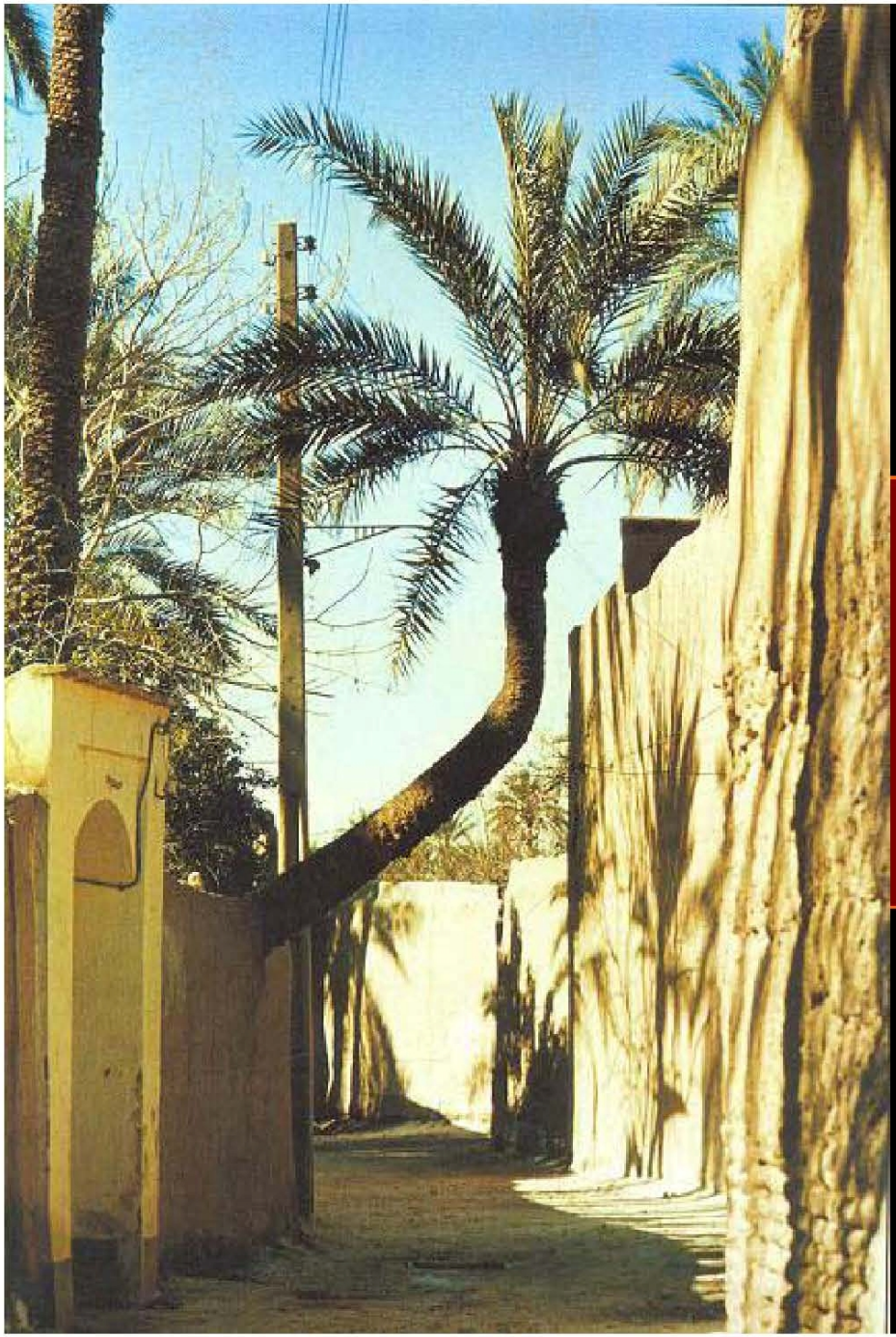


Streets and Houses in the town Tabas in Persia(Iran)

Semi desert Area

Using soil fibers and adapting achitecture of the town according to existing nature

Old Persian Houses in the town Tabas inPersia(Iran)

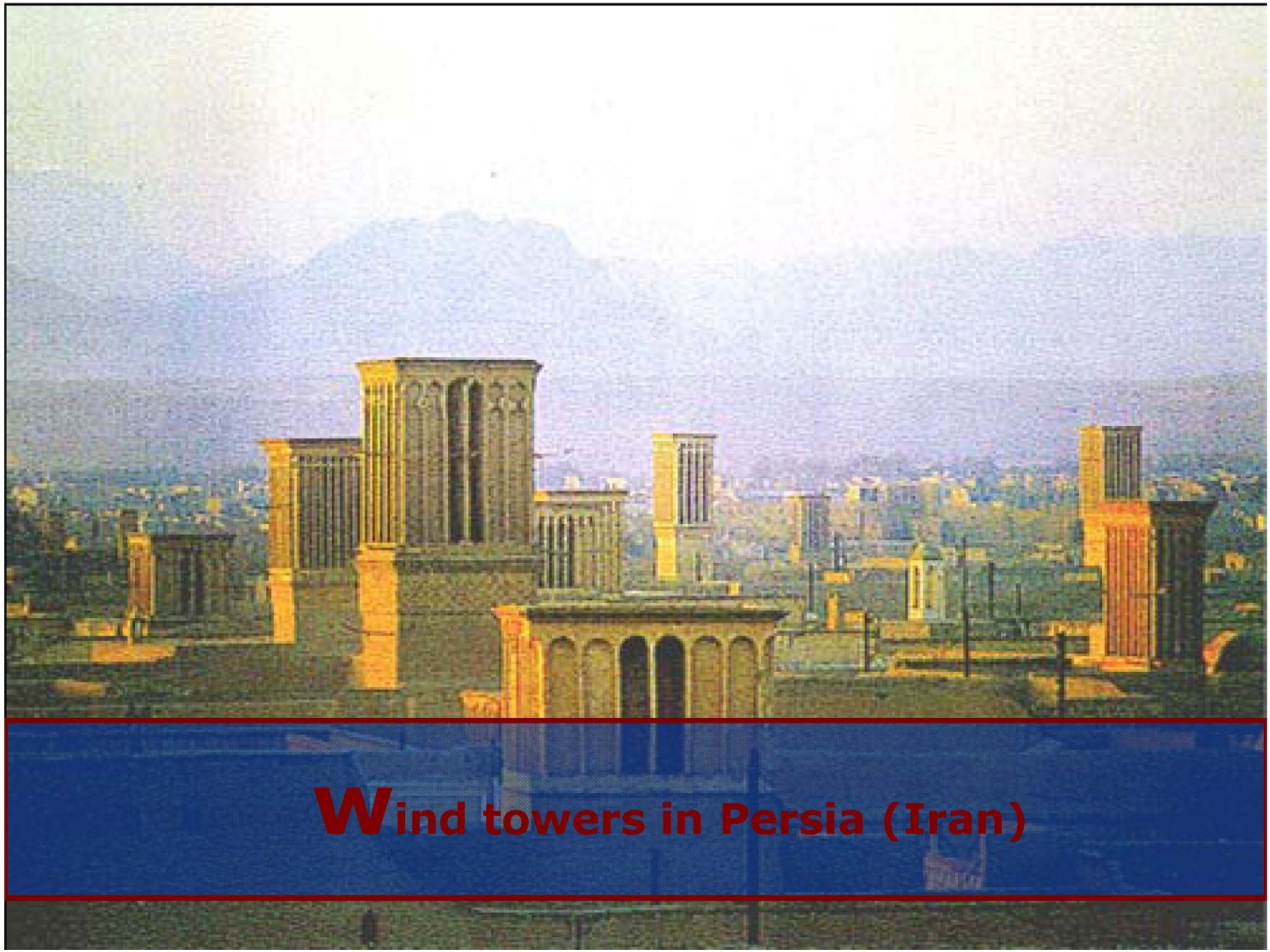
Semi Desert Area

Using Soil fibers



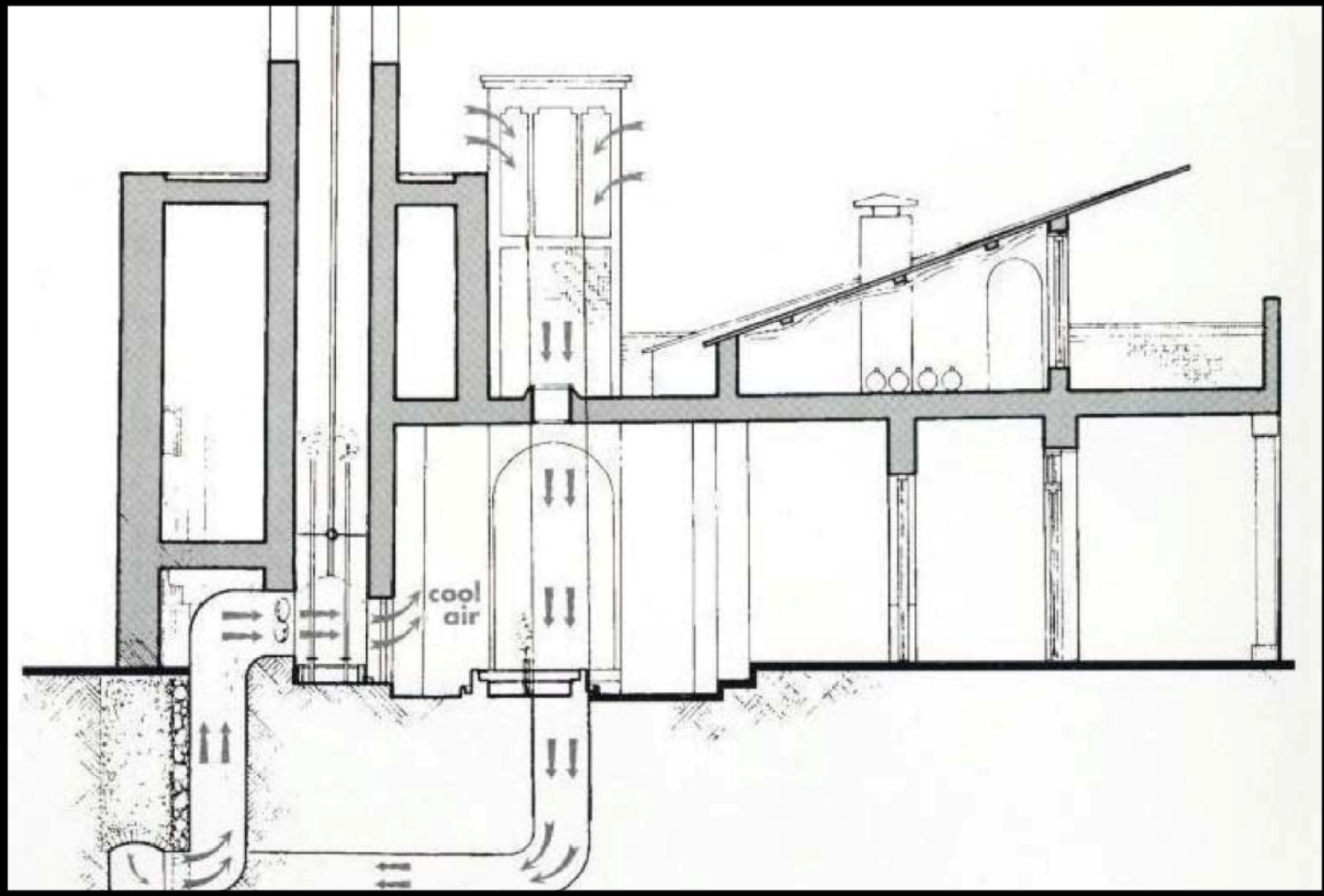


Composite soil construction of old bazaar in Persia (Iran)


Wind towers in Persia (Iran)

Using the existing natural energy for cooling the internal air and heating the water

Natural Air Conditioning in semi regions in Iran (Persia)

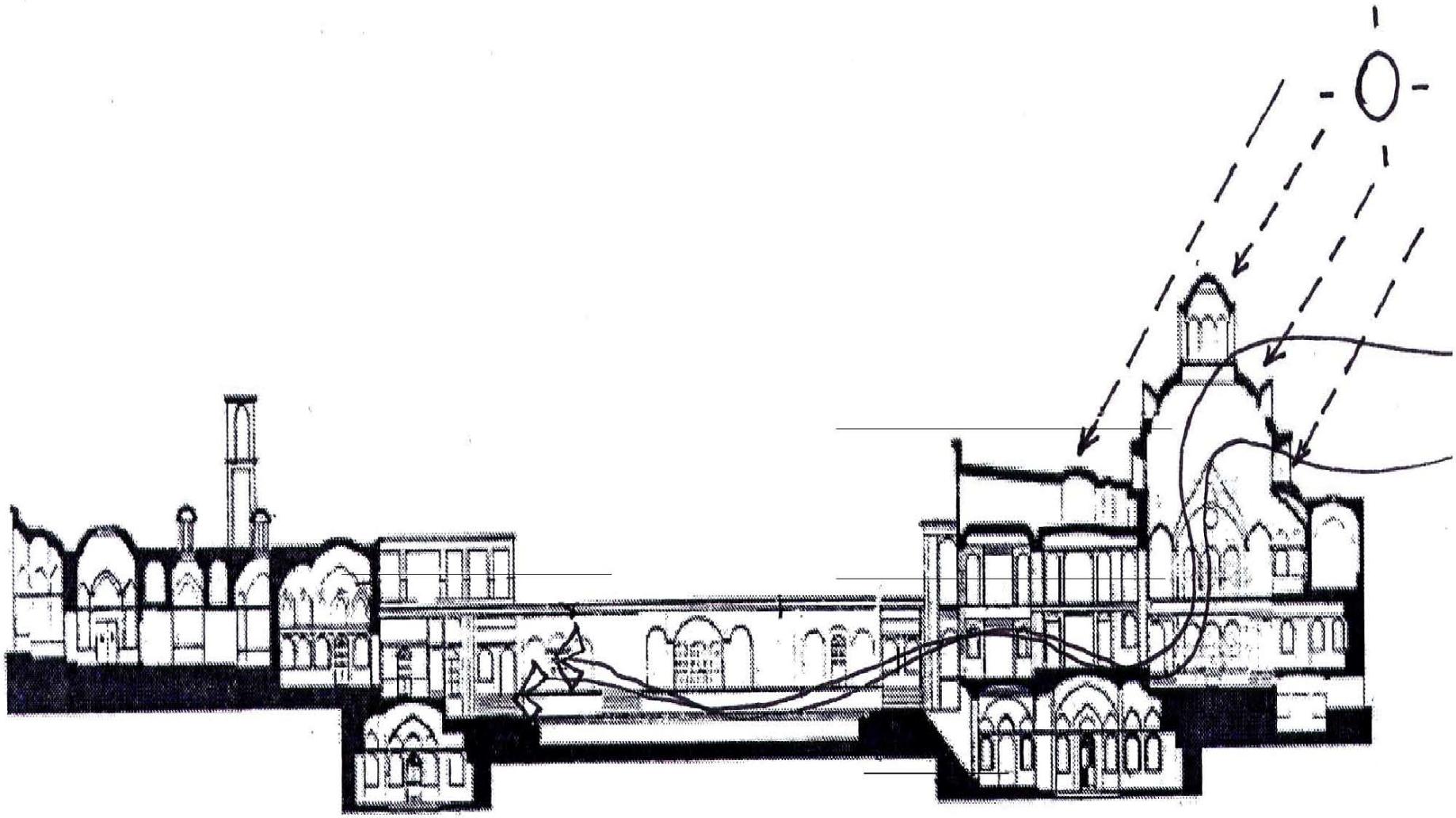


Application of engineering materials through time

Pre-Industrial era



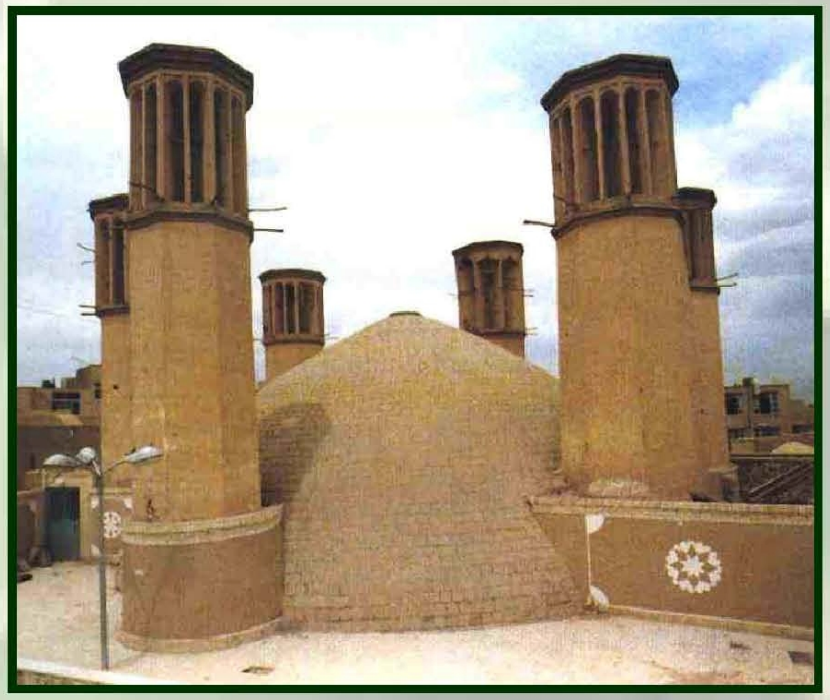
Composite soil construction of old building in Persia (Iran)

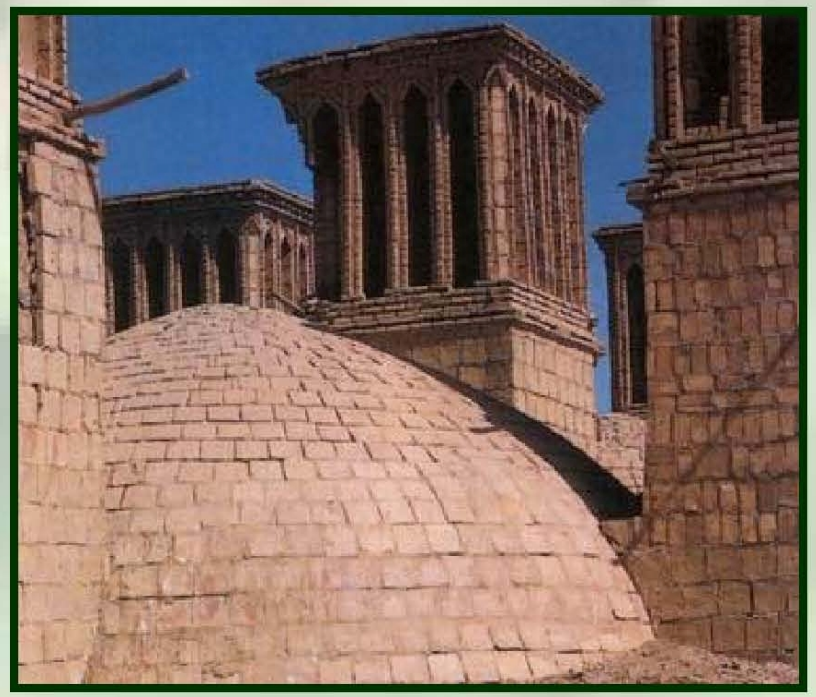


Sustainable building in Borojerdies Iran (Persia).

Application of engineering materials through time

Pre-Industrial era

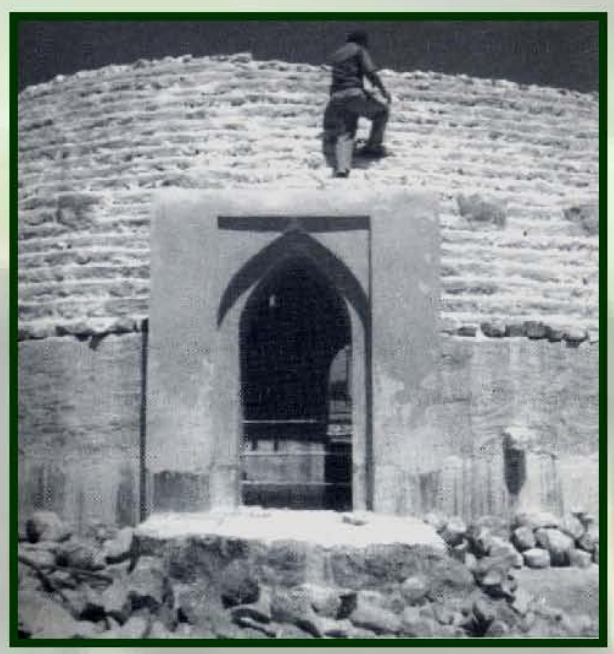




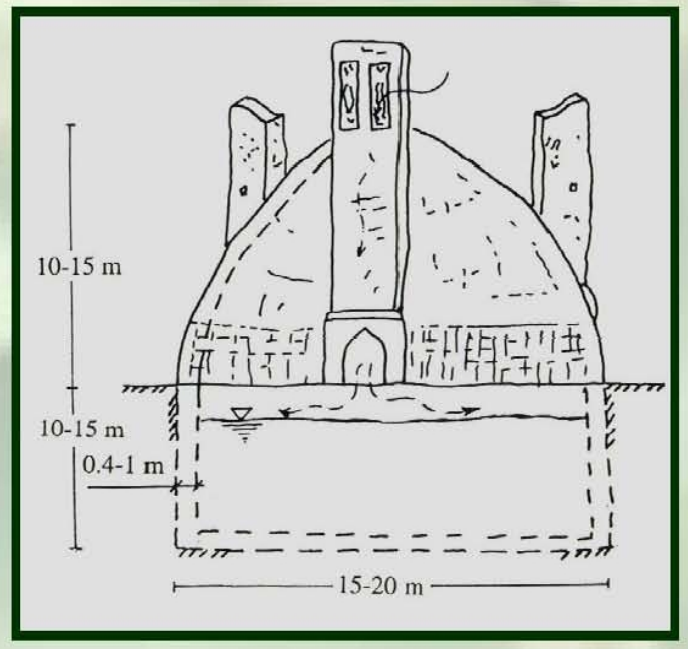
Composite soil construction of old building in Persia (Iran)

Application of engineering materials through time

Pre-Industrial era



Cistern With wind towers, Laristan.



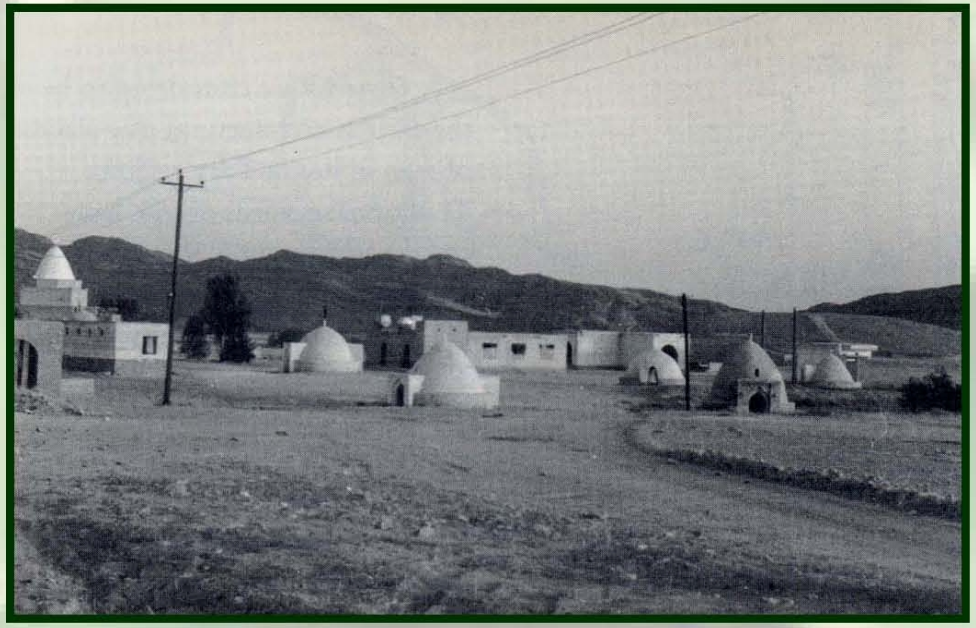
Cistern With wind towers, Yazd, Central Iran

Composite soil construction of old building in Persia (Iran)

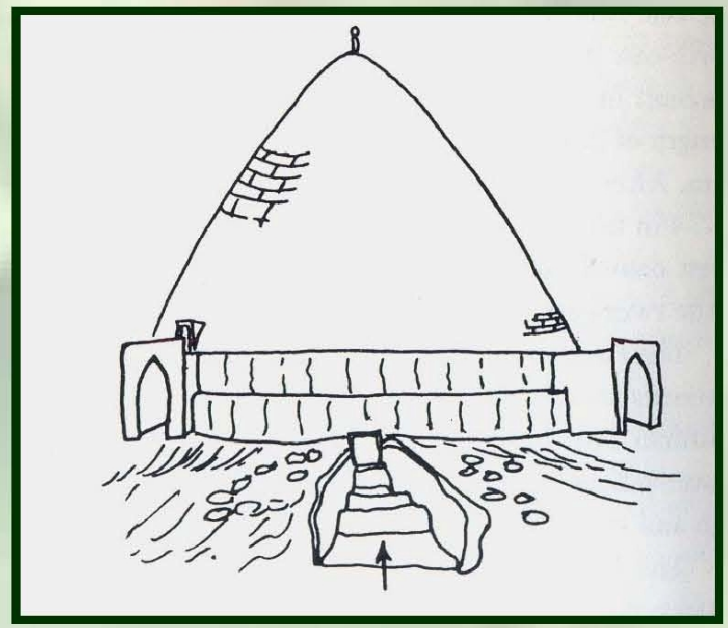
Reference Historical Building of Iran:
Their Architecture and Structure. M.M.Hajazi

Application of engineering materials through time

Pre-Industrial era



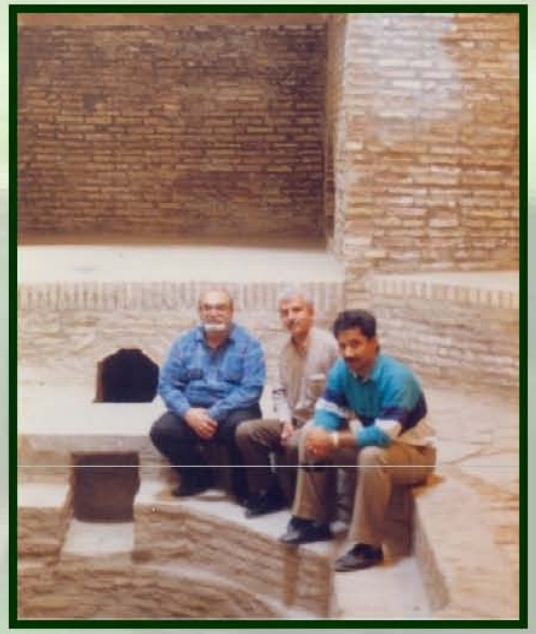
A group of cisterns, Laristan, Southern Iran



The settling basin of a cistern, Laristan, Souther Iran

Application of engineering materials through time

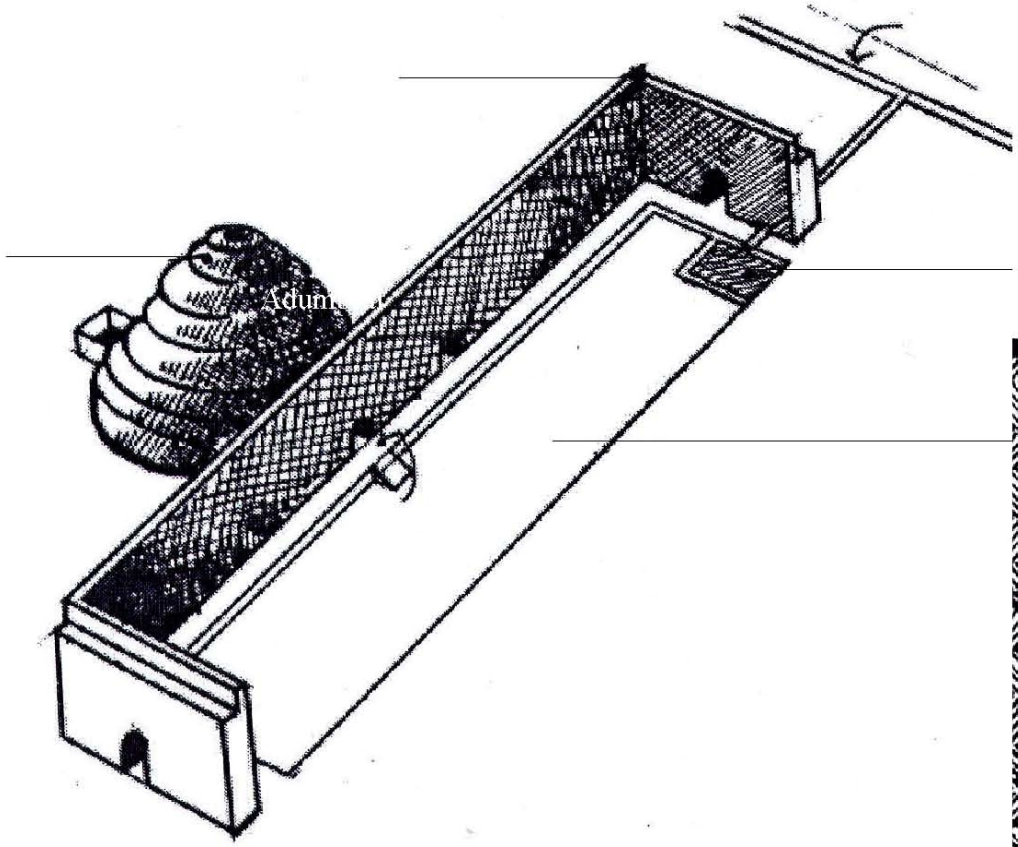
Pre-Industrial era



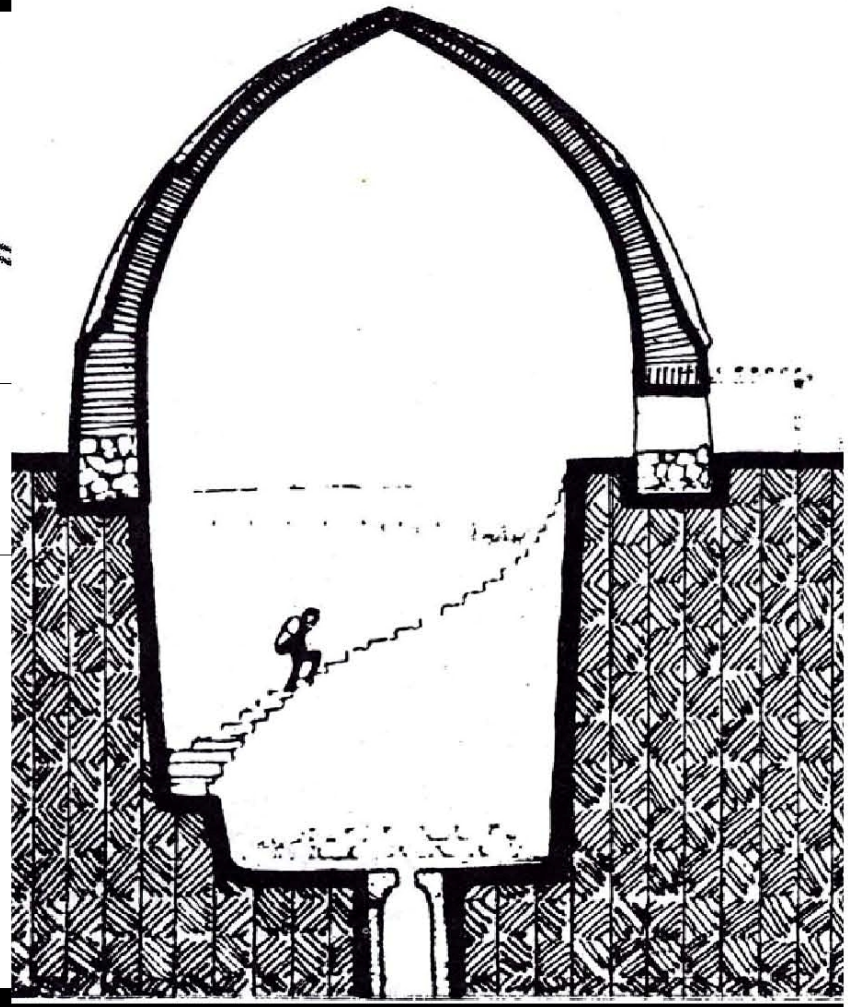
Production of the ice



The manual methods of production of ice during winter



Yakh-Chaal Sustainable Ice Factory



Middle section of Yakh-Chaal



Pigeon tower for the production of fertilize in Iran (Persia) before the industrialization.



Pigeon tower for the production of fertilize in Iran (Persia) before the industrialization.


Pigeon tower for the production of fertilize in Iran
(Persia) before the industrialization.

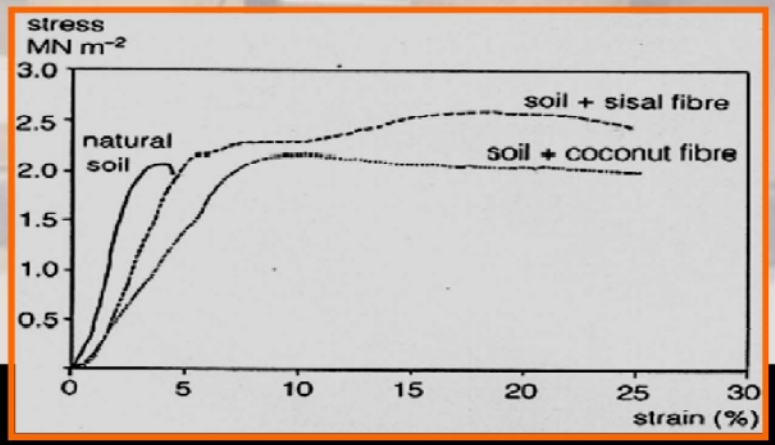
Soil Reinforced with Vegetable fibers

Executed at UFPB

Soil blocks after testing



Compression behavior



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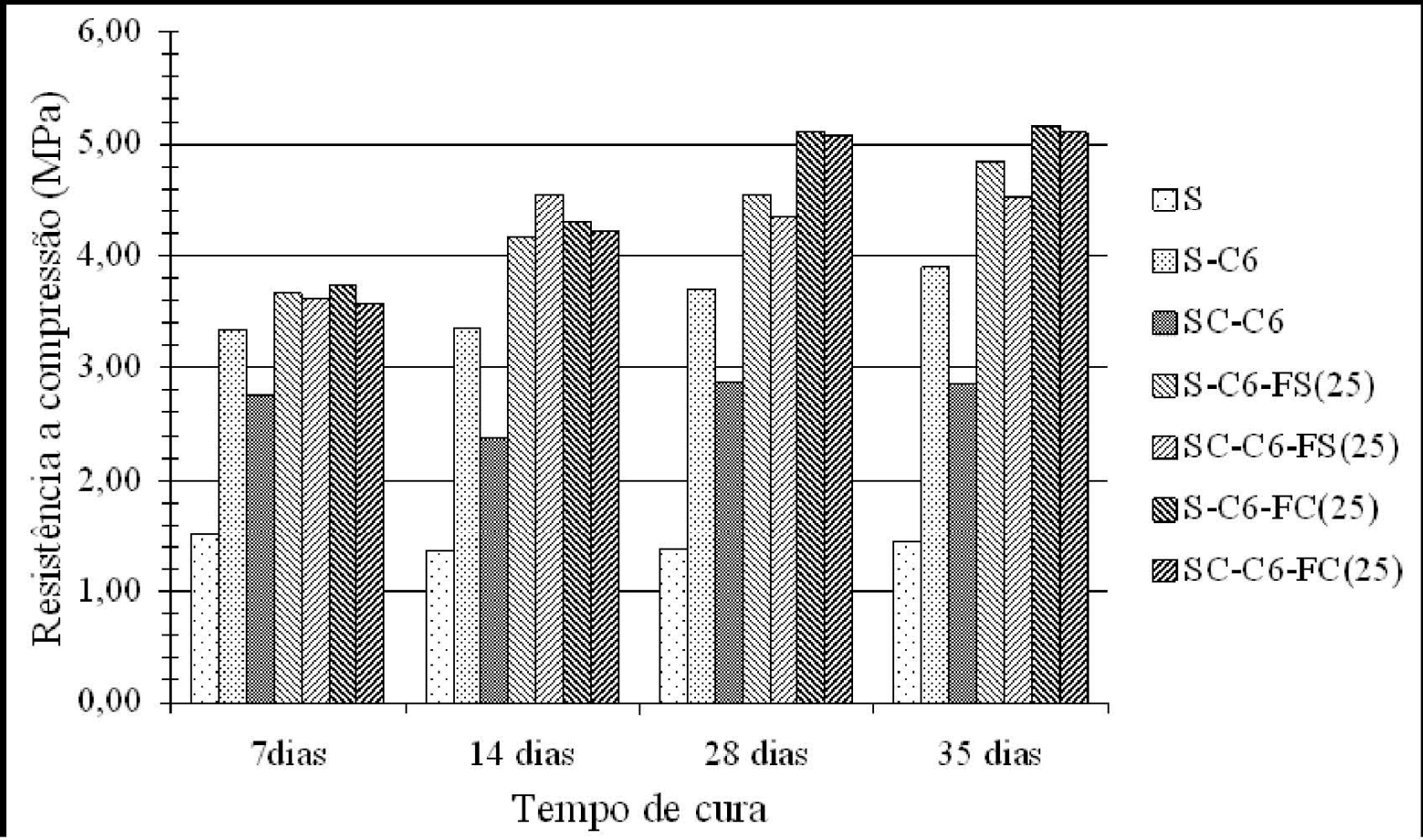
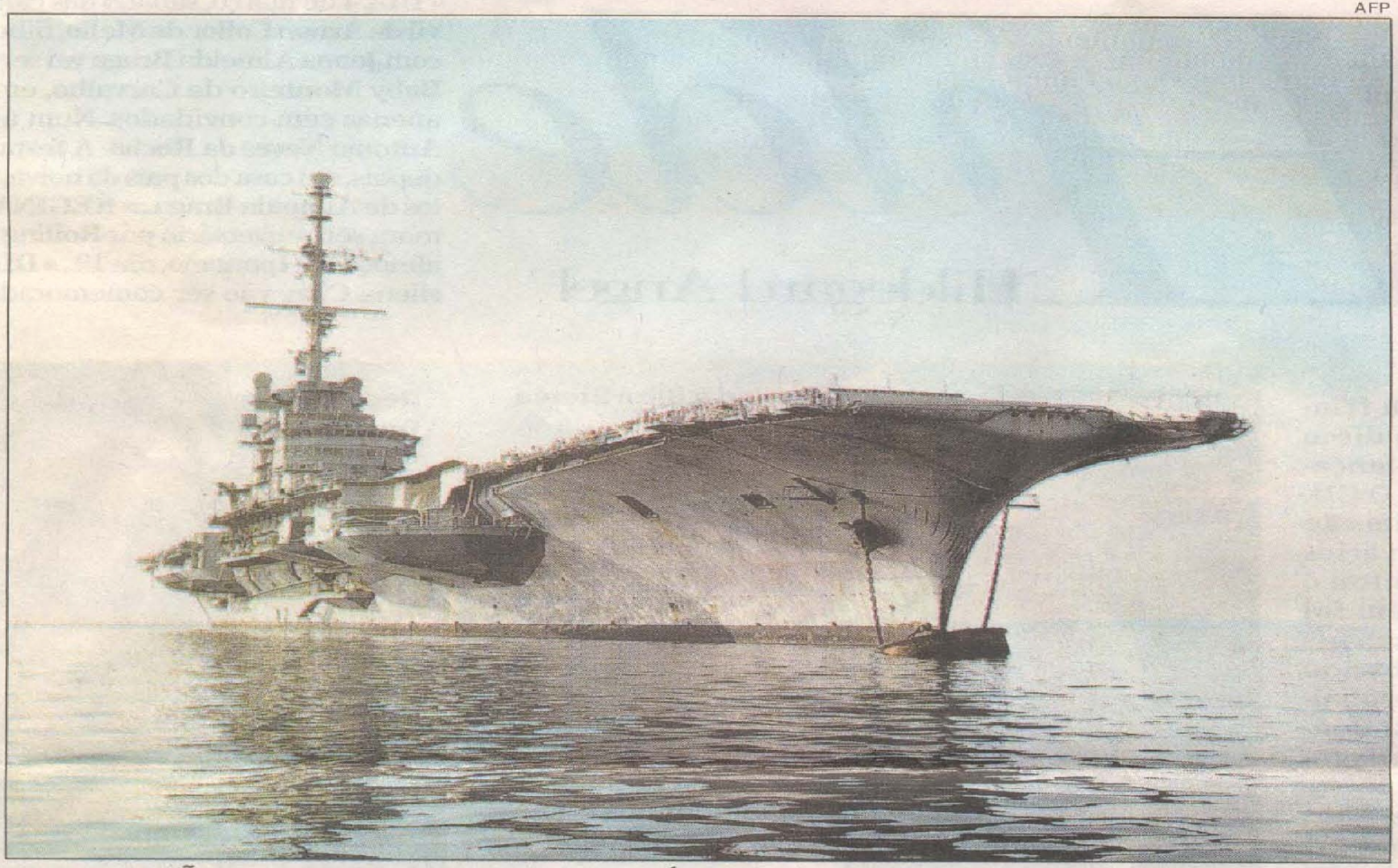

6,00
5,00
4,00
3,00
2,00
1,00
0,00
Resistência a compressão (MPa)
7dias
14 dias
28 dias
35 dias
Tempo de cura
S
S-C6
SC-C6
S-C6-FS(25)
SC-C6-FS(25)
S-C6-FC(25)
SC-C6-FC(25)

AFP

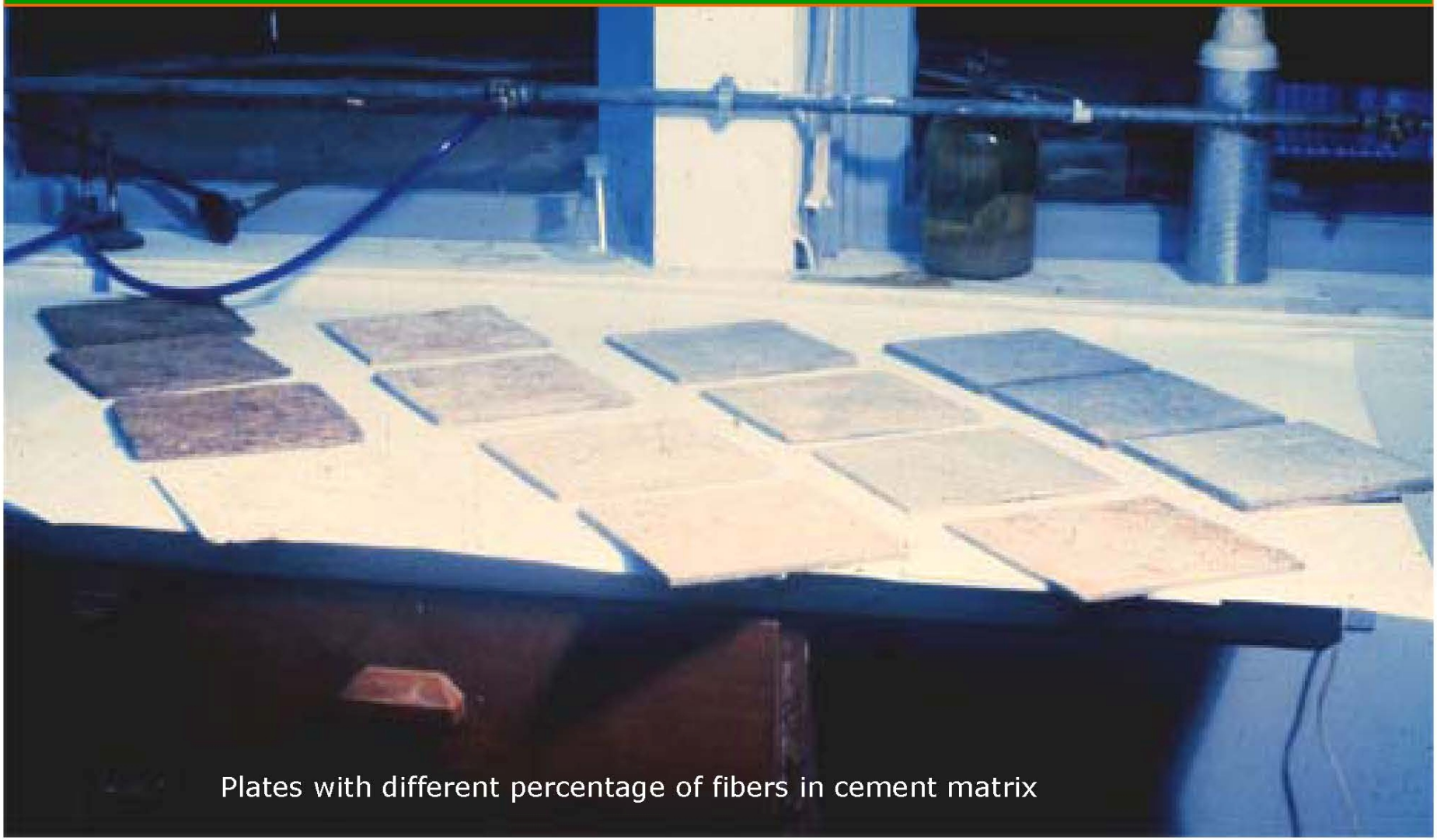


EMBARCAÇÃO revestida de amianto iria para a Índia para ser desmontado. Ecologistas protestaram

Crise flutuante retorna

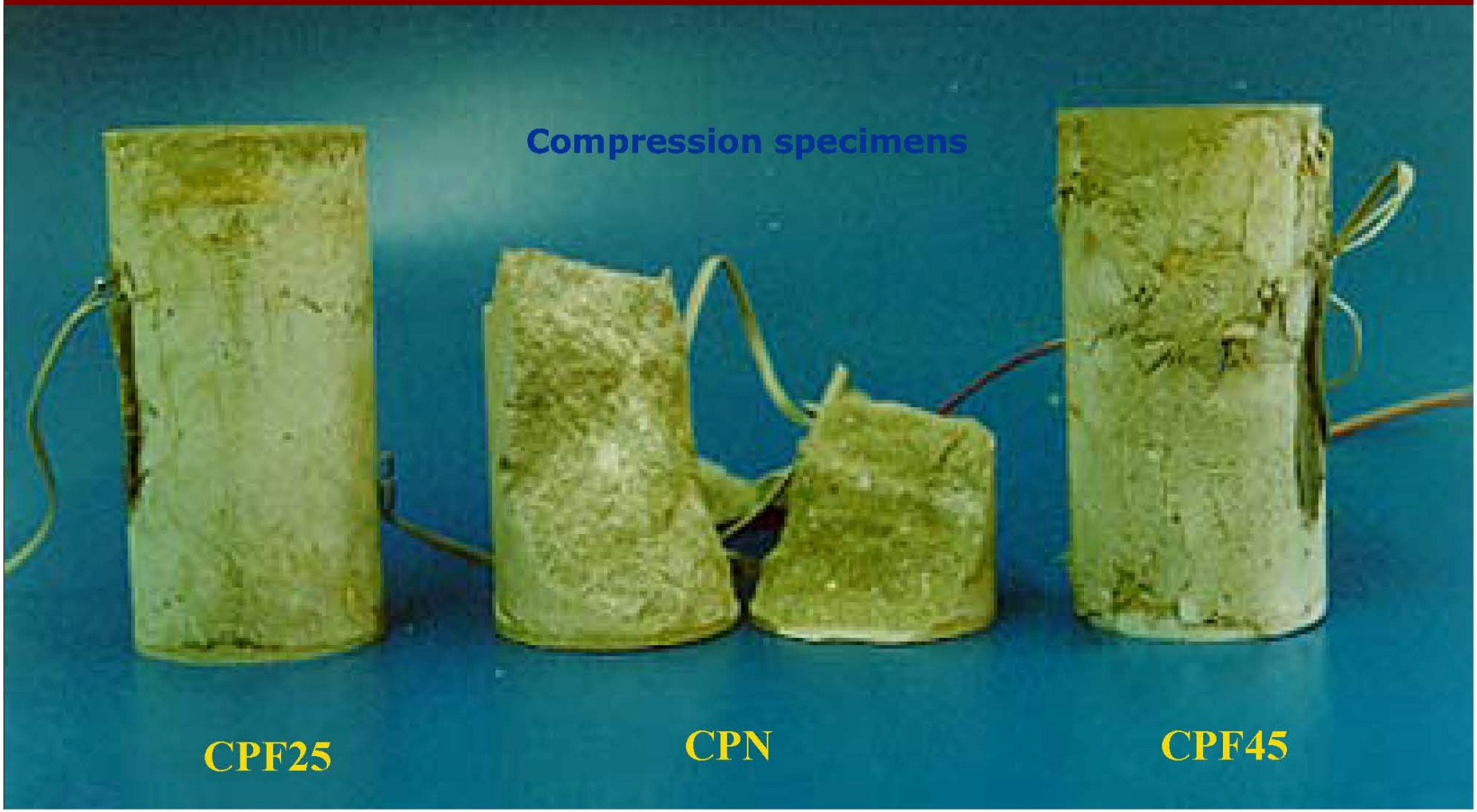
First works (1979)

First efforts to find an alternative material for asbestos-cement: availability of coconut fibers to be used as reinforcement of cement-based composites



Plates with different percentage of fibers in cement matrix

Materiais Compositos



Sisal fibers processing: low degree of industrialization







Study and modification of tropical vegetable fibers

Origin, Morphology, Composition, Structure, Treatments, properties

In colaboration whit Marie –Ange ARSENE, Ketty BILBA

Species studied
Banana *(Musa)*







Study and modification of tropical vegetable fibers

Origin, Morphology, Composition, Structure, Treatments, properties

In colaboration whit Marie –Ange ARSENE, Ketty BILBA

Species studied

Coconut *(Cocos Nucifera)*







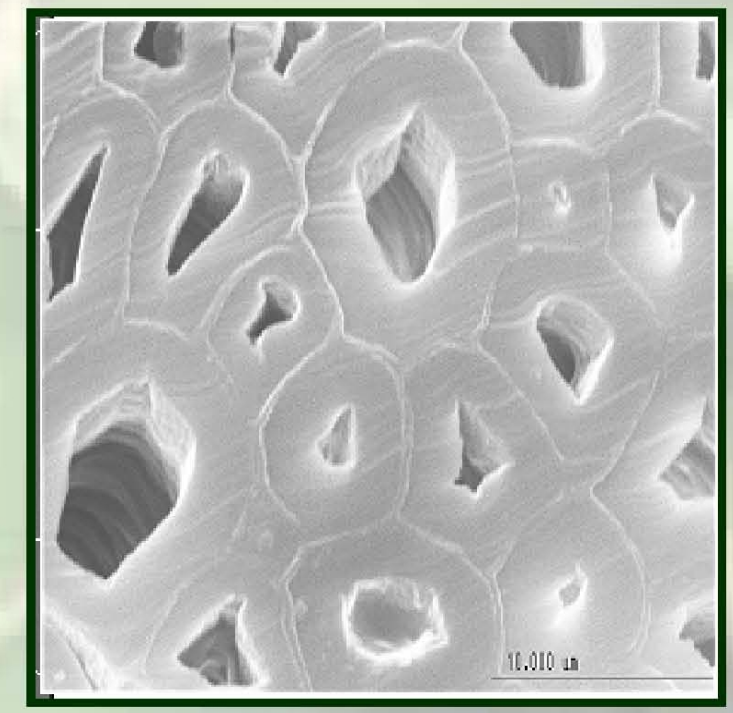
Coir



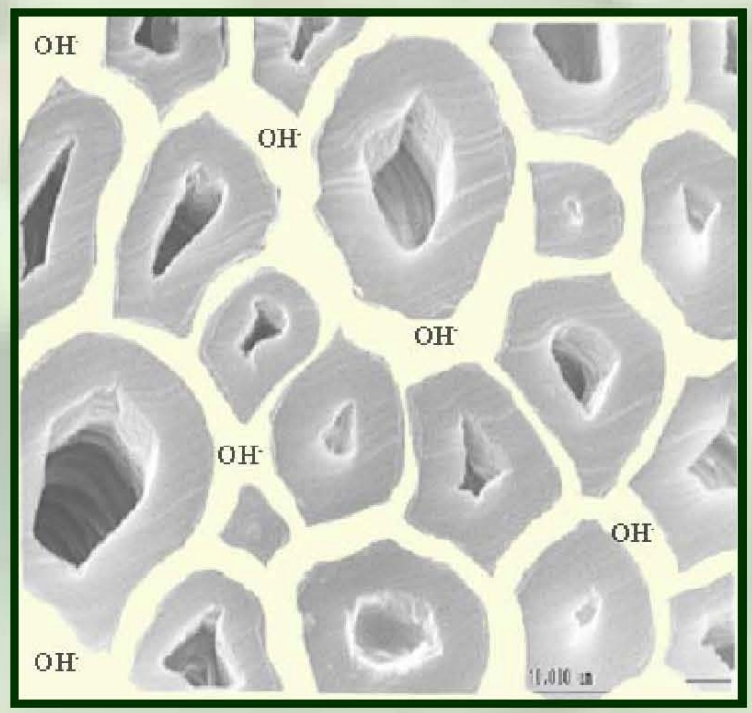
Sheath

Study of the durability of fibers in cimentitious matrix

Gram



Sisal fiber



Sisal fibre after exposure to the alkaline water present in concrete pores: possible dissolution of the middle lamellae ?

post-INDUSTRIAL ERA



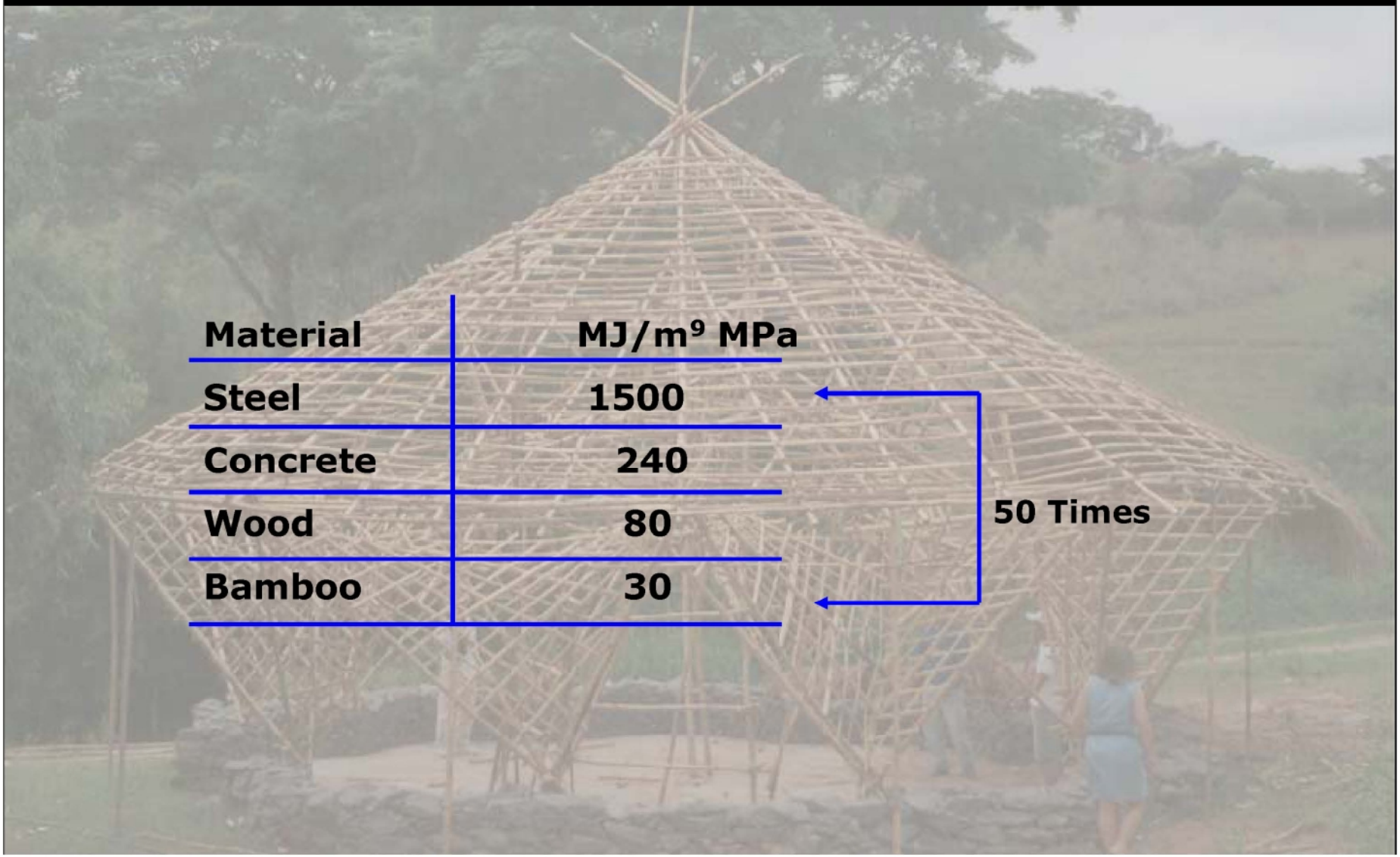
Bamboo Forest - Fernando de Noronha – PE Brasil

Why the use of plants in engineering

Social-economics motivations

- production of low cost construction materials;
- substitution of whole or part of polluting materials by environmental friendly ones;
- new design possibilities using non-conventional materials and techniques (e.g. vegetable fibers composites, bamboo as structural element);
- use of local materials and labor;
- protection of non-renewable energy resources (with the adoption of low energy consumption materials and techniques).

Energy in [MJ] for the production of 1 m^3 per unit strength [MPa]



Material	MJ/m^9 MPa
Steel	1500
Concrete	240
Wood	80
Bamboo	30

50 Times

Why the use of plants in engineering

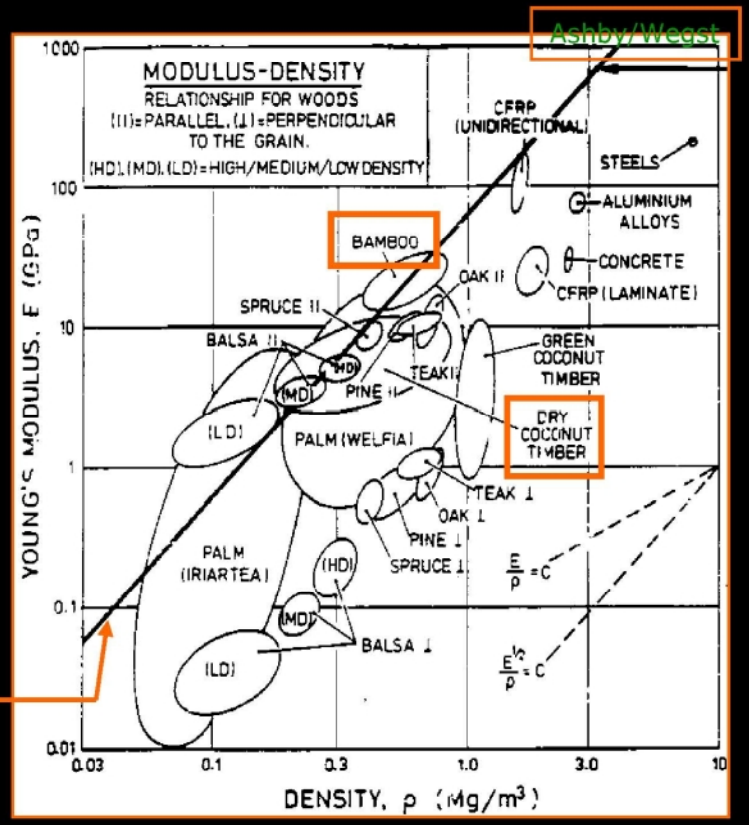
Technical motivations

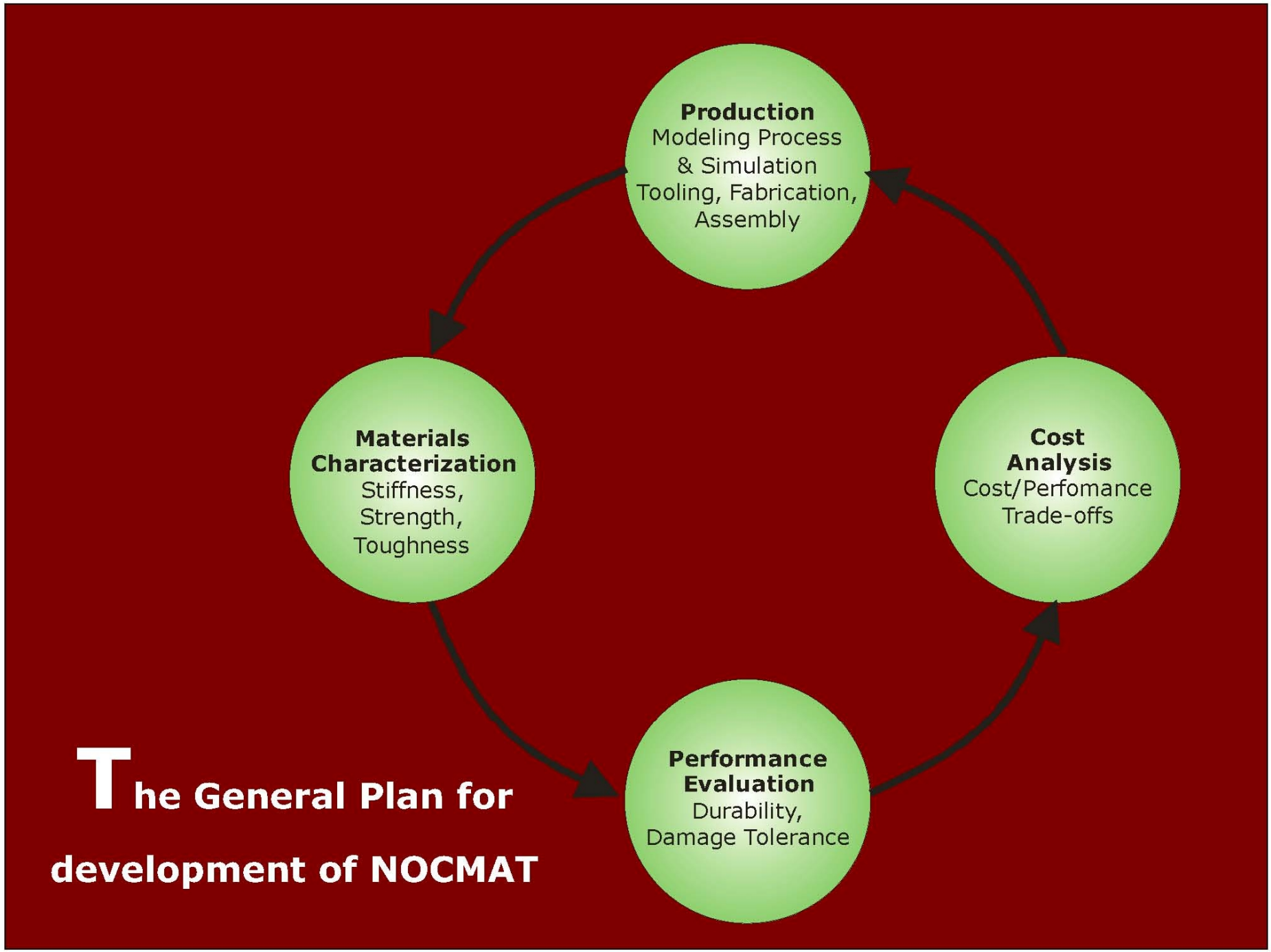
- simple processing materials;
- mechanical properties;

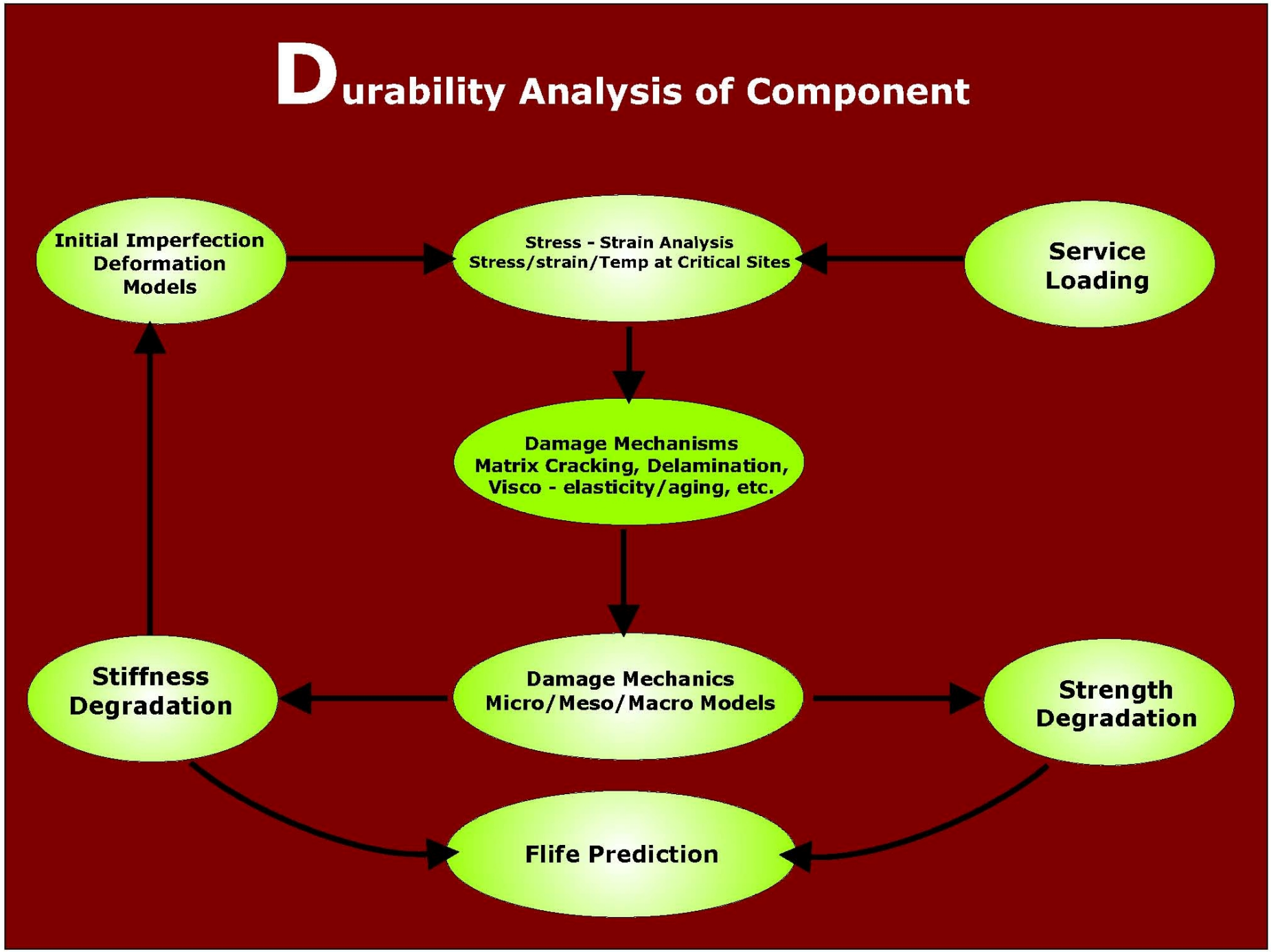
"merit index": relation between resistance and density.

All materials below the line (determined considering bamboo properties) have merit index worst than that for bamboo (concrete, steel, aluminum alloys)






Production
Modeling Process
& Simulation
Tooling, Fabrication,
Assembly
Materials
Characterization
Stiffness,
Strength,
Toughness
Cost
Analysis
Cost/Perfomance
Trade-offs
Performance
Evaluation
Durability,
Damage Tolerance
The General Plan for
development of NOCMAT


Durability Analysis of Component
Initial Imperfection Deformation Models
Stress - Strain Analysis Stress/strain/Temp at Critical Sites
Service Loading
Damage Mechanisms Matrix Cracking, Delamination, Visco - elasticity/aging, etc.
Stiffness Degradation
Damage Mechanics Micro/Meso/Macro Models
Strength Degradation
Flife Prediction

Future research for NOCMAT

In the YEAR of Vegetable Fibers

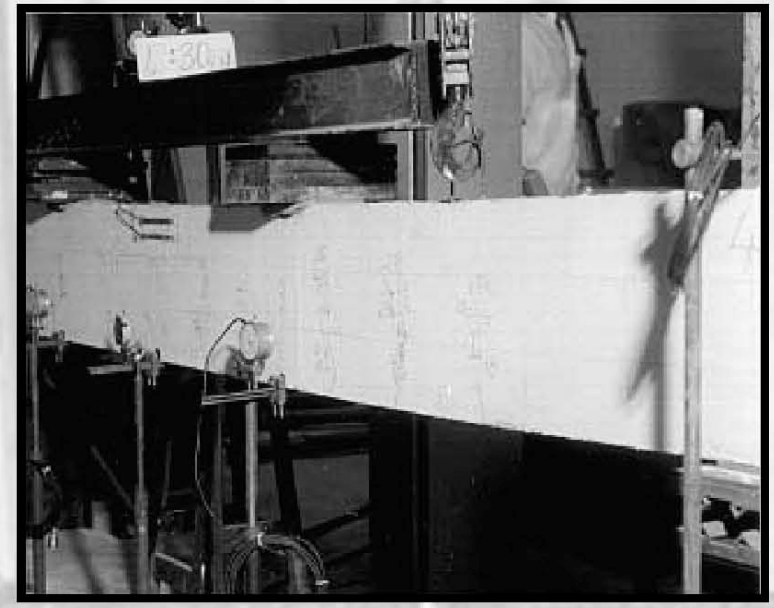
Declared by UNIESCO-FAO

The research of new plants and local materials

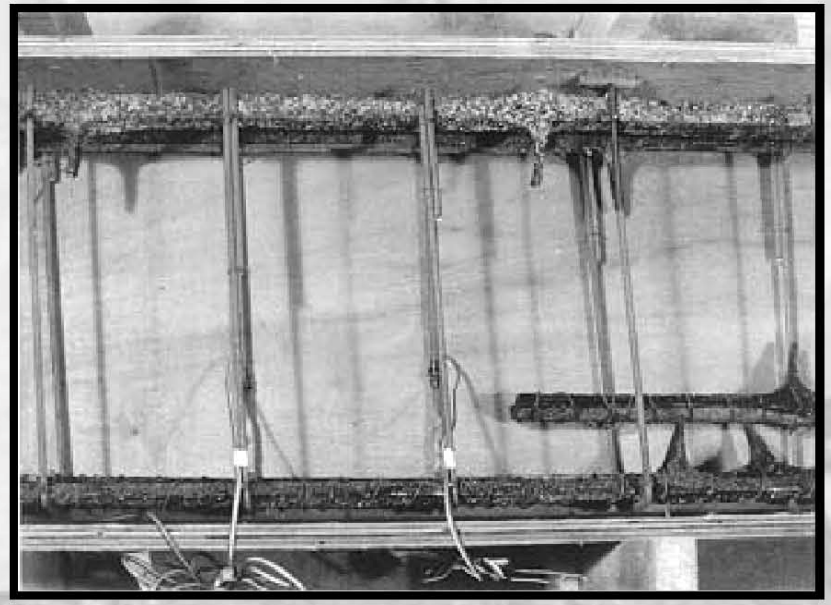
- Study of Bamboo.
- palm trees.
- cellulose micro-fibers from paper industries or agricultural wastes to reinforce composites;
- the vast range of Tropical vegetable fibers.
- mechanical processes to produce fiber composites´ components
- Numerical and analytical analysis of the experimental results.
- Investigation of the NOCMAT of the past.

Beams application: bamboo reinforced concrete beam

M.Sc thesis Ruth Amada 1982 PUC-Rio

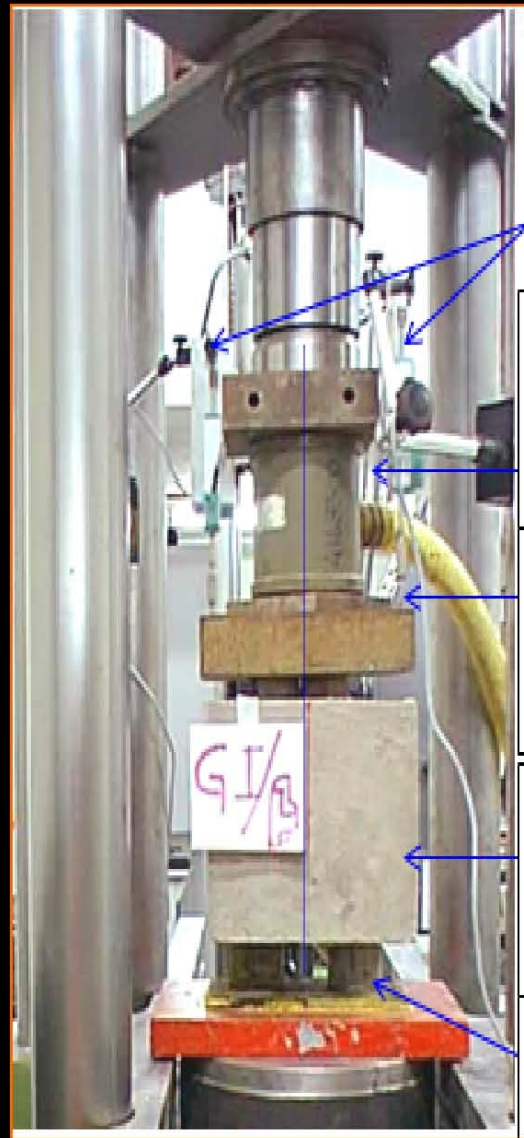


Concrete beam reinforced by bamboo
Subjected to flexural test



Reinforcement detail

Push out test of the bamboo the diaphtagms



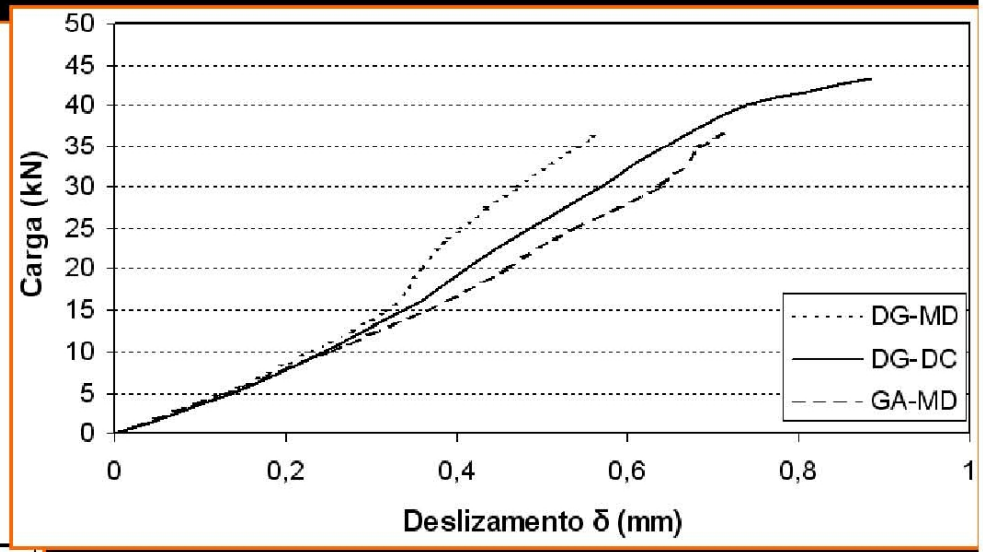
LVDT

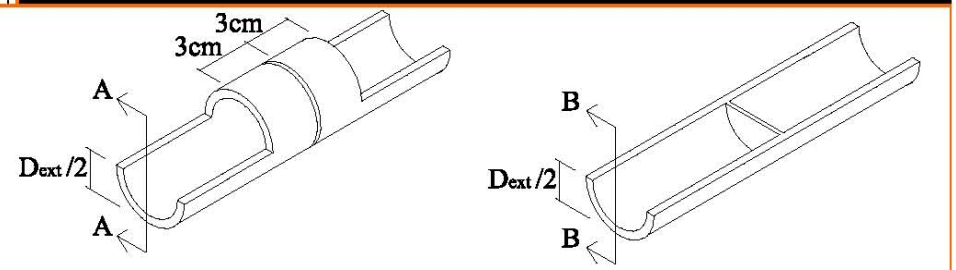
Célula de Carga

Chapa Distribuidora

Corpo De prova

Apoios

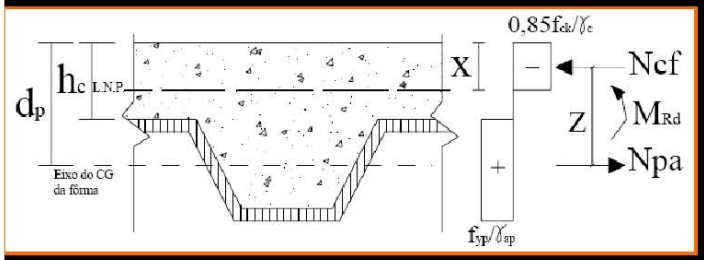






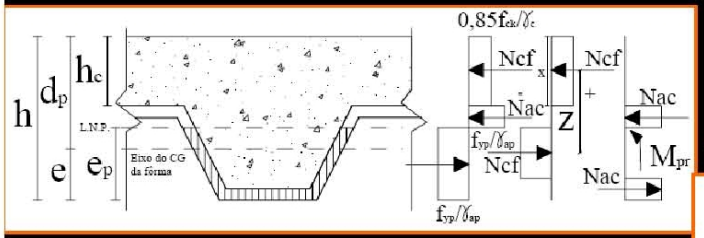
Corte A-A
Ruptura por cisalhamento na metade do conector

Corte B-B
Ruptura por cisalhamento na base do conector

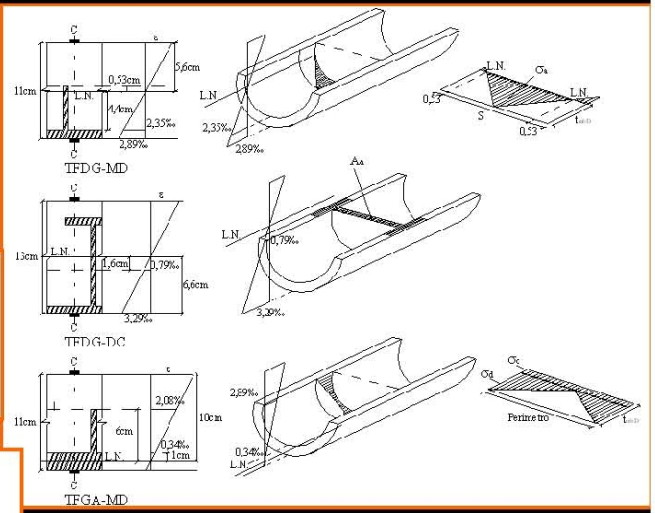


$$M_{p,Rd} = N_{cf} z + M_{pr}$$

$$N_{cf} = b h_c \frac{0{,}85 f_{ck}}{\gamma_c}$$

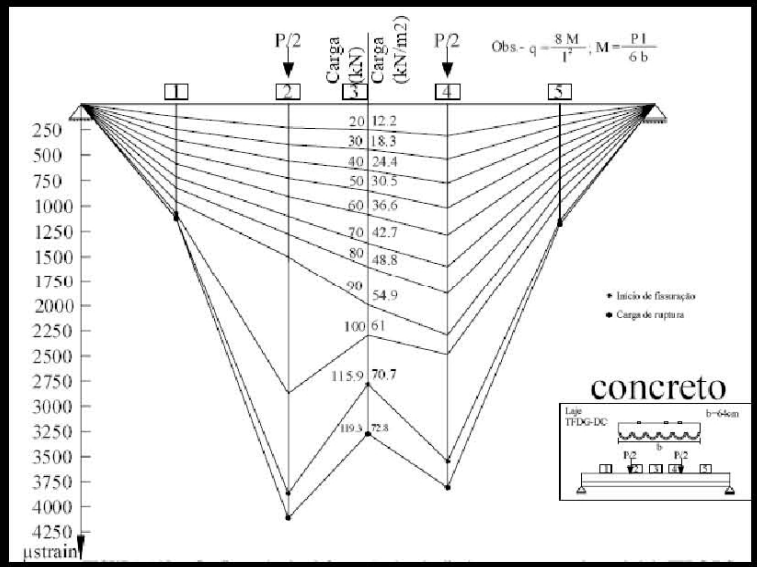


$$z = h - \frac{h_c}{2} - e_p + \left(e_p - e\right)\frac{N_{cf}}{A_p \dfrac{f_{yp}}{\gamma_{ap}}};$$



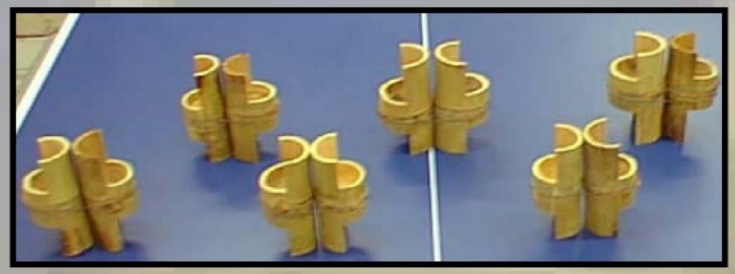
$$M_{pr} = 1{,}25 M_{pa}\left(1 - \frac{N_{cf}}{A_p \dfrac{f_{yp}}{\gamma_{ap}}}\right) \le M_{pa}$$



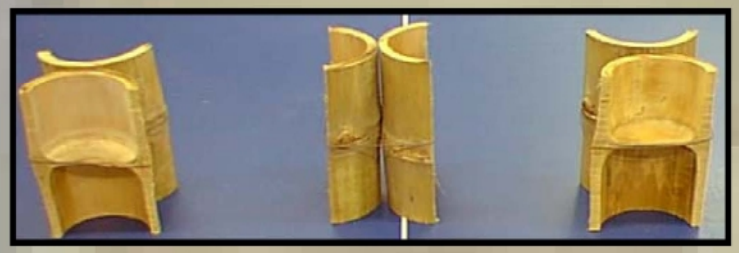
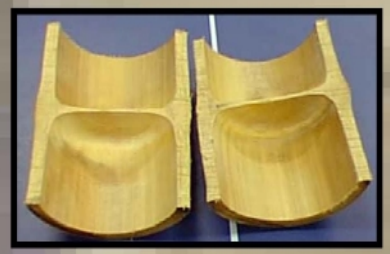


Bamboo specimens for the push-out test

(Ph.D. Researcher ACHÁ E.H. PUC-Rio)







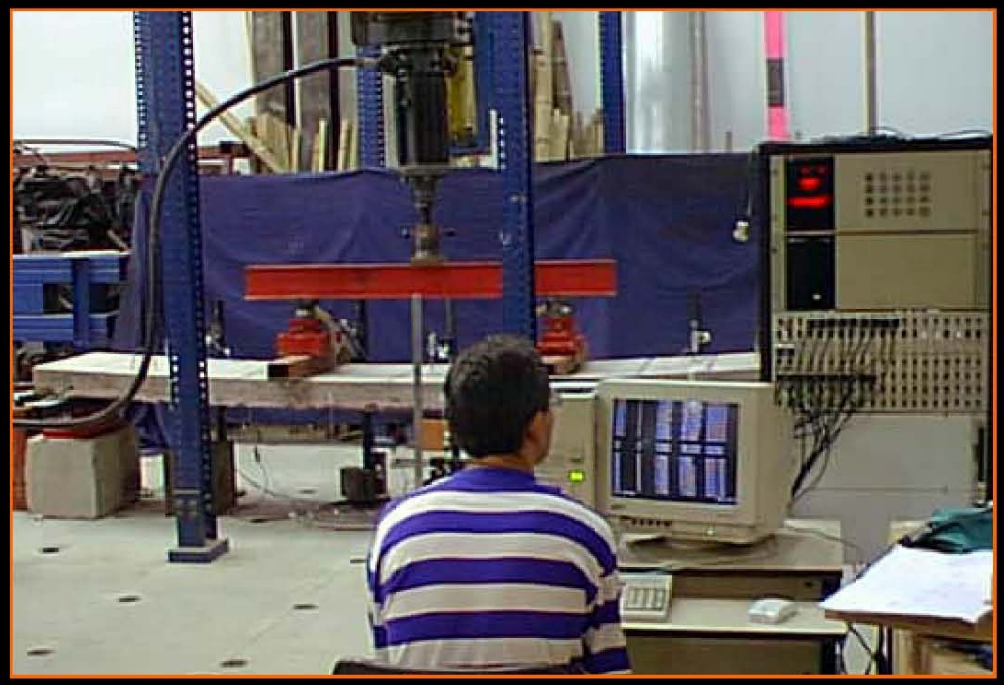

Permanent shutter bamboo concrete slab



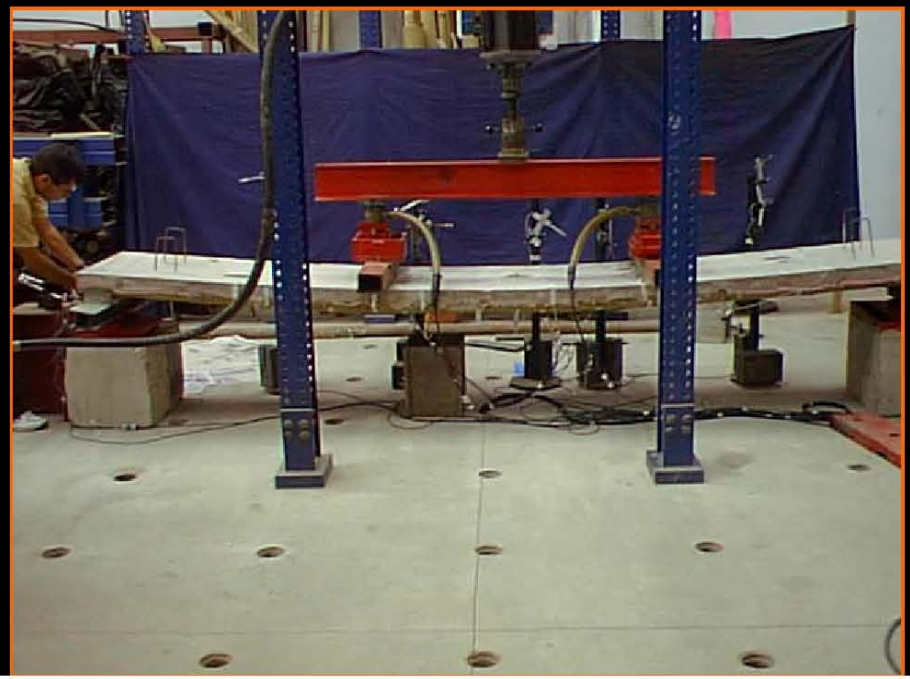








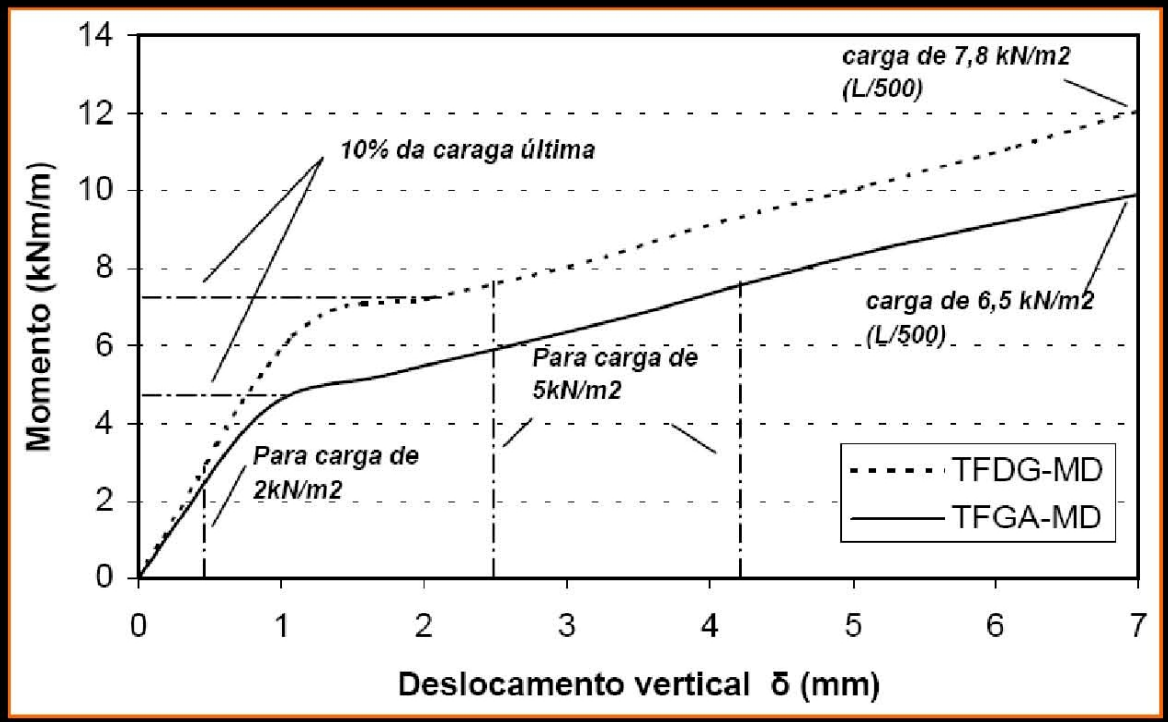


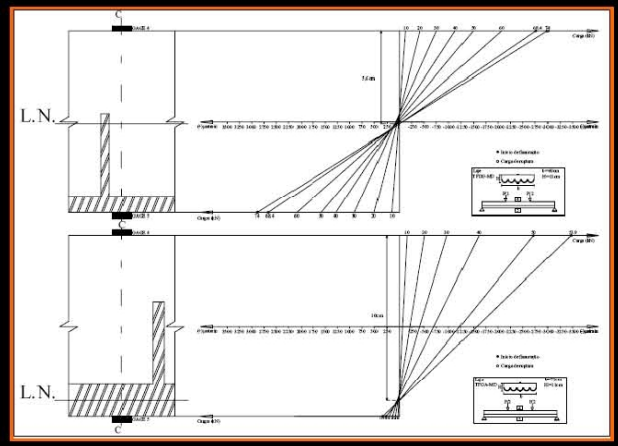






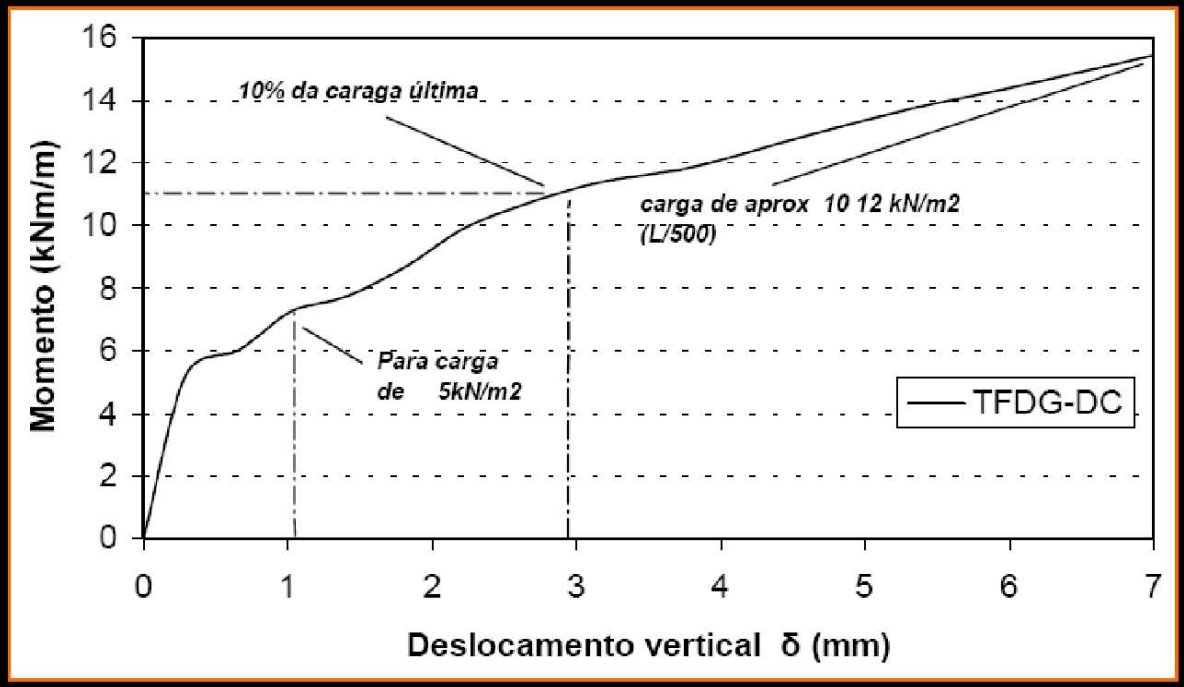



14
12
10
8
6
4
2
0
0
1
2
3
4
5
6
7
Momento (kNm/m)
Deslocamento vertical δ (mm)
carga de 7,8 kN/m2
(L/500)
10% da caraga última
carga de 6,5 kN/m2
(L/500)
Para carga de
5kN/m2
Para carga de
2kN/m2
TFDG-MD
TFGA-MD


L.N.
L.N.






Momento (kNm/m)
Deslocamento vertical δ (mm)
10% da caraga última
carga de aprox 10 12 kN/m2
(L/500)
Para carga
de 5kN/m2
TFDG-DC
0
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12
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16
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1
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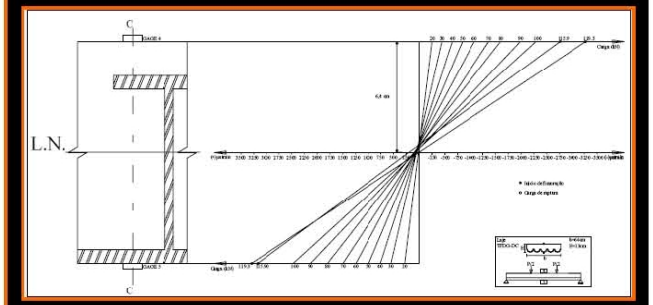
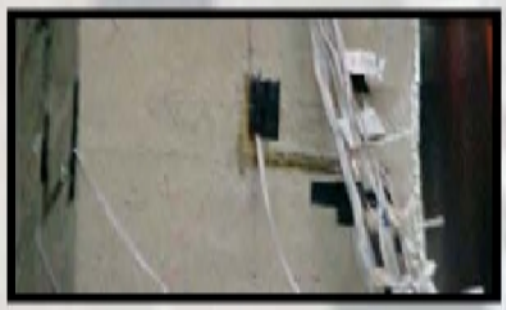
7


L.N.

Column application: bamboo reinforced concrete column

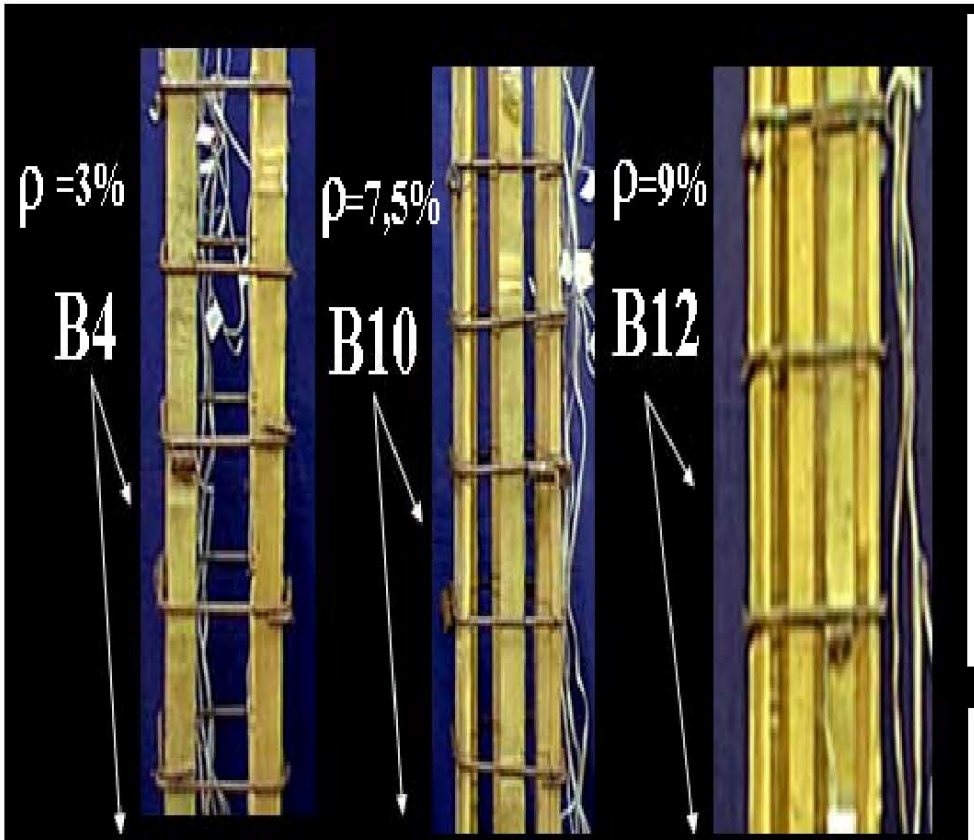






Square bamboo reinforced concrete column

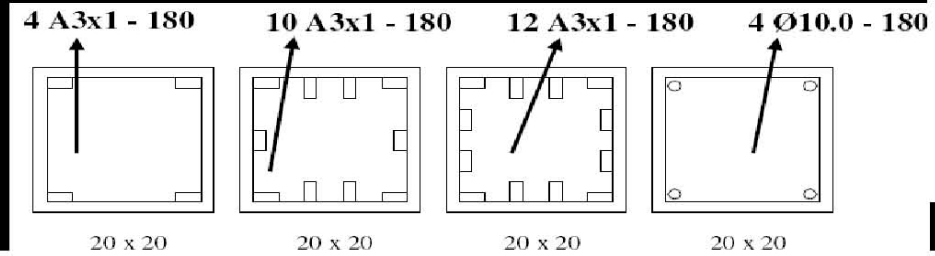


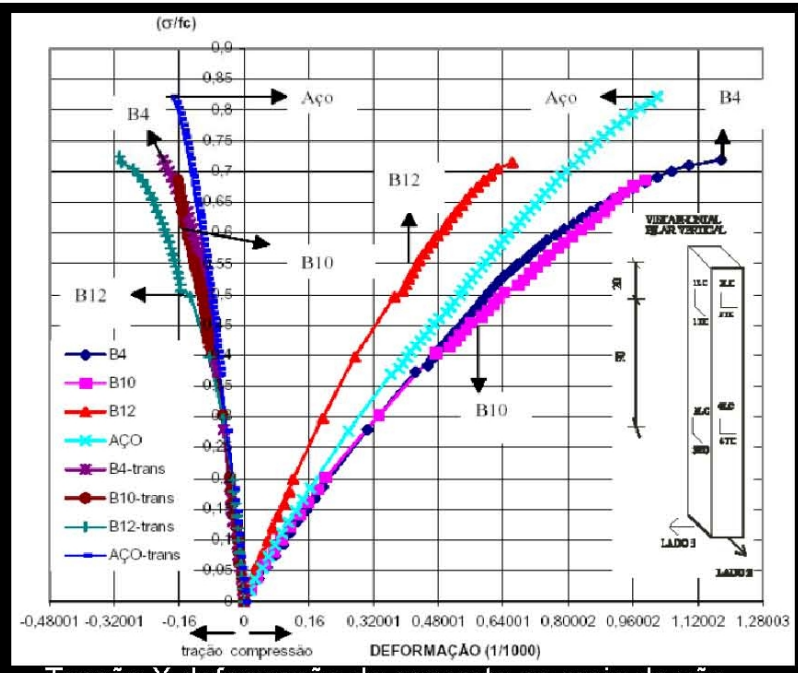




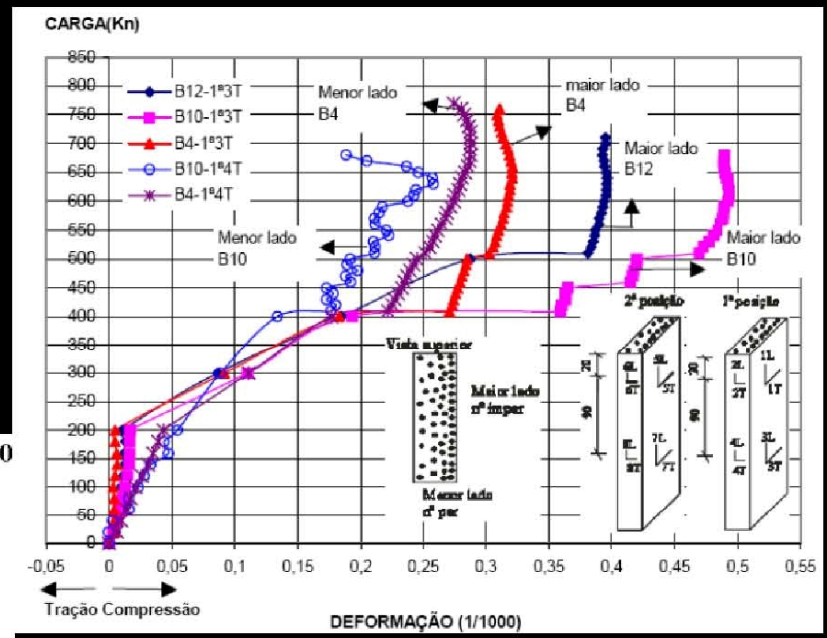








Tensão X deformação do concreto no meio do vão



Carga X deformação no meio das ripas de bambu.

The objective of the bamboo researches are to establish its physical and mechanical behavior making possible its employment as a substitute of the structural steel.



Bamboo space structure



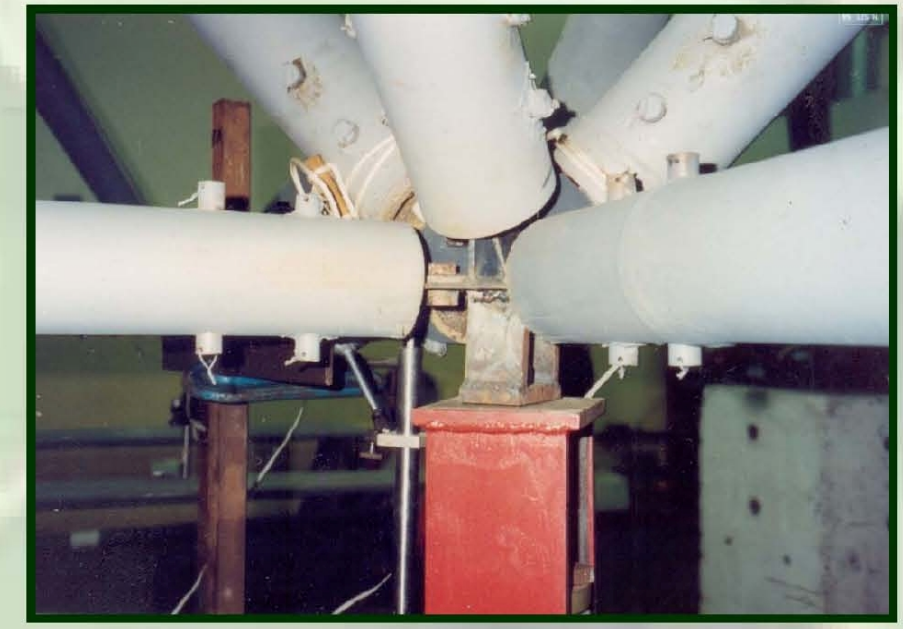
Joint details

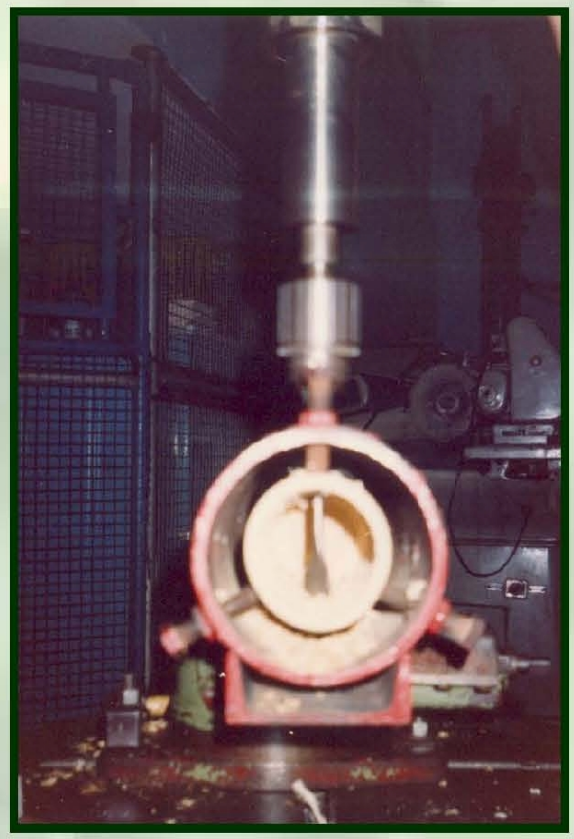
Detail study in the development of bamboo space structure



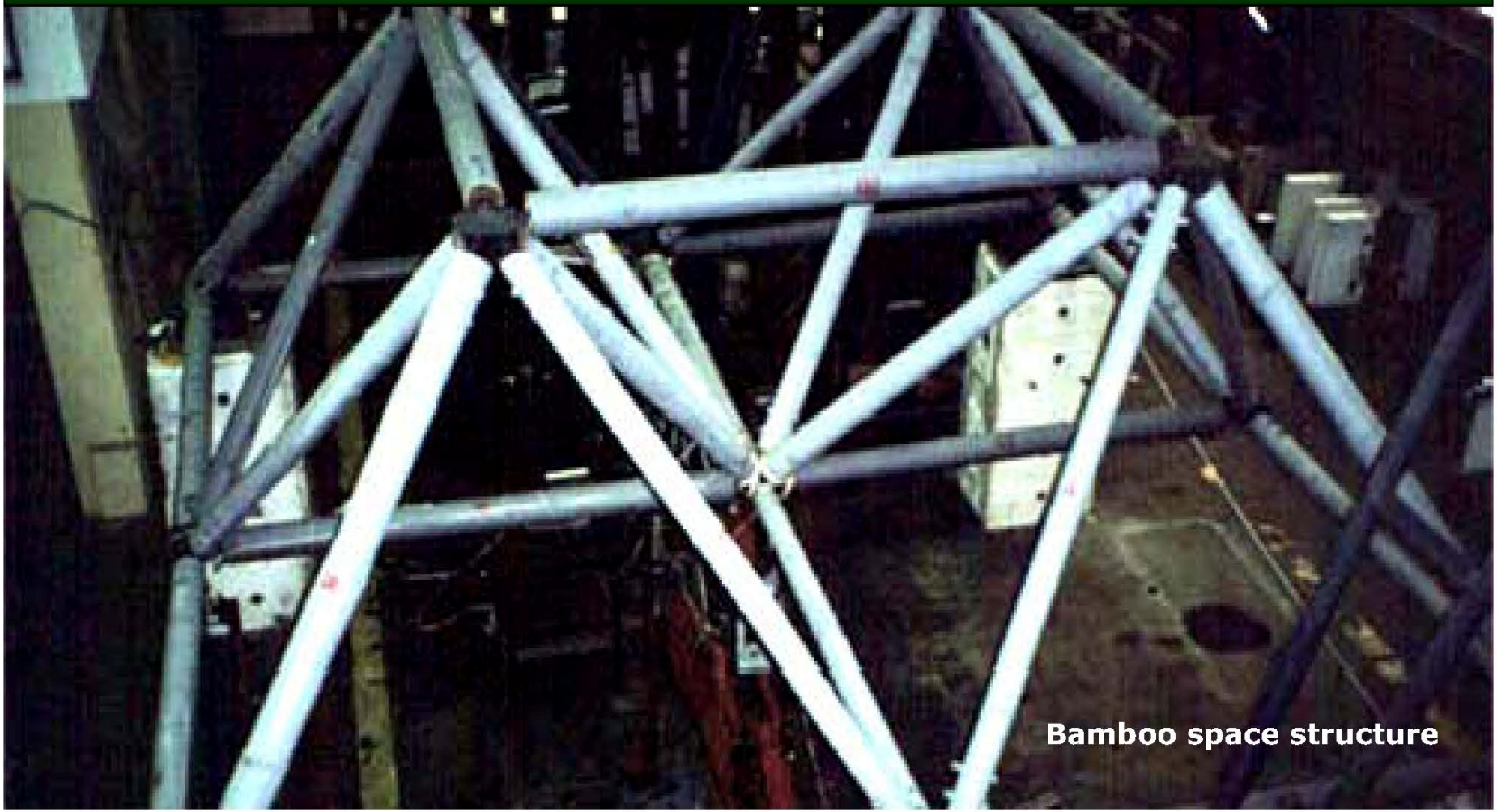


Detail study in the development of bamboo space structure





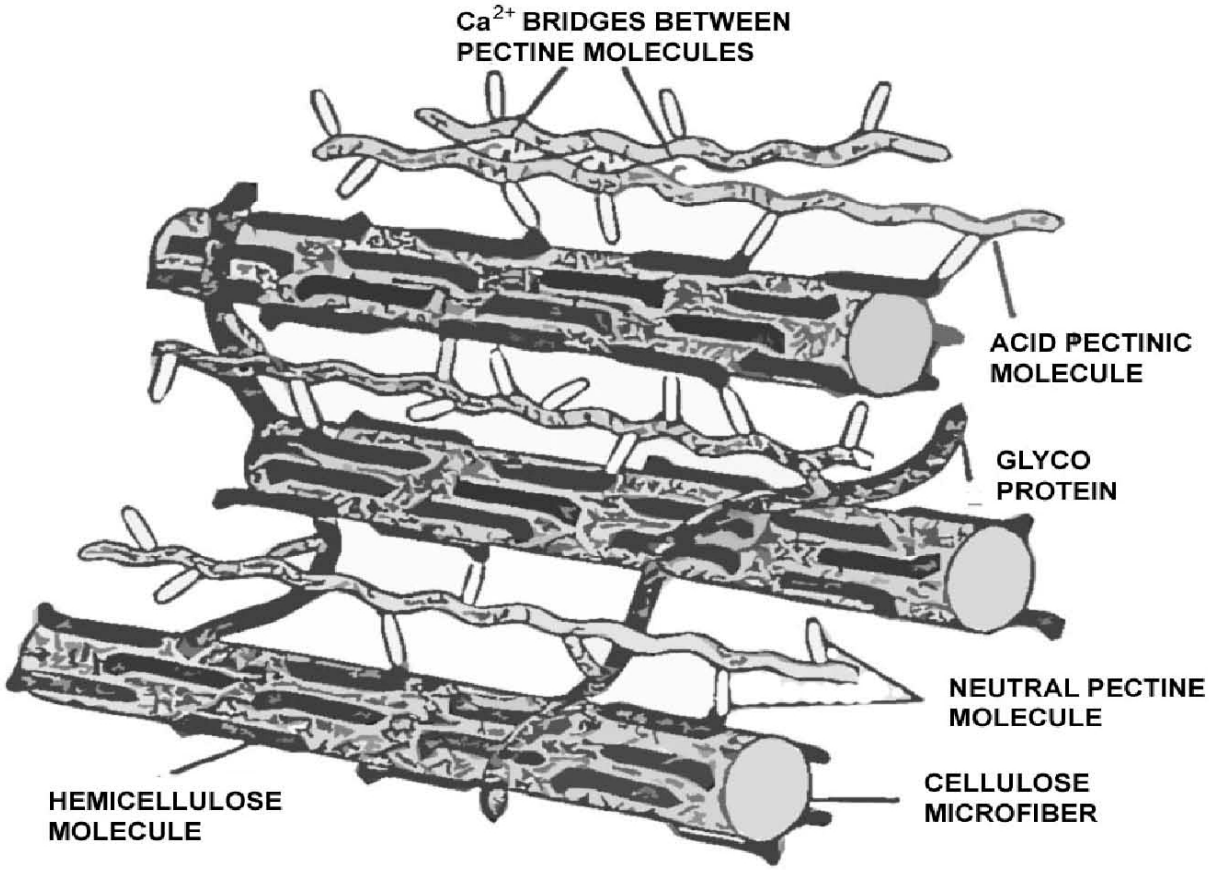
The objective of the bamboo researches are to establish its physical and mechanical behavior making possible its employment as a substitute of the structural steel.



Bamboo space structure

Bamboo micro-structure

CHEMICAL COMPOSITION AND STRUCTURE OF A FIBER CELL



Polysacharid in the walls :

-**Cellulose:** polysaccharide of 1,4 β-D-glucose.

-**Hemicellulose:** branched polysaccharides homologous to cellulose because they have 1,4-linked β -D-hexosyl.

-**Pectin:** polysaccharide of 1,4-linked α-D-galacturonic acid.

-**Pectic acid:** pectine with low degree of methyl esterification.

Other factors reducing bamboo quality:

- Abiotic factors:
  - Cracks and splits
  - Weathering
  - Fire



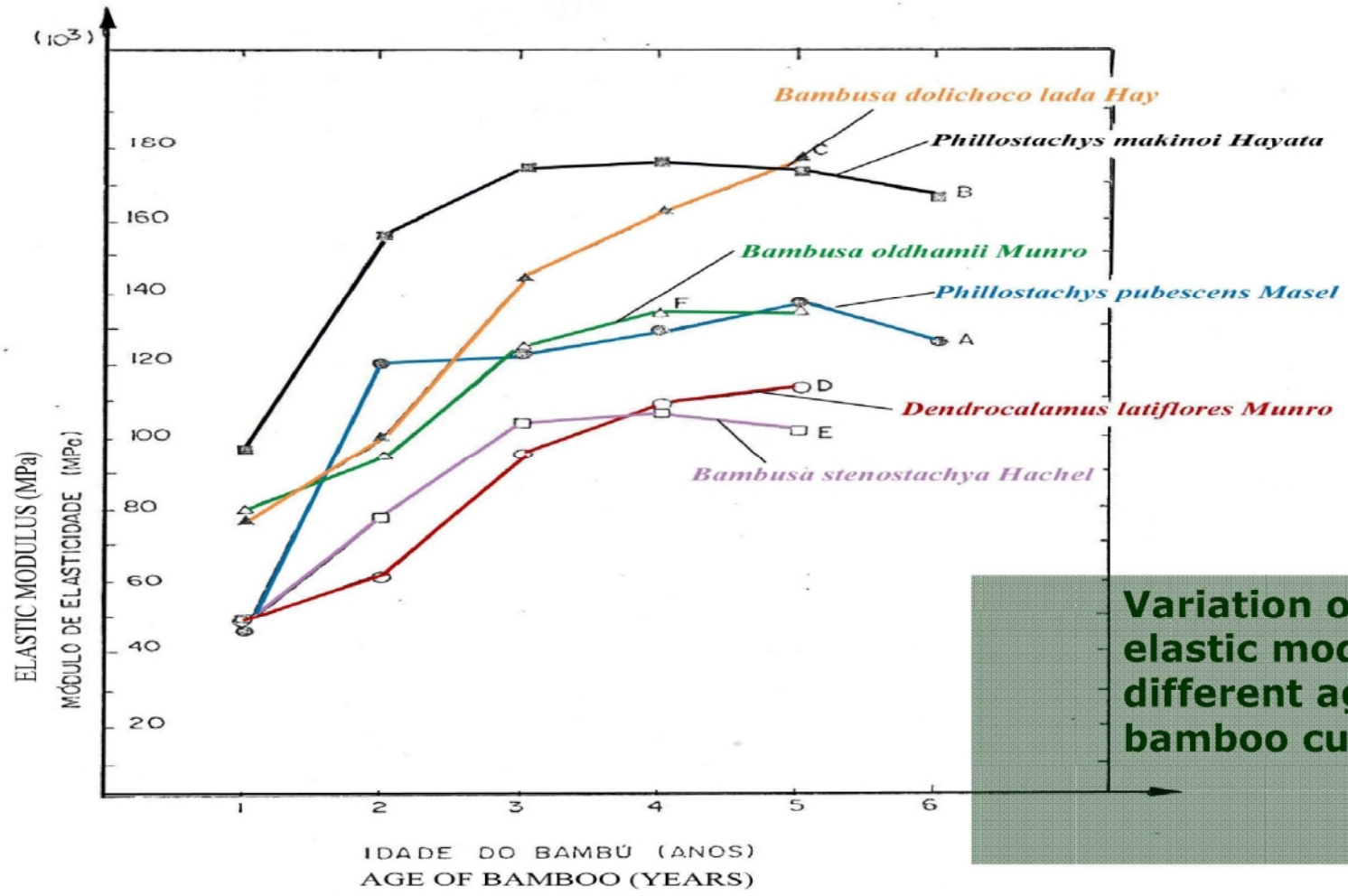
- Biotic factors:
  - Fungi
    - Mould and Blue-Stain fungi
    - Decay fungi
  - Insects
    - Beetles
    - Termites





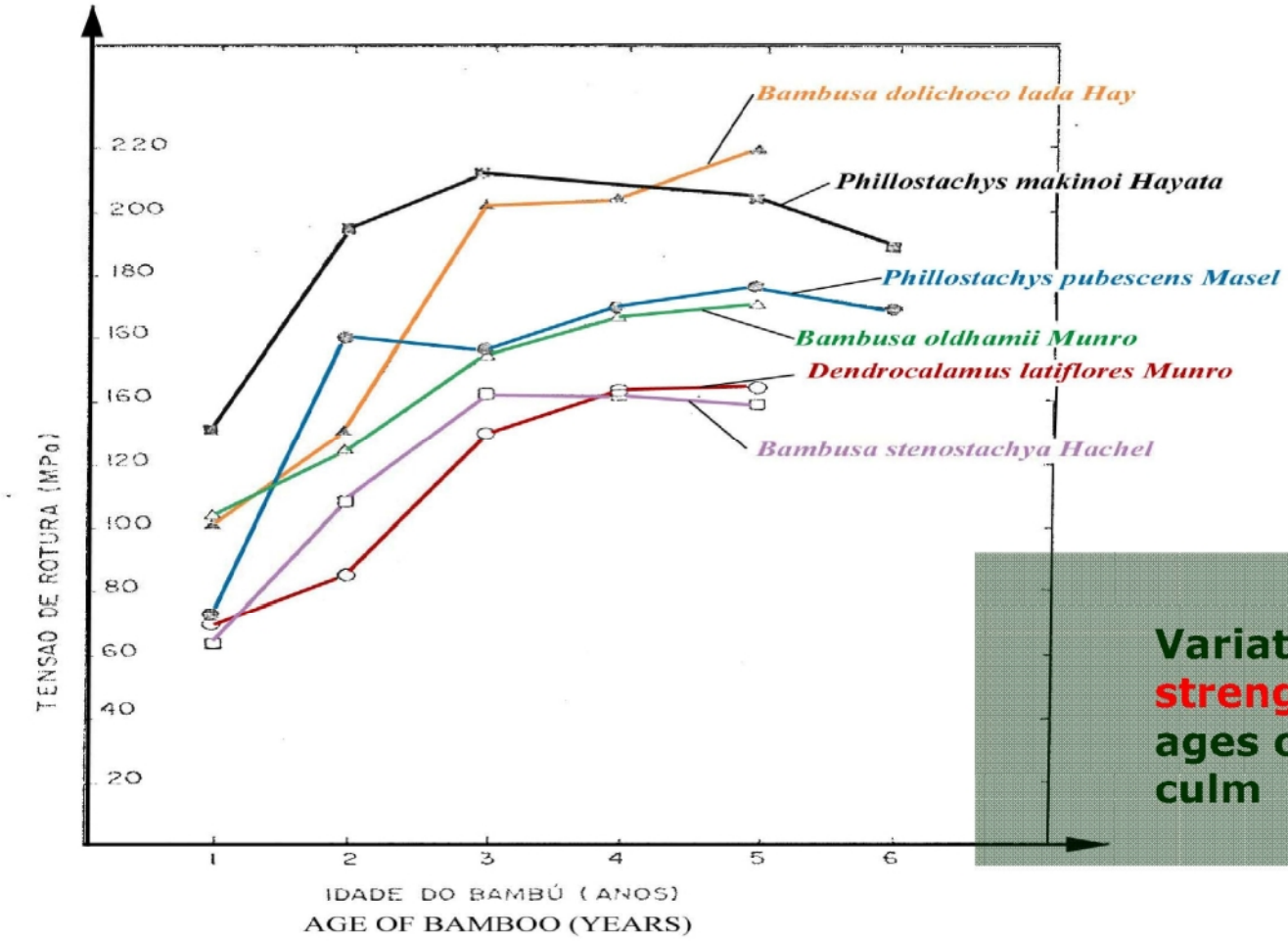


Physical Properties and age



Variation of the elastic modulus at different ages of the bamboo culm

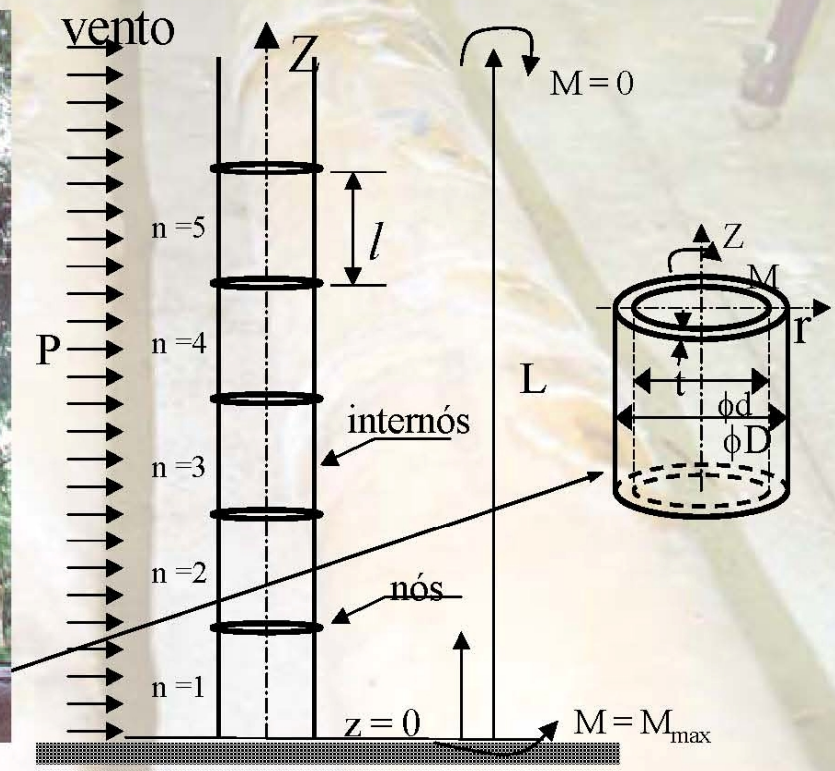
Physical Properties and age



Variation of the tensile strenght at different ages of the bamboo culm

Systematic Study of the Bamboo Entire Culm:
Mapping Its Physical and Mechanical Properties

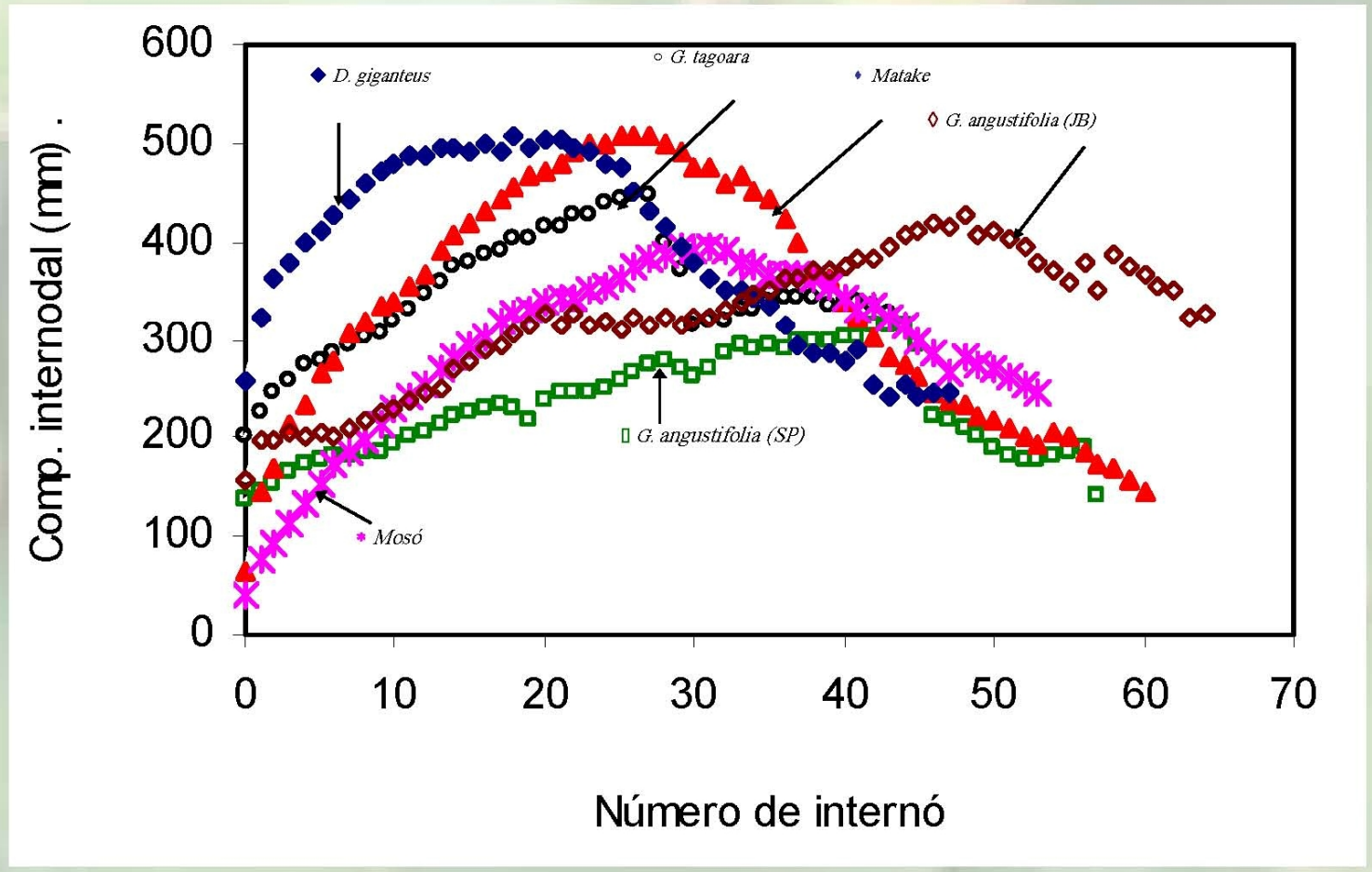






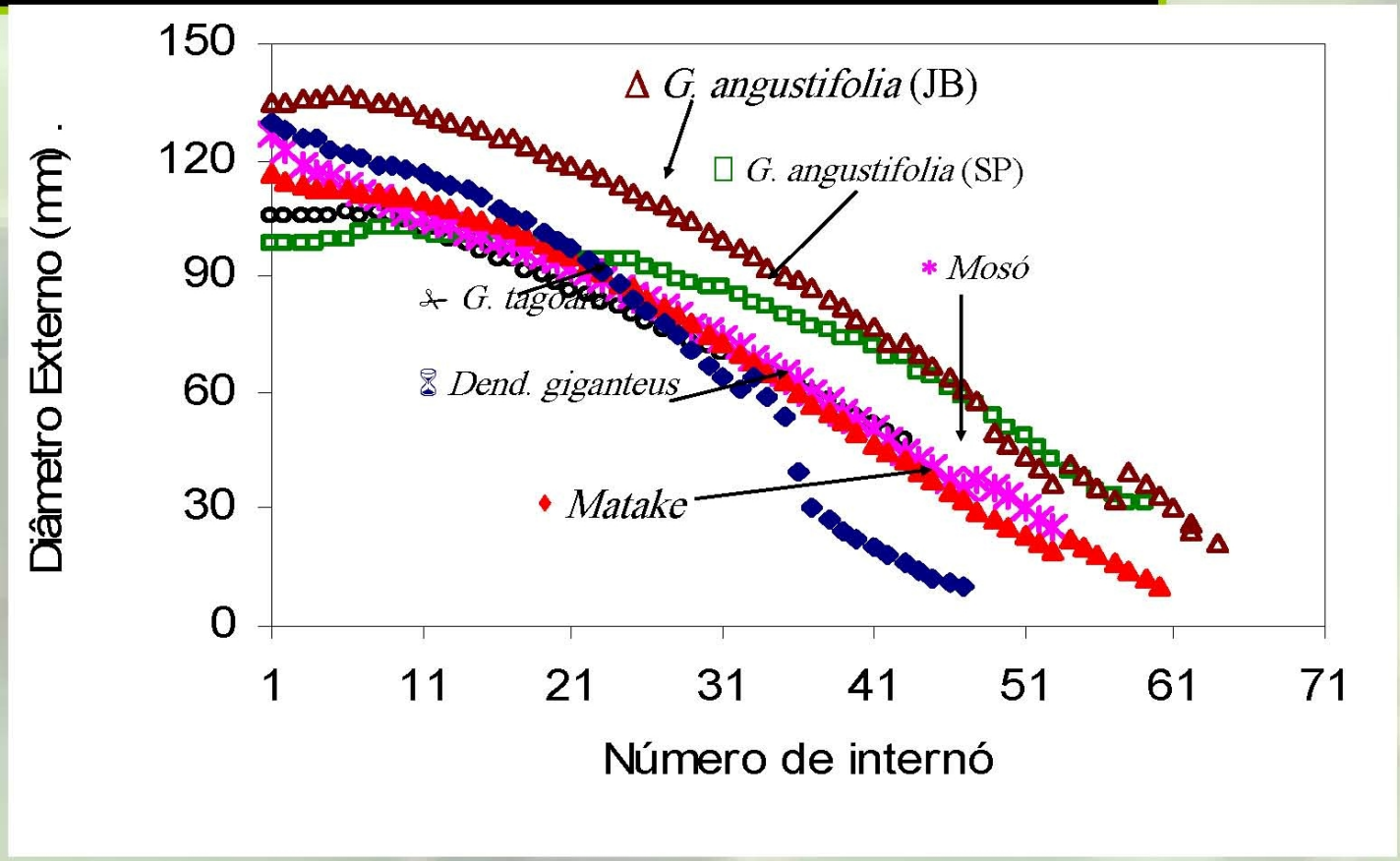
Furos para medição da espessura da parede do bambu

Physical Properties of Entire Bamboo



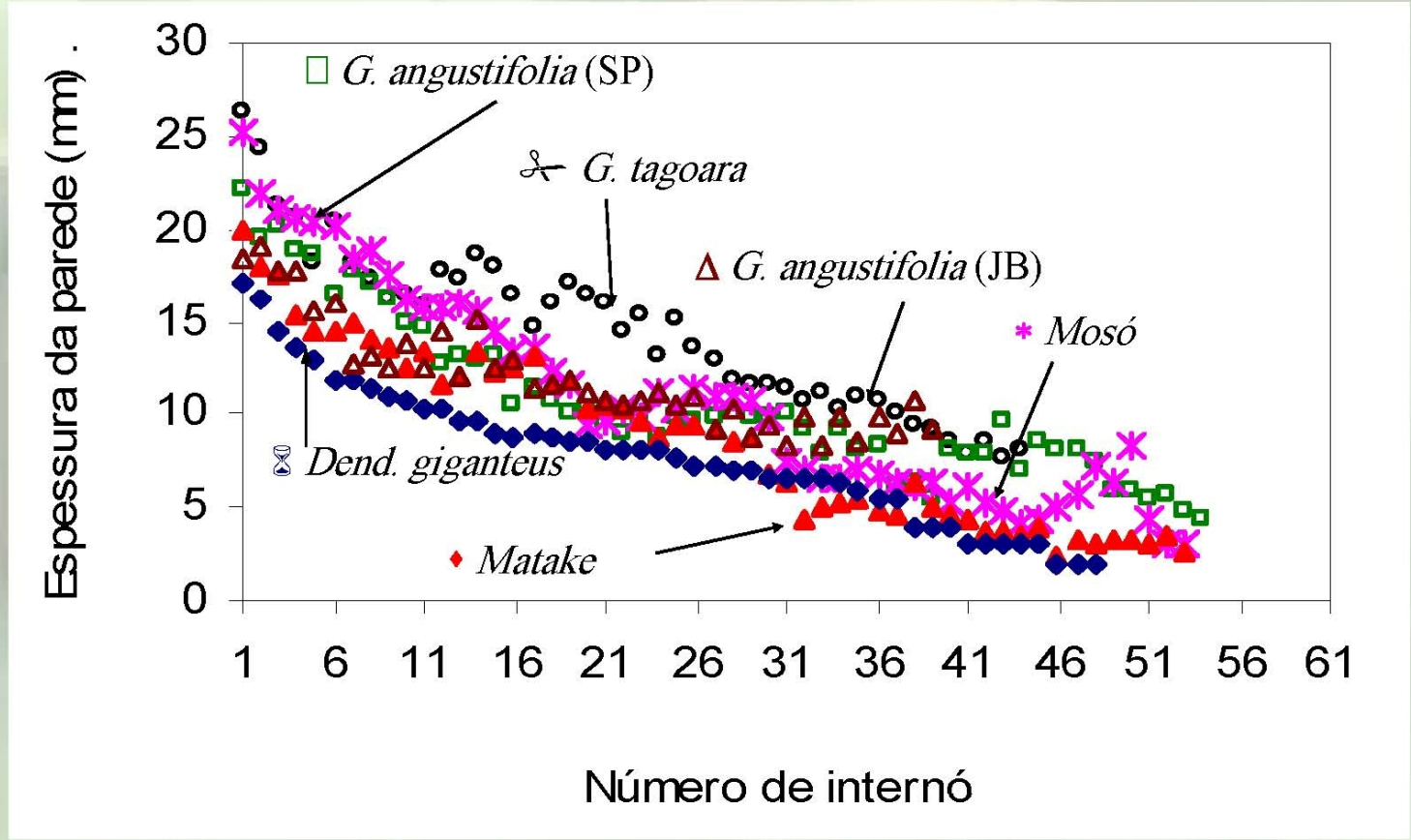
Inter node length X no Internode

Physical Properties of Entire Bamboo



External diameter as a function of the inter node number throughout the bamboos culm.

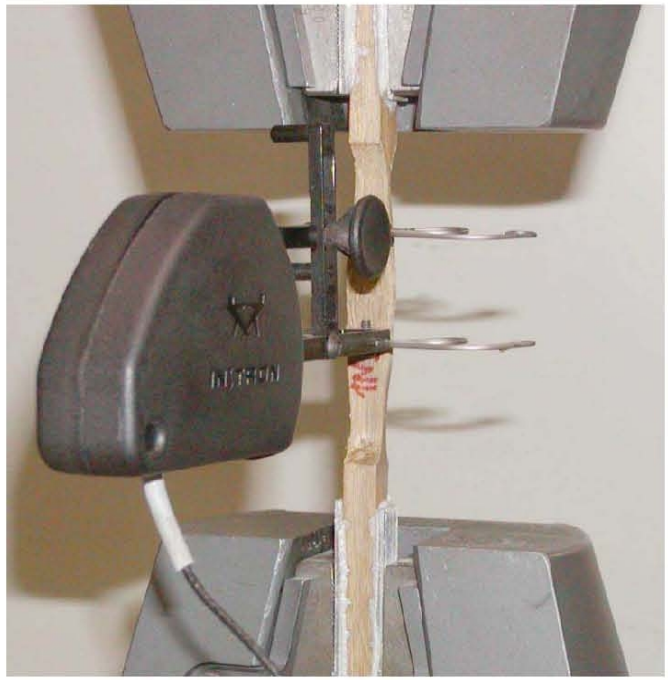
Physical Properties of Entire Bamboo

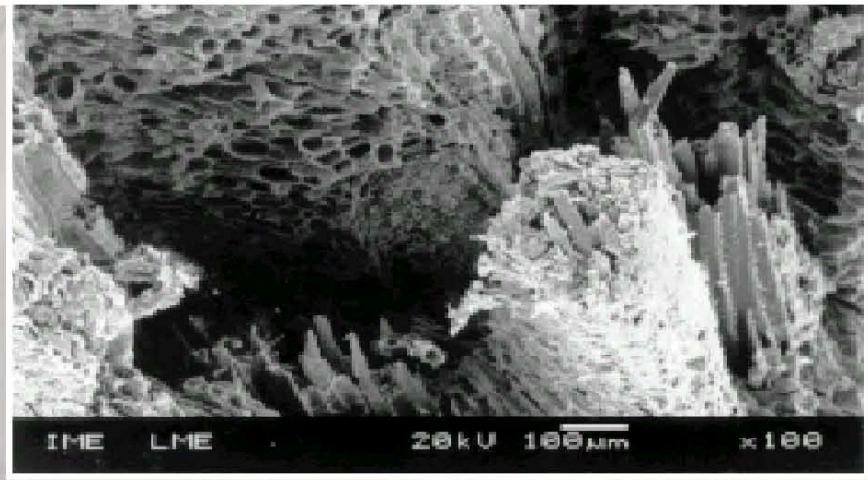


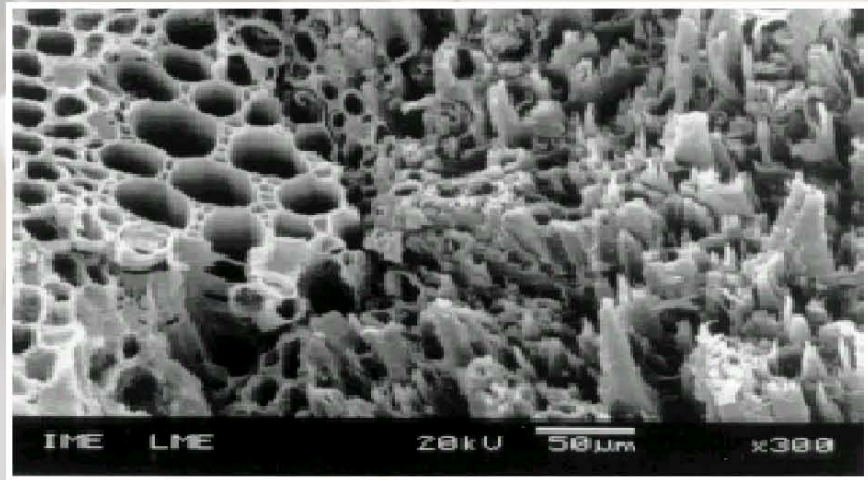
Mechanical Properties of Bamboo

Tensile test performed following the international standards proposed by INBAR and now aproved by ISO.

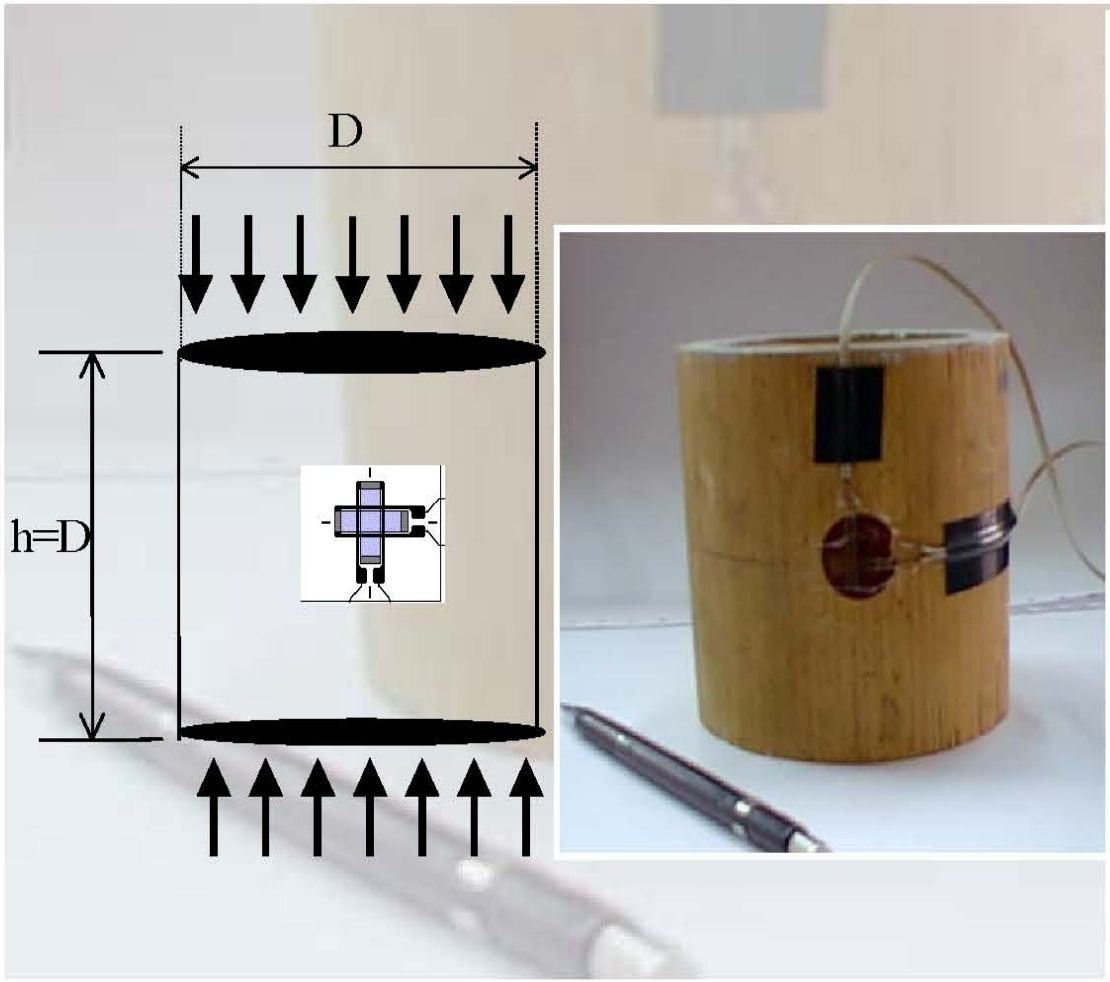








Compression tests performed following the international standards proposed by INBAR.





Data from the shear test throughout the fibers

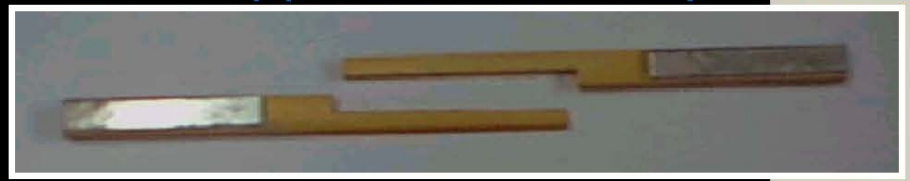
Data from the shear test throughout the fibers:

Temperature: 23 ^{0}C.

Local humidity: 60 %.

Specimen humidity: 6 – 8 %.

Load application velocity: 1 mm/min







Restaurant and Hotel entirely made of bamboo in the Philippines



General view and details





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Reference number of committee draft: ISO/TC 165/ N 313

Date: 2001-11-21

Reference number of document: ISO/DIS –22156

Committee identification: ISO/TC 165/WG 9

Secretariat: SCC

Bamboo Structural Design

Titre — Titre — Partie n: Titre de la partie

Bambou – design pour usage structurel

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Reference number of working document: ISO/TC 165 N315

Date: 2001-12-07

Reference number of document:

Committee identification: ISO/TC 165/WG 9

Secretariat: SCC

Laboratory Manual on Testing Methods for Determination of physical and mechanical properties of bamboo

Rapport Laboratoire d'Essai pour Détermination des propriétés physiques et mécaniques du bambou

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Reference number of committee draft: ISO/TC165N314

Date: 2001-11-28

Reference number of document: ISO/DIS- 22157

Committee identification: ISO/TC 165/WG9

Secretariat: SCC

Determination of physical and mechanical properties of bamboo

Titre — Titre — Partie n: Titre de la partie

Détermination des propriétés physiques et mécaniques du bambou

Laboratory of materials and structures of the Eindhoven University-The Netherland

Prof: J.J. Janssen



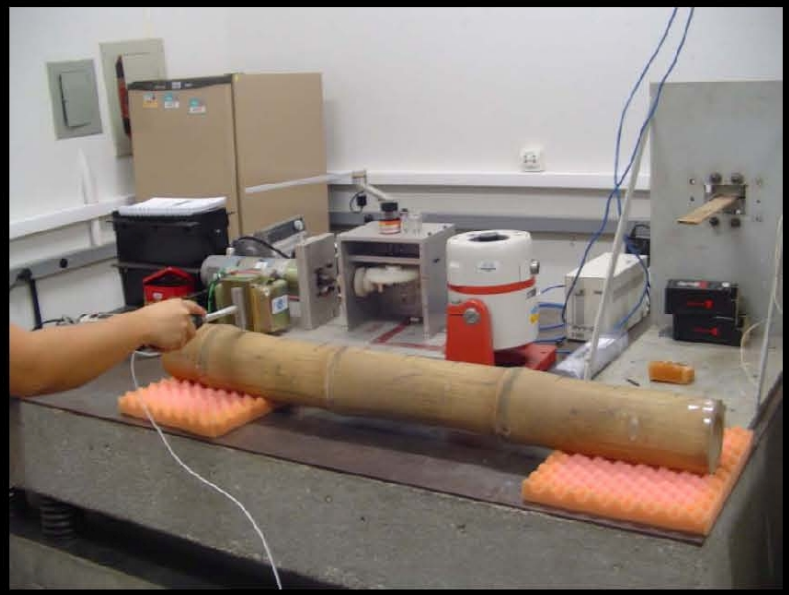
DYNAMIC TESTS

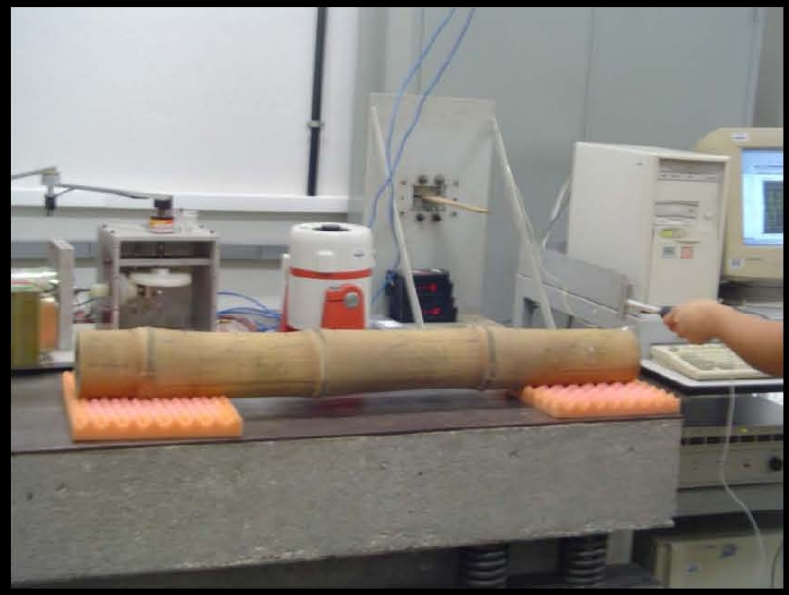




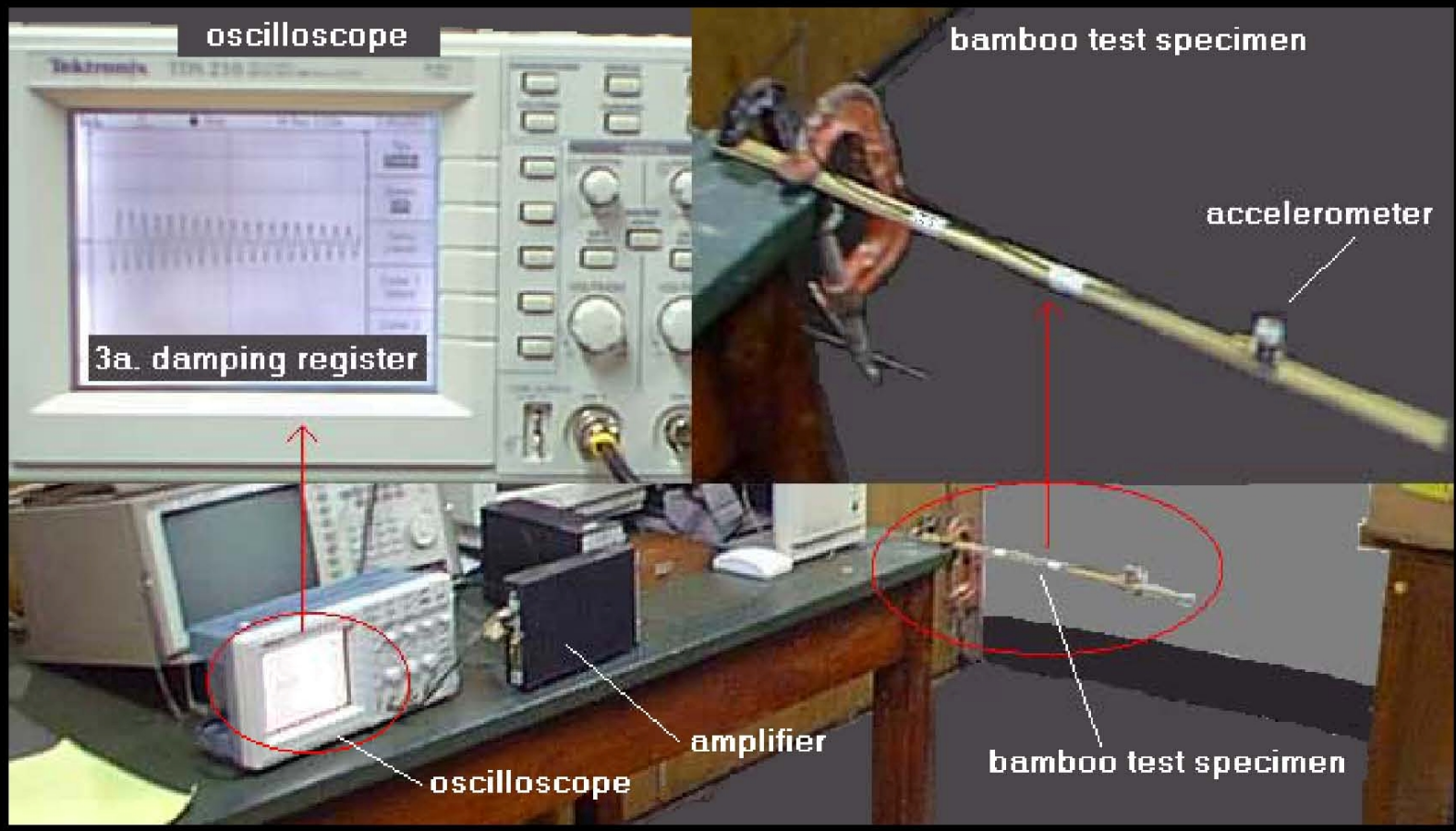


DYNAMIC TESTS





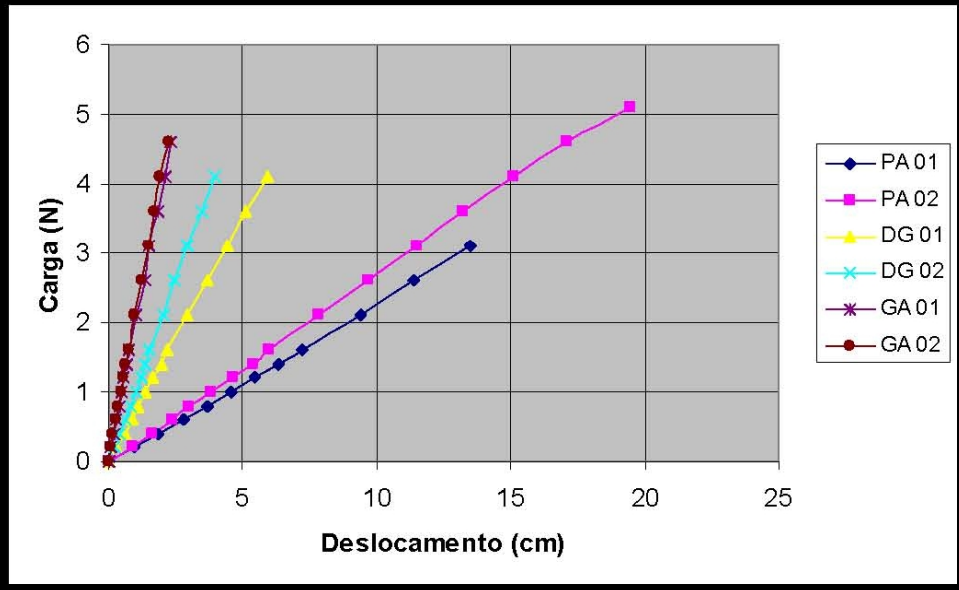
Dynamic Properties of Bamboo

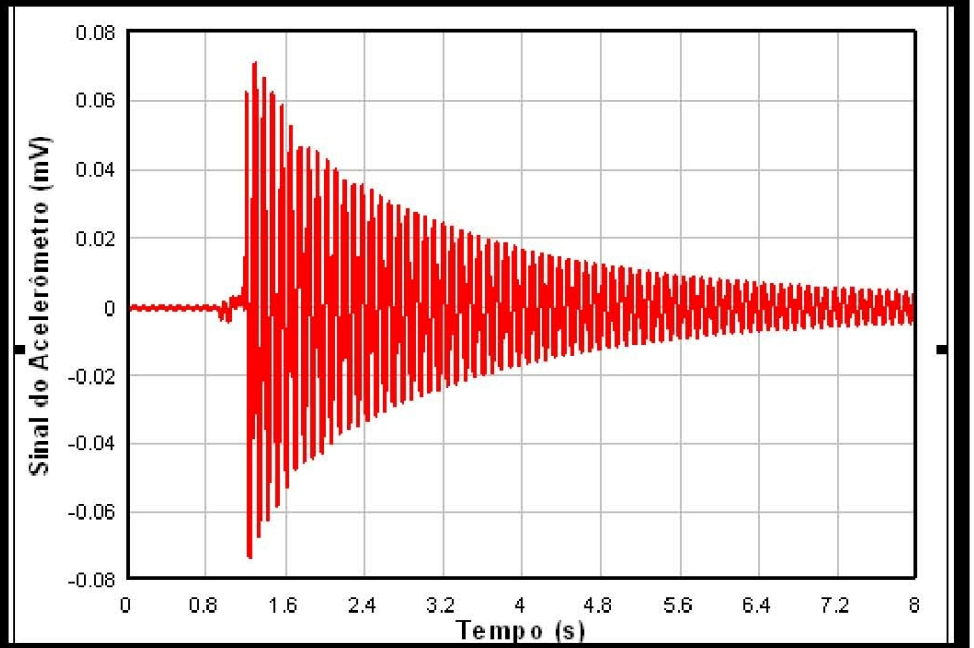


Dynamic Analysis of Bamboo



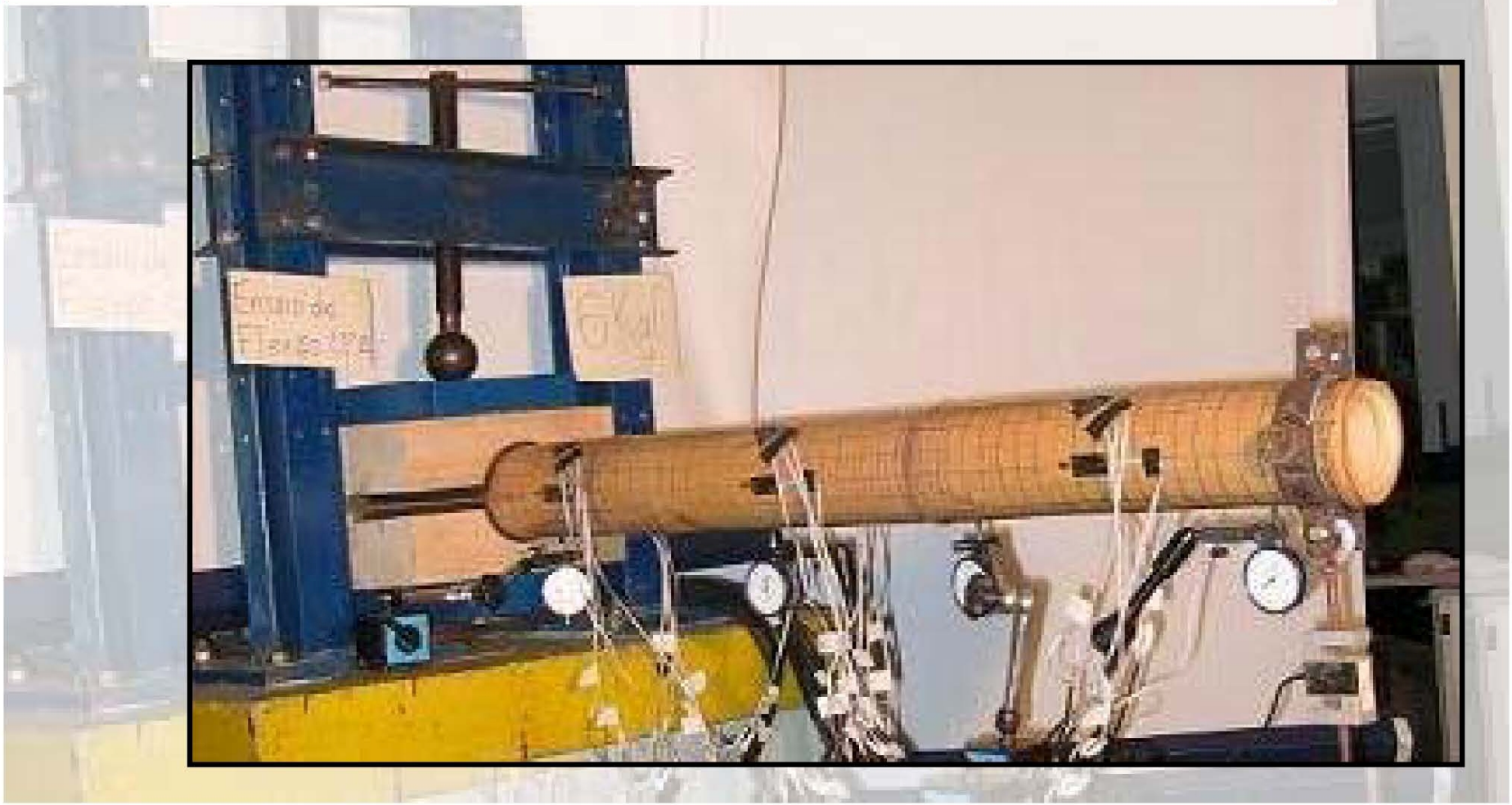






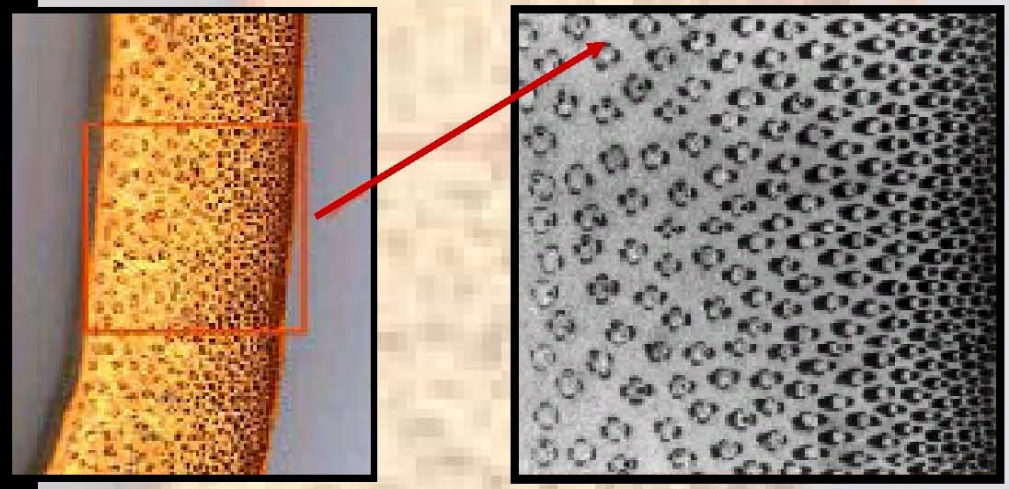
Bending and Torsion Tests of Bamboo

Research is being carried out by undergraduate student Luis Alberto Torres
from University of Valle, Colombia,
at PUC-Rio 2006



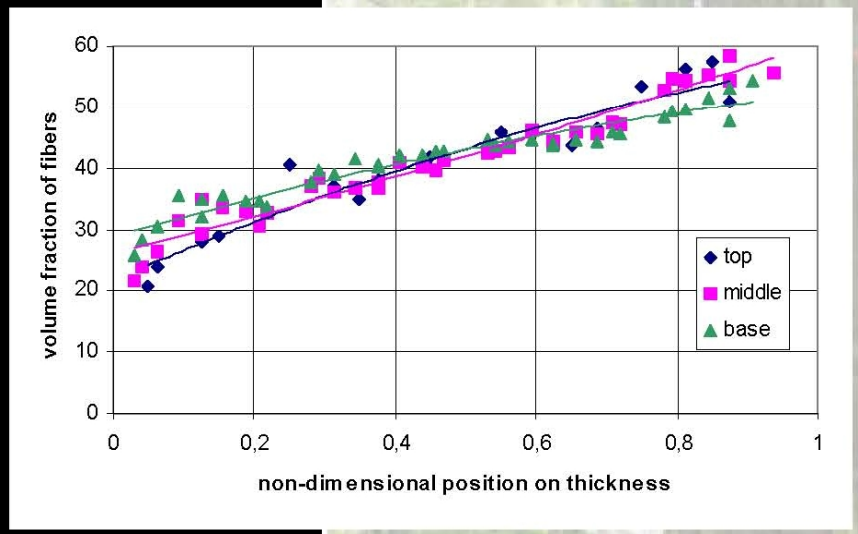
Bamboo Meso-Structural Analysis Using Digital Image Processing

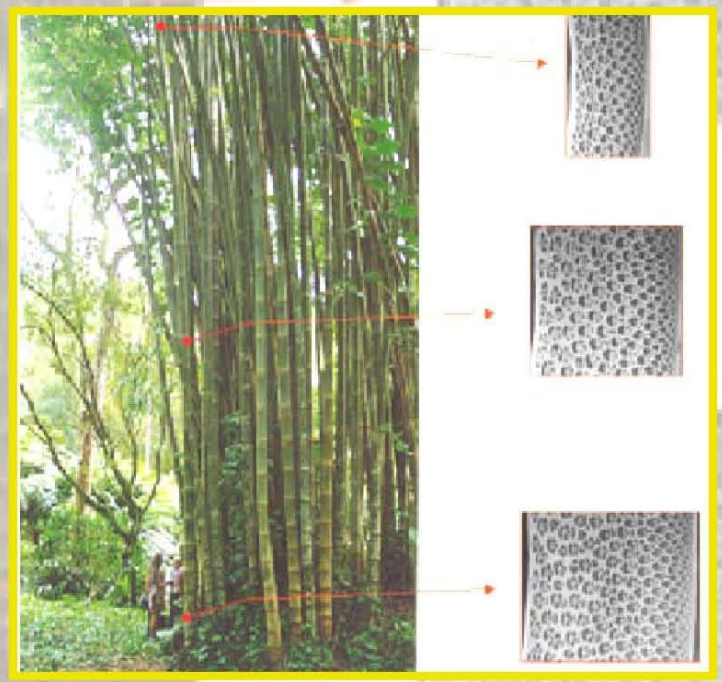
Establish how the volume fraction variation occurs in the bamboo thickness in order to model bamboo as a composite material using a modified rule of mix.



bamboo: an intelligent functionally graded material

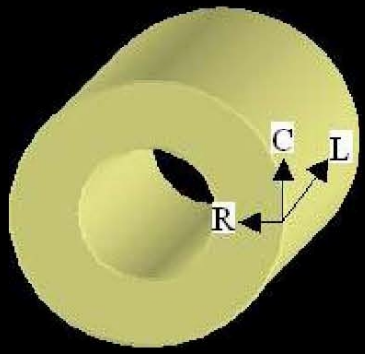
Bamboo Meso-structural Analysis Using Digital Image Processing (applications)



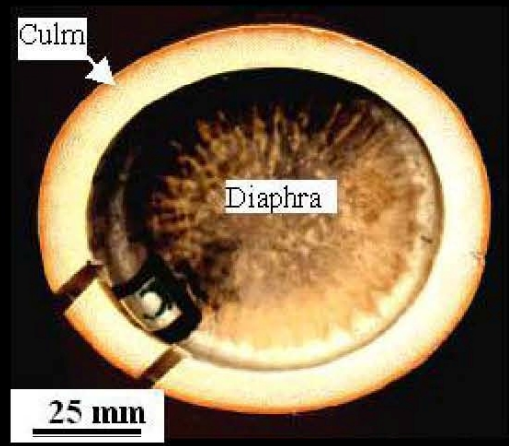


volume fraction distributions at different points of the total bamboo´s length.

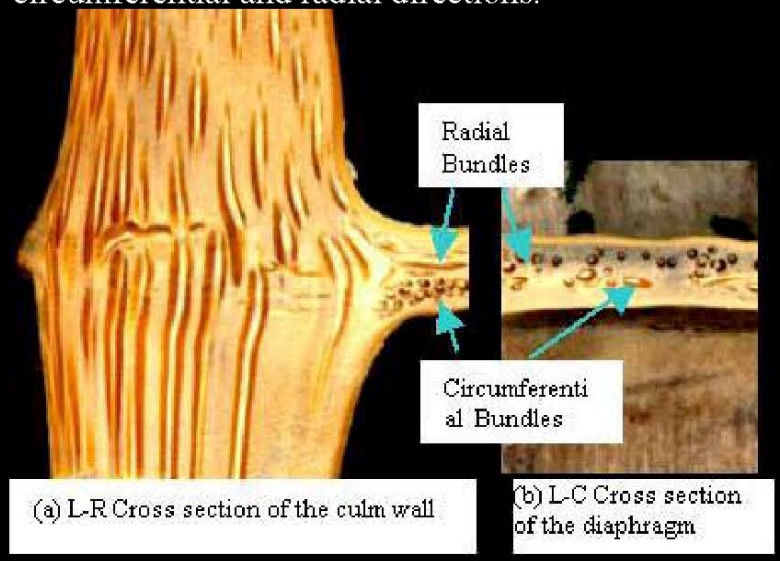
Distribution of fibers in the nodal region of Phyllostachys Edulis Bamboo (Moso)

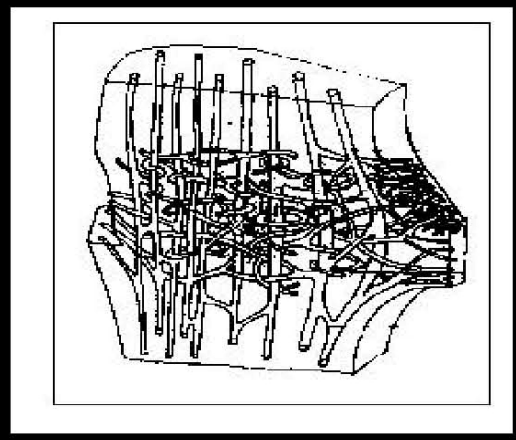


Axis in respect to longitudinal, circumferential and radial directions.



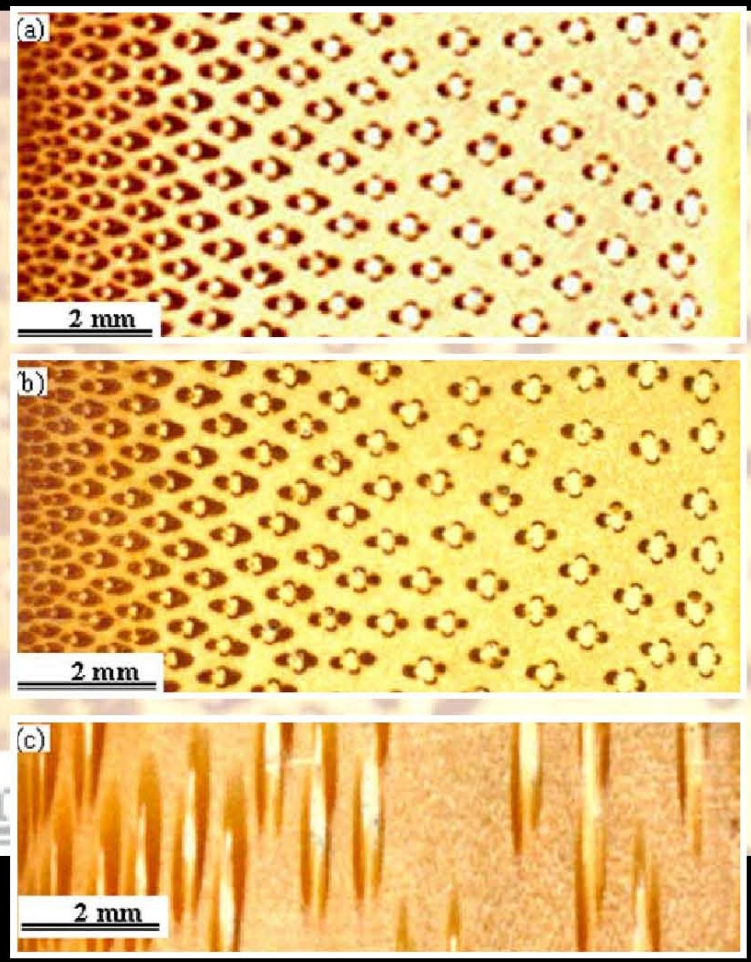
The R-C cut of the bamboo with diaphragm labeled.





Vascular anastomoses

Non-conventional method for mesostructural characterization

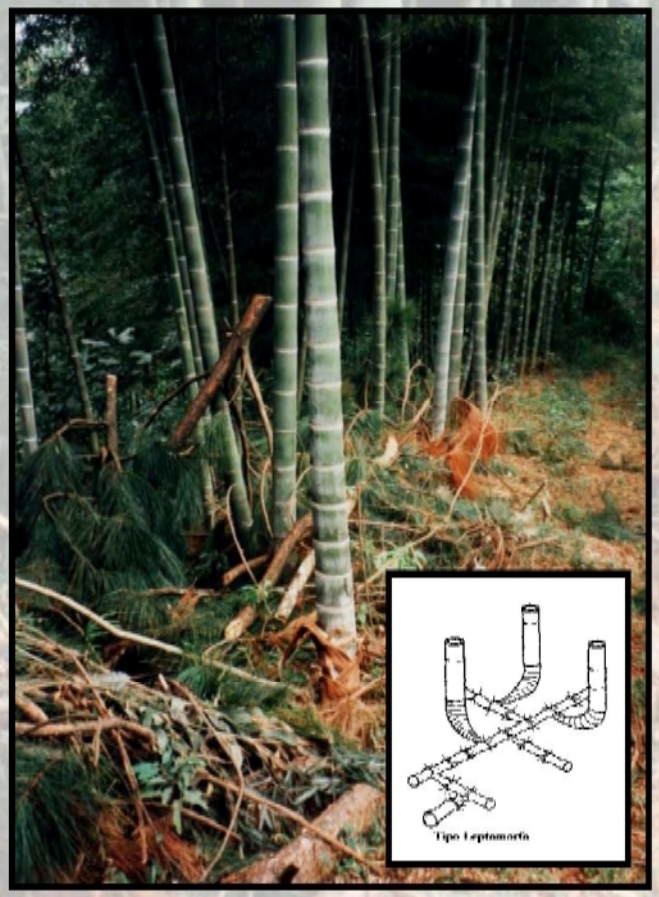


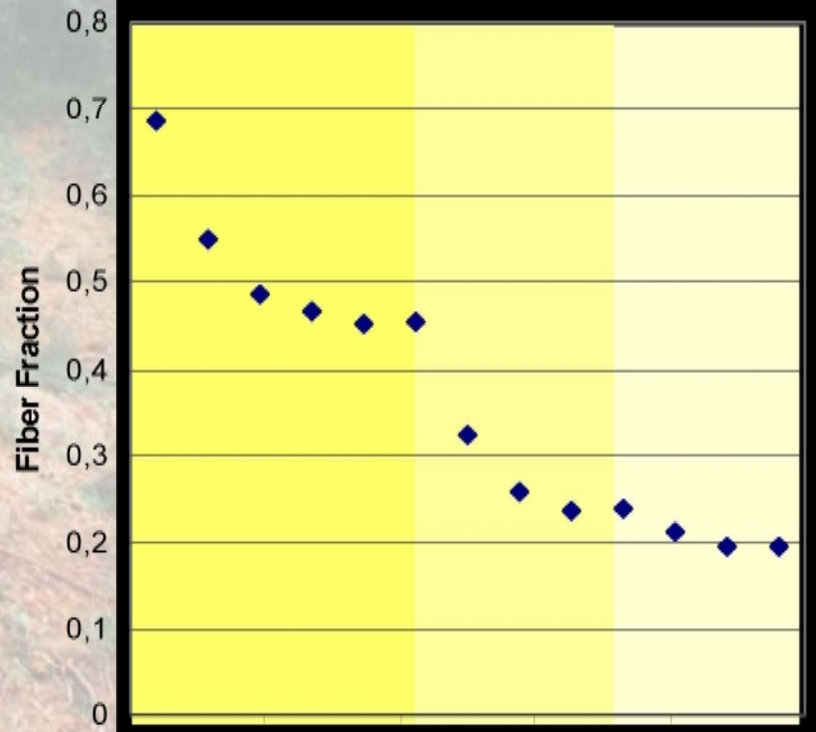
(a) Scanned image of the R-C cross section of the bamboo culm

(b) (b) Same area imaged by an optical microscope

(c) (c) L-R cut at the culm.

Analysis of the meso-structure of bamboo using an Astra Umax 2200 scanner and the NIH Image J software.





Research of bamboo for engineering

PUC Rio





The Measures for Ecological & stainable Construction Materials &Technologies for Green Buildings

The educational system should prepare students for design practice combining the knowledge and skills learned in basic studies.

Realistic constraints including the following considerations:

ETHICAL VALUES, HEALTH HAZARDS, SAFETY, LOCAL AVAILABILITY, ENVIRONMENTAL, SUSTAINABILITY, SOCIAL AND POLITICAL ECONOMY.

The Measures for Ecological & stainable Construction Materials &Technologies for Green Buildings



- Life cycle design
- Systems engineering
- Alternative fabrication processes
- Environmental impacts
- Safety/security considerations
- Societal and global considerations
- Economics and ethics
- Project management

The Measures for Ecological & stainable Construction Materials &Technologies for Green Buildings

The Nine Green Principles

1. **Engineer processes and products holistically, using systems thinking, and environmental impact assessment tools.**
2. **Conserve and improve ecosystems and human health and well-being.**
3. **Use life cycle thinking in all engineering activities.**
4. **Ensure that all materials and energy inputs and outputs are as**

   inherently safe and benign as possible.
5. **Minimize depletion of natural resources.**

The Measures for Ecological & stainable Construction Materials &Technologies for Green Buildings

The Nine Green Principles (Continue)

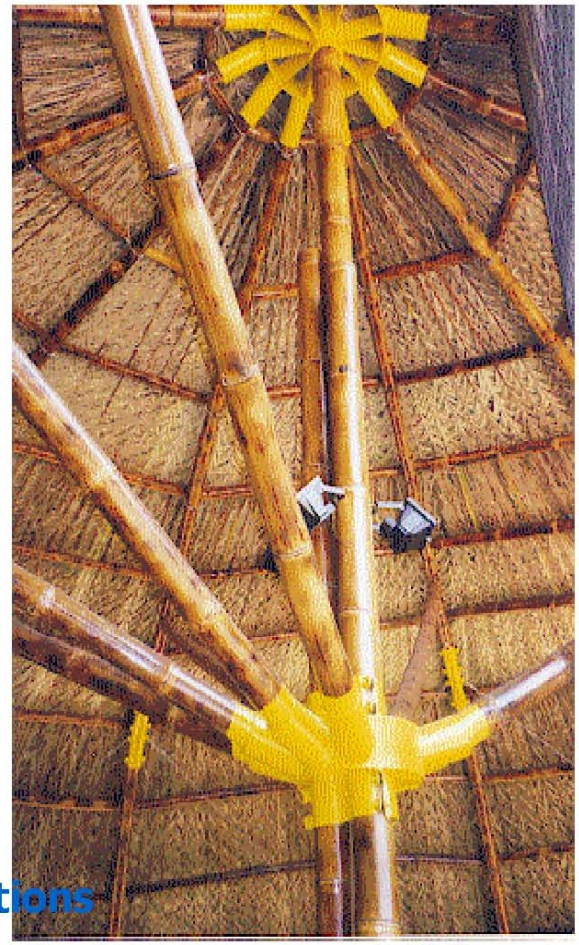
6. **Strive to prevent waste.**
7. **Develop and apply engineering solutions, being aware of local geography, aspirations and cultures.**
8. **Do not be limited by current or dominant technologies; seek**

   fundamental and incremental change.
9. **Create awareness in and engage communities and stakeholders.**

Indigenous memorial-MT: Bamboo structure with lateral walls made of soil covered by straw



General view



Detail of the bamboo connections

Indigenous memorial – Built in Campinas, MT (1980)



Front of the building detail



Interior detail





Bamboo house
in Itanhangá,
Rio de Janeiro-RJ

Musician instrument made from bamboo.





Bicycle to transport bamboo fishing in Vietnam

Capela de Andrelandia, M.G
Jose Luiz Mendes Ripper
PUC Rio



Capela de Andrelandia, M.G

Jose Luiz Mendes Ripper
PUC Rio



Capela de Andrelandia, M.G

Jose Luiz Mendes Ripper
PUC Rio



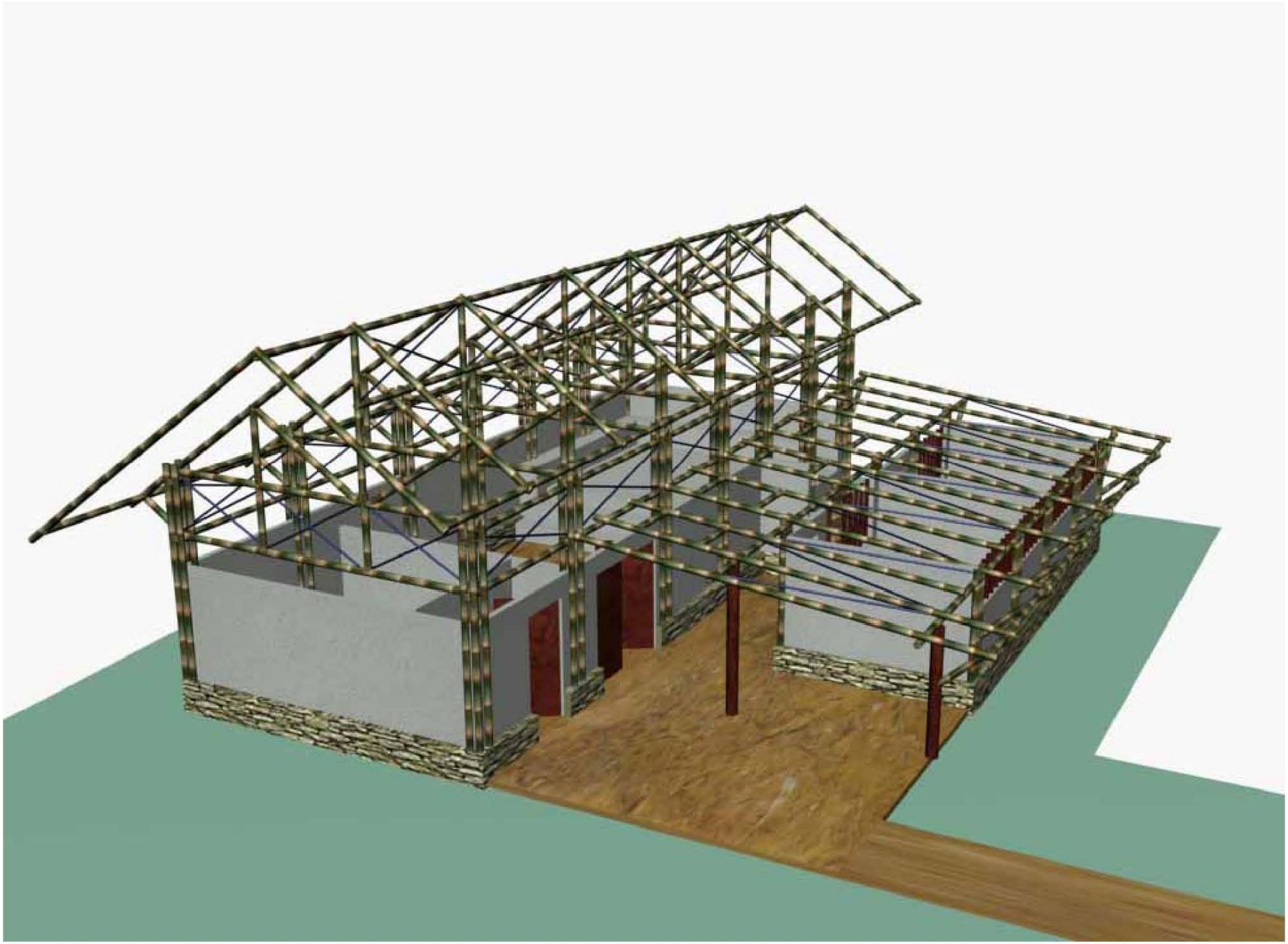

Parque Estadual da Serra do Mar
BR 101
Cachoeira da Escada
Os Poços
QUILOMBOS
19 - 21
Casa de Farinha
Piscina Natural
28 - 29
26
27
25
24
7 - 18
MAPA DO CAMBURY
Bar / Restaurante
01 Bar Cachoeira
02 Bar Divisa
03 Bar do Samuel
04 Bar do Donato
05 Restaurante Zé-Cobra
06 Restaurante Clorinda
07 Bar da Barra
08 Bar do Noeno
09 Bar do Vaico
10 Bar do Simão
11 Bar Raiz Caiçara
12 Vanusa Bar e Restaurant
13 Bar do Miguel
14 Bar Beira-Mar
15 Bar do Eliel
16 Bar e Restaurante do Dito
17 Bar do Andre
18 Bar do Inglês
19 Bar do Magrão
Camping / Casa
20 Casa Catherina
21 Casa Johanna
22 Casa Moisés
23 Casa Maria
24 Cafofo do Simão Preto
25 Camping Ypé
26 Camping Zé-Cobra
26 Casa Donato
27 Camping Dédé
28 Camping Georgina
29 Casa Altino

Bamboo pedestrian bridge built for local community by Belgian architects and engineers in collaboration with NOCMAT research group of PUC-Rio

Ubatuba – São Paulo/Brazil







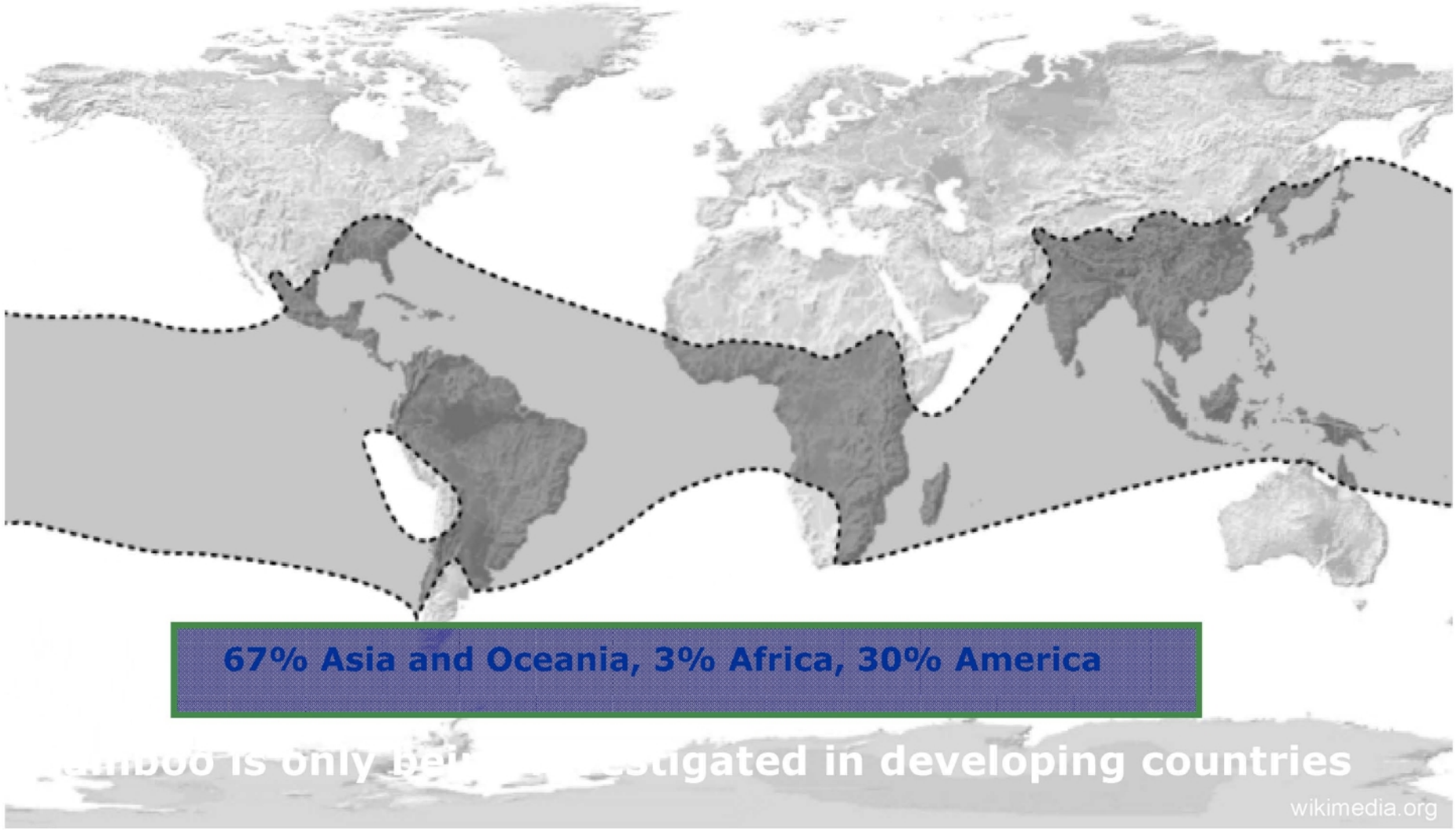








Bamboo: Distribution in the world



67% Asia and Oceania, 3% Africa, 30% America

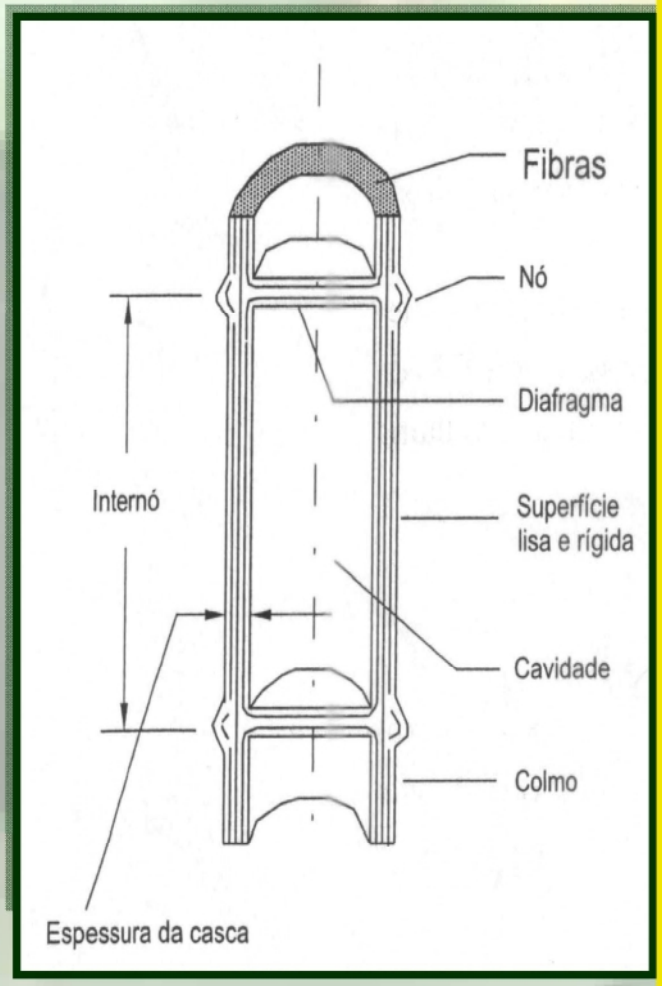
Bamboo is only be[illegible]stigated in developing countries

wikimedia.org

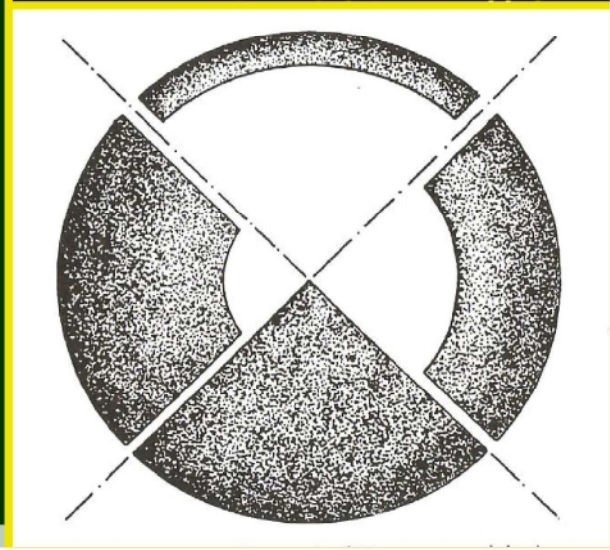
Bamboo Culm





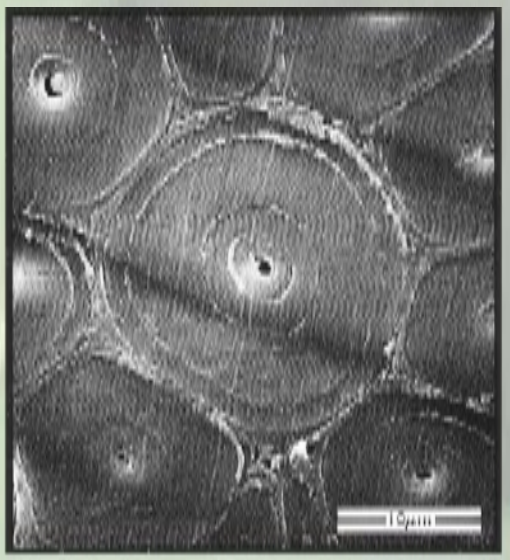

Fibras
Nó
Diafragma
Internó
Superfície lisa e rígida
Cavidade
Colmo
Espessura da casca



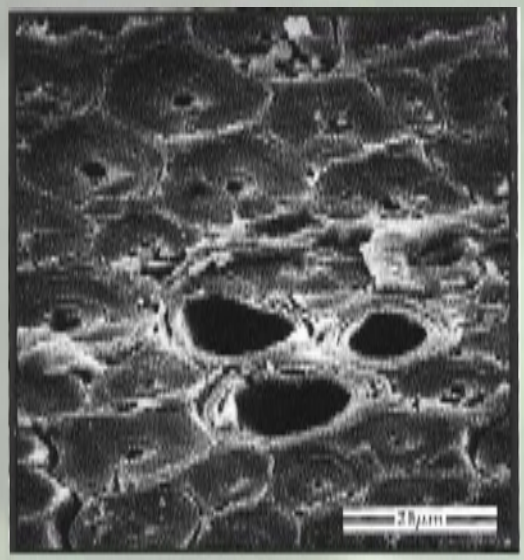


Bamboo micro-structure

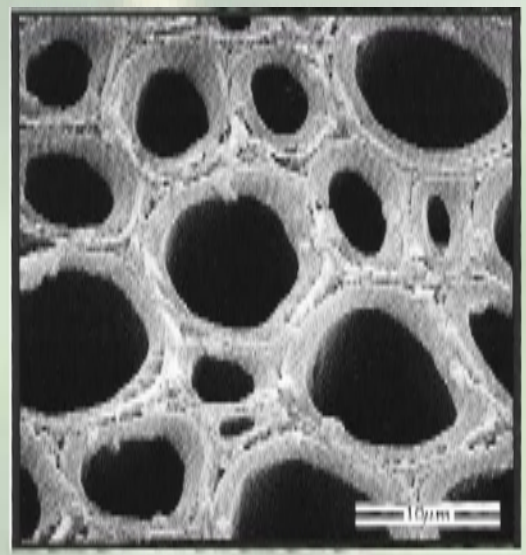
Fiber of a culm of *Phillostachys viridiglaucescens*



12 year old culm



8 year old culm



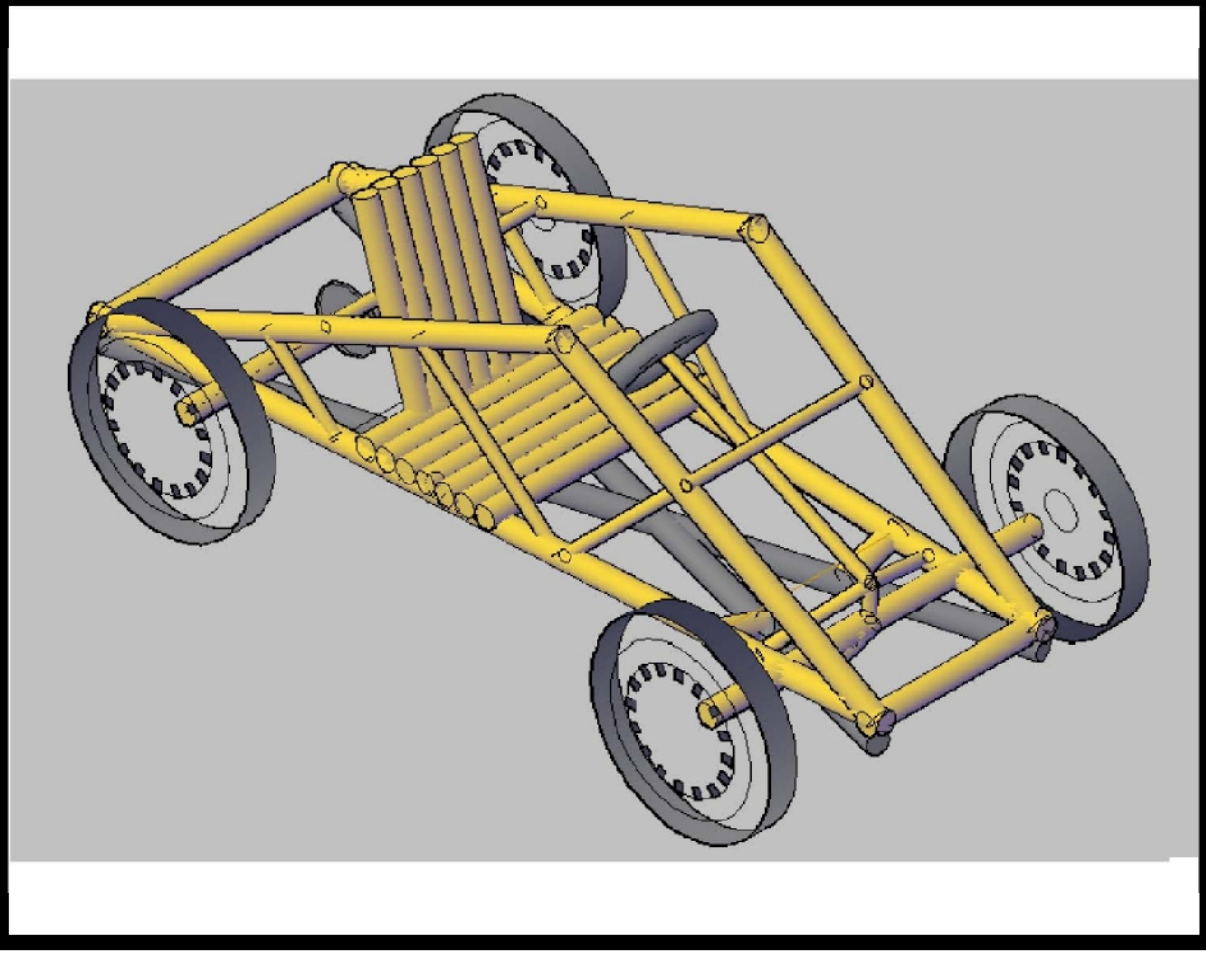
1 year old culm

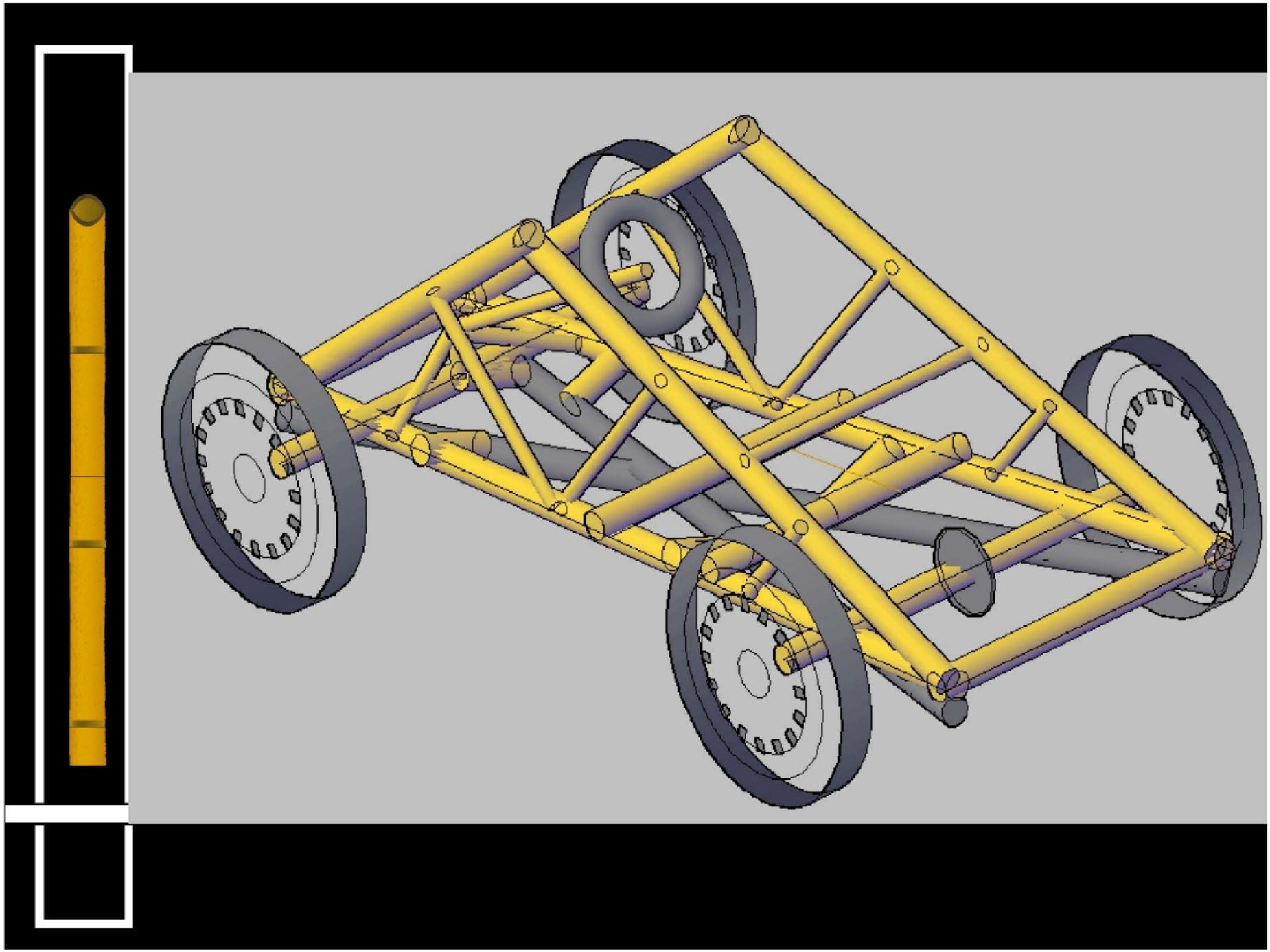
Photos from Liese

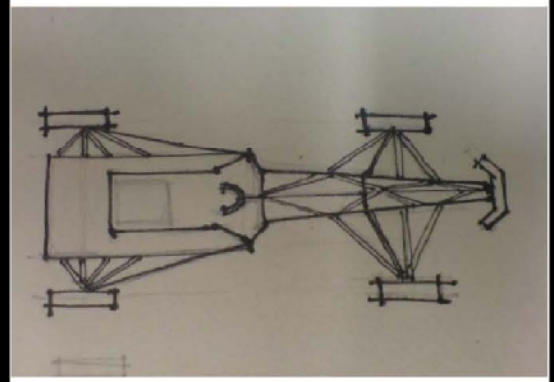


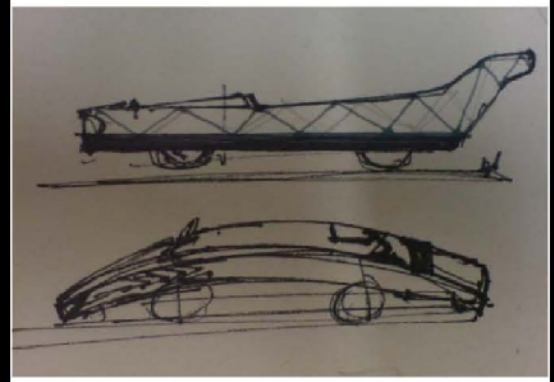


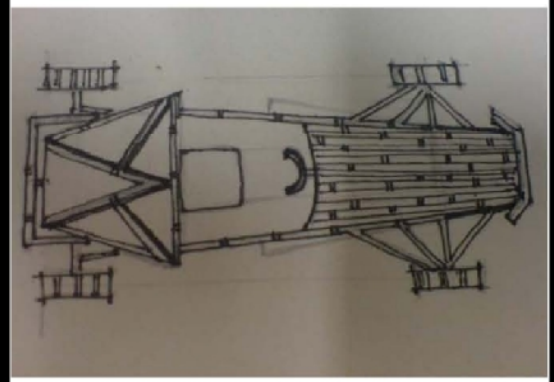
Treliça

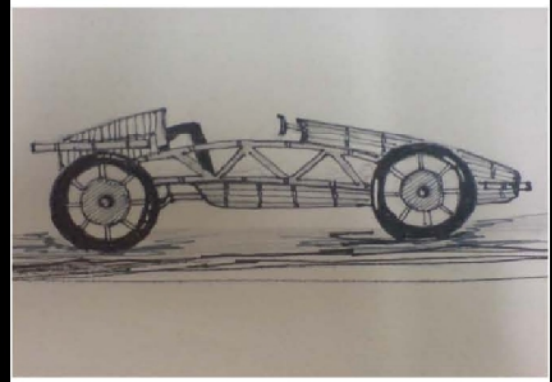




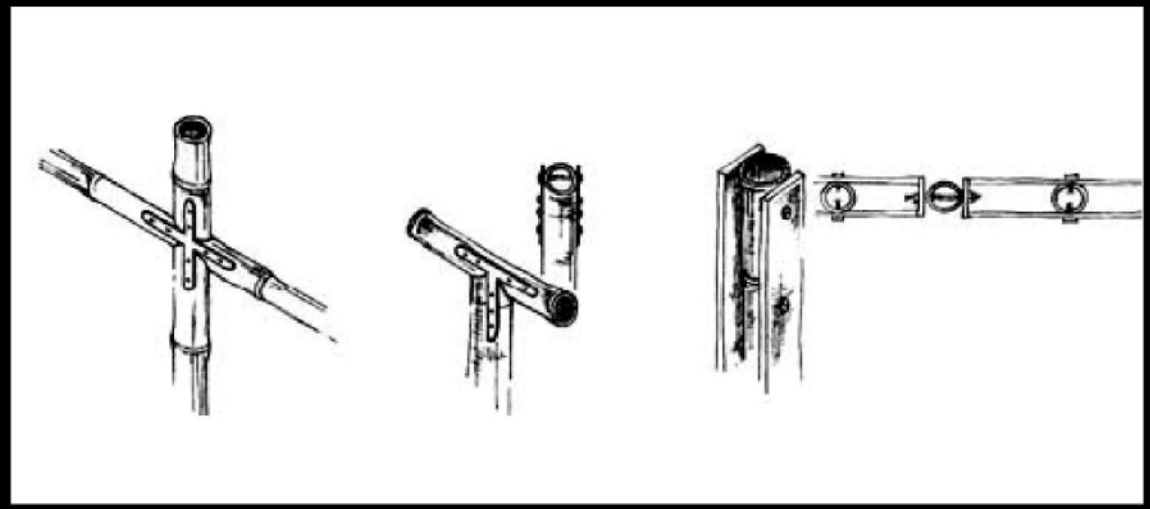


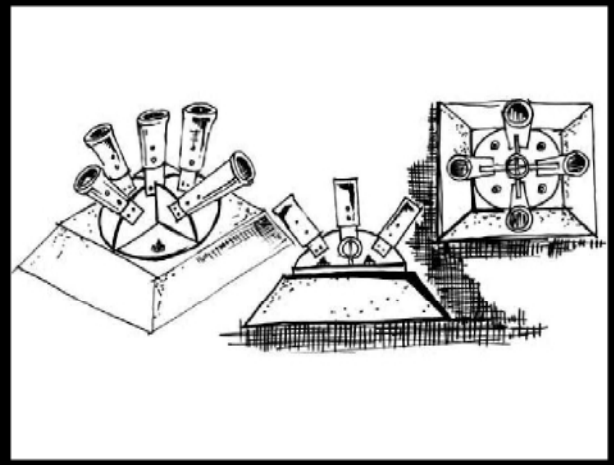


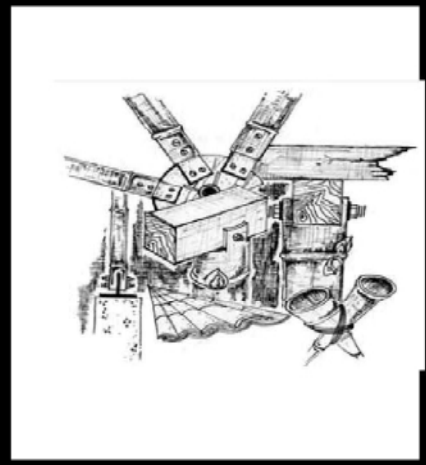




Esboço







Ligações












JUL 12 2004

Ainda precisa capacete de Bambu para o Carro do bambu...

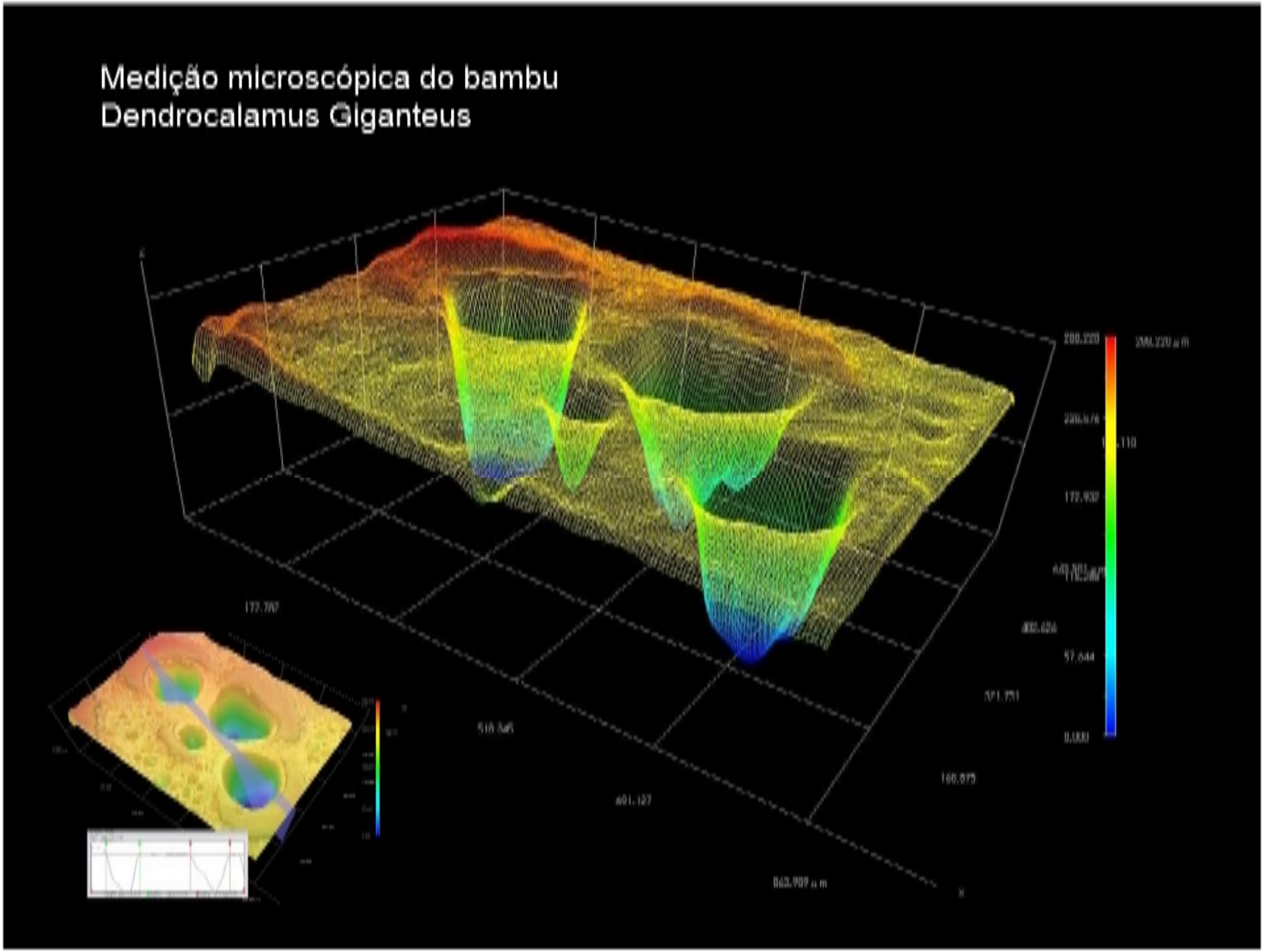




Bicicleta

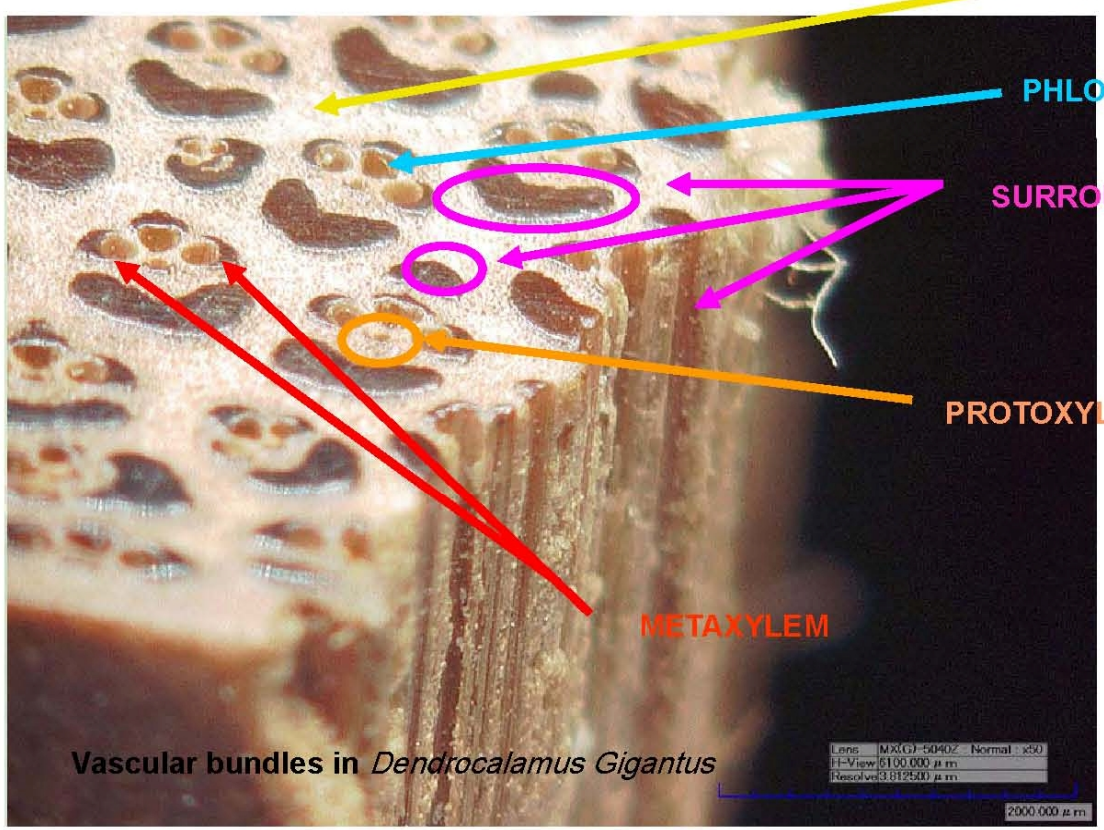
Medição microscópica do bambu
Dendrocalamus Giganteus




Medição microscópica do bambu
Dendrocalamus Giganteus

Bamboo micro-structure

BAMBOO MICROSTRUCTURE

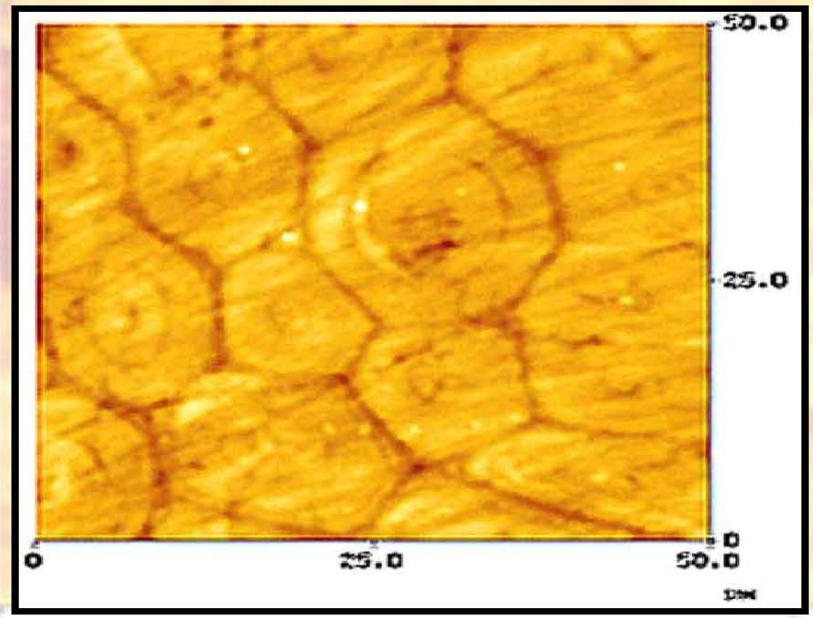


Vascular bundles in *Dendrocalamus Gigantus*

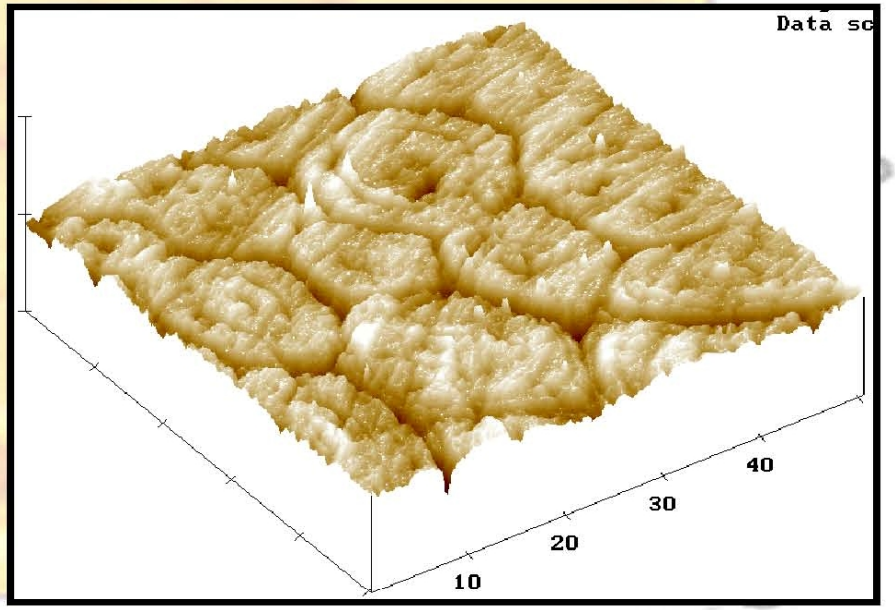
Photos ACHÁ E.H.N.



Atomic Force Microscopy (AFM)



(a) Surface of vascular bundles in 2-D image



(b) Surface of vascular bundles in 3-D image

A Veeco_DI 3100 Nanoscope AFM system was used in the tapping mode to characterize surface topography of the fiber bundles.

Future Buildings
(Nano Arhitecture Barcelona Marko - Spain)



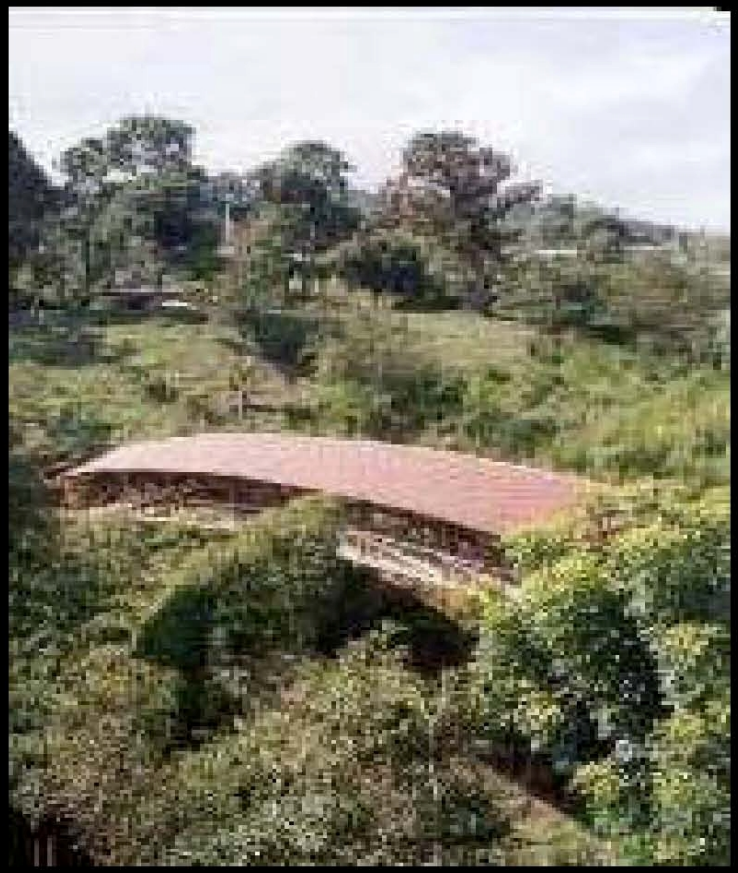
Future Buildings
(Nano Arhitecture Barcelona, Marko - Spain)



Future Buildings

(Nano Arhitecture Barcelona Marko - Spain)









Ponte de Bambu na
Colômbia

- **Para sérios problemas, soluções cri**





Passarela de bambu em Stuttgart-Alemanha



Ponte de Bambu na Colômbia

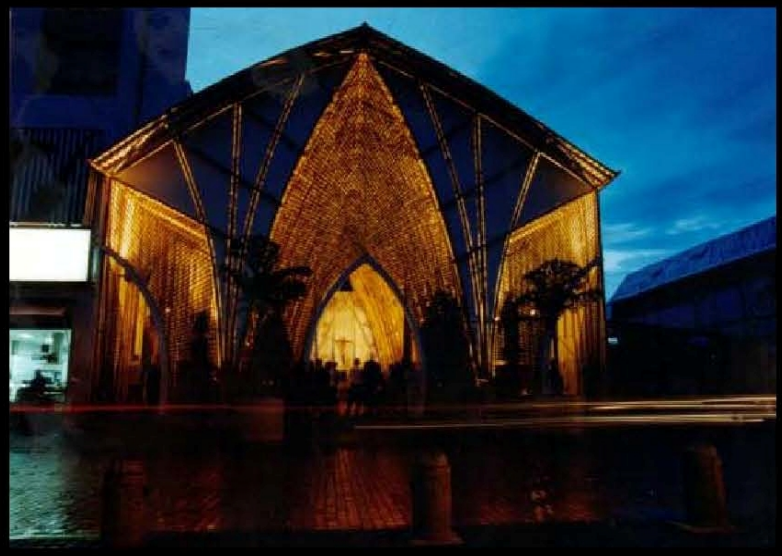
ZERI pavilhão de bambu na Expo Hanover 2000- Alemanha





Casa de bambu em Vietnã

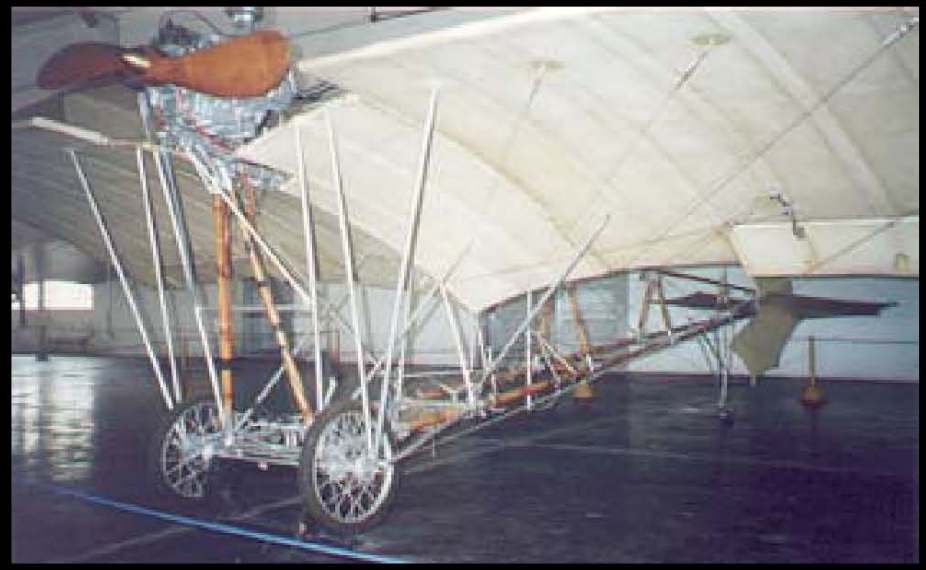






Catedral de Bambu na Colômbia

Avião Demoiselle construído e comercializado por Santos Dumont em 1906

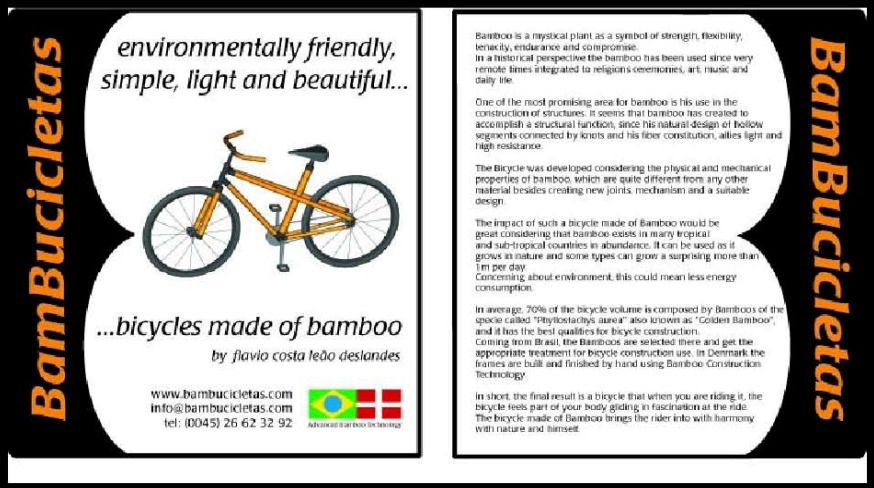


Estrutura em bambu e cabos de fio de piano





Bambucicletas desenvolvidas na PUC-Rio/ LOTDP, Prof. Ripper em Colaboração com o grupo de Materiais Não-Convencionais da Eng. Civil





Some of the on-going research and application Programs on NOCMAT

In the year of Vegetable Fibers "UNISCO"

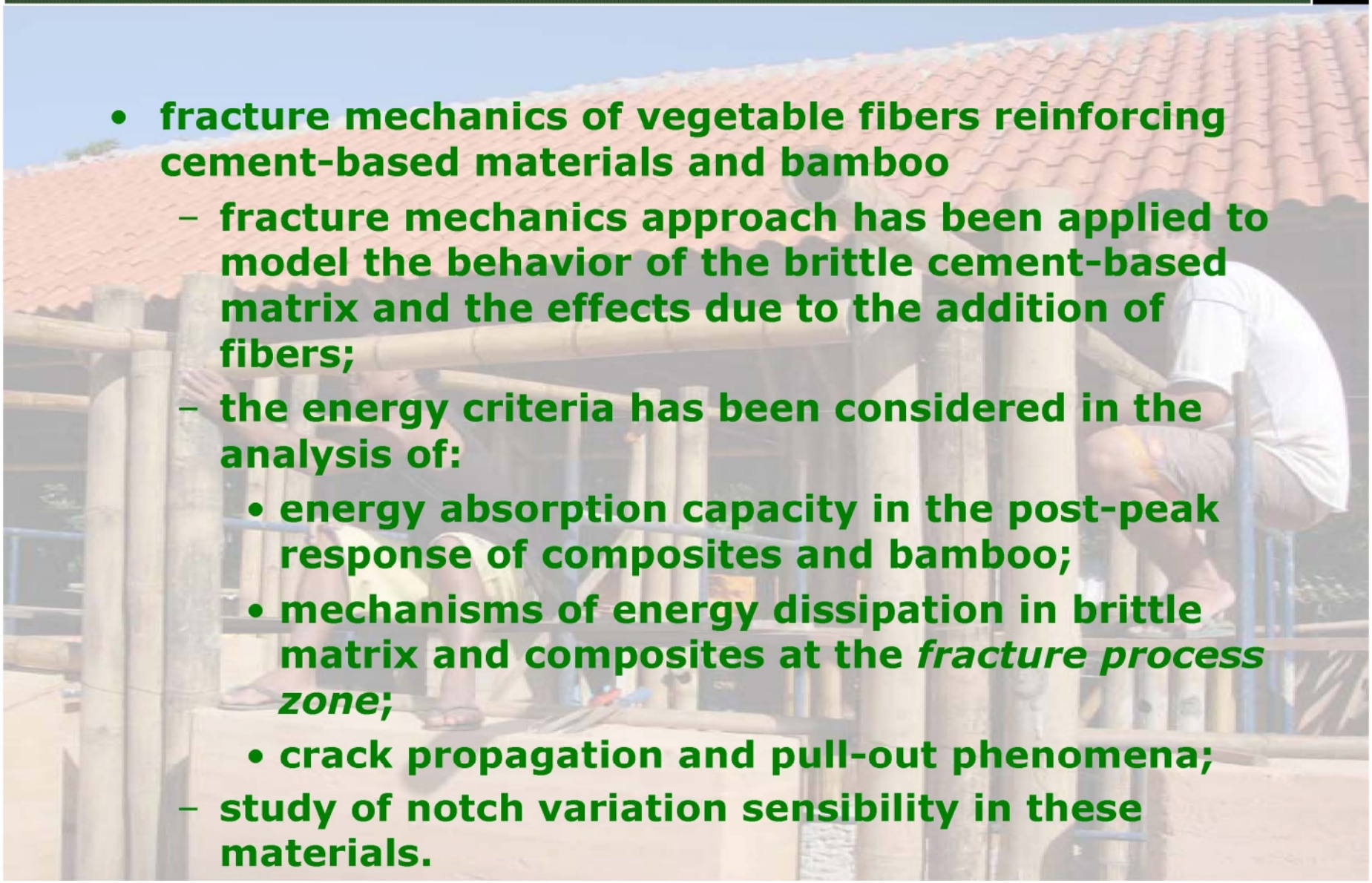
Continuation of the studies on Bamboo as a construction Materials. Development of new structure, new treatment and the plantation of bamboo where it would be possible.

Cement-based composites reinforced with natural fibers including pulps; - Sisal, Coconut, eucalyptus, bamboo and wollastonite.

- influence of fibers on the cement-based composite (shrinkage, creep,compression, bending, fracture toughness, impact, rheological aspects, micro-structural analysis, temperature effects, and porosity);
- durability analysis of fibers in cementitious environment and and their treatment methods;
- statistical analysis of physical and mechanical properties of these vegetable fibers
- Study of Polymer composites reinforced with vegetable Fibers

Plants as engineering materials: the research at PUC-Rio

(Current projects and main problems involved)



- fracture mechanics of vegetable fibers reinforcing cement-based materials and bamboo
  - fracture mechanics approach has been applied to model the behavior of the brittle cement-based matrix and the effects due to the addition of fibers;
  - the energy criteria has been considered in the analysis of:
    - energy absorption capacity in the post-peak response of composites and bamboo;
    - mechanisms of energy dissipation in brittle matrix and composites at the *fracture process zone*;
    - crack propagation and pull-out phenomena;
  - study of notch variation sensibility in these materials.

Plants as engineering materials: the research at PUC-Rio (looking for the future)

- durability of plants
  - the improvement of the durability of vegetable fibers used in cement-based composites can be reached through:
    - modifying matrix constitution in order to diminish the alkaline attack;
    - pre-treatment of fibers to prevent the water absorption;
  - the durability of bamboo culms can be reached considering the following treatments:
    - compatible polymer impregnation;
    - low cost smoking treatment (thermal treatment);
    - application of chemical non-polluting products.

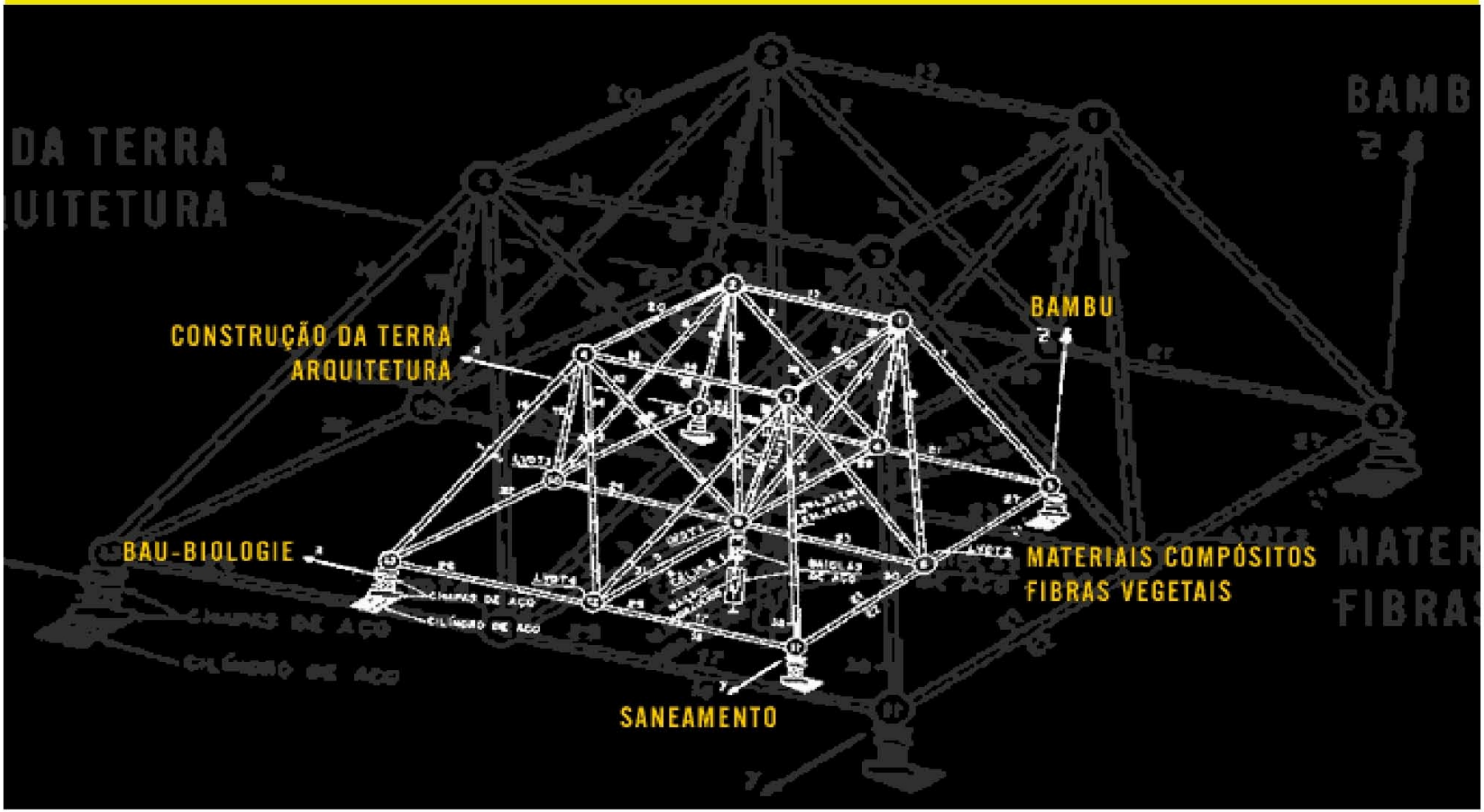
The ABMTENC site Today

It is in English and Portuguese

- History
- Administration
- Membership
- Registration
- Research Areas
- Bulletin
- Events
- Links



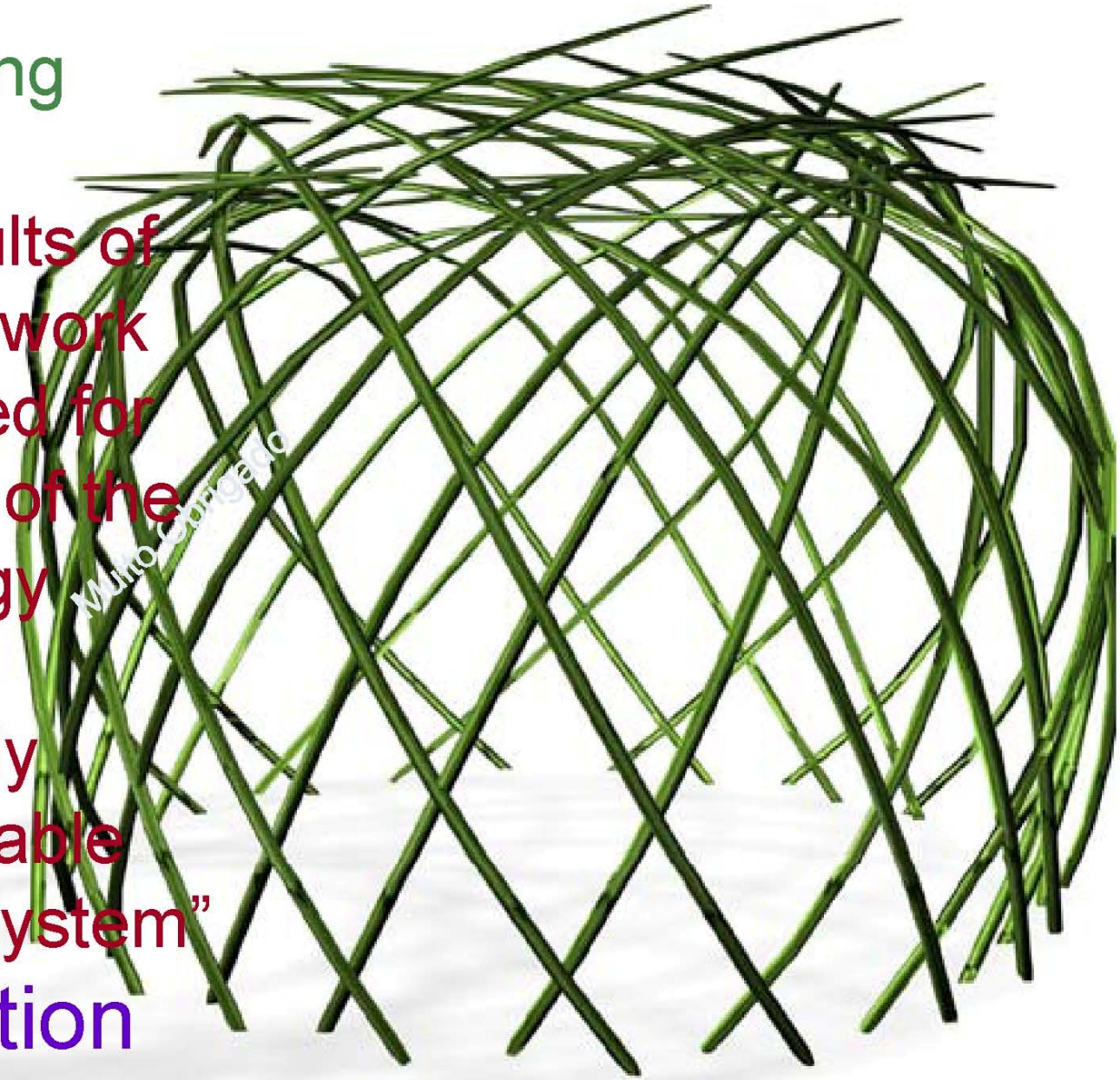
ABMTENC
Areas of Work - Today

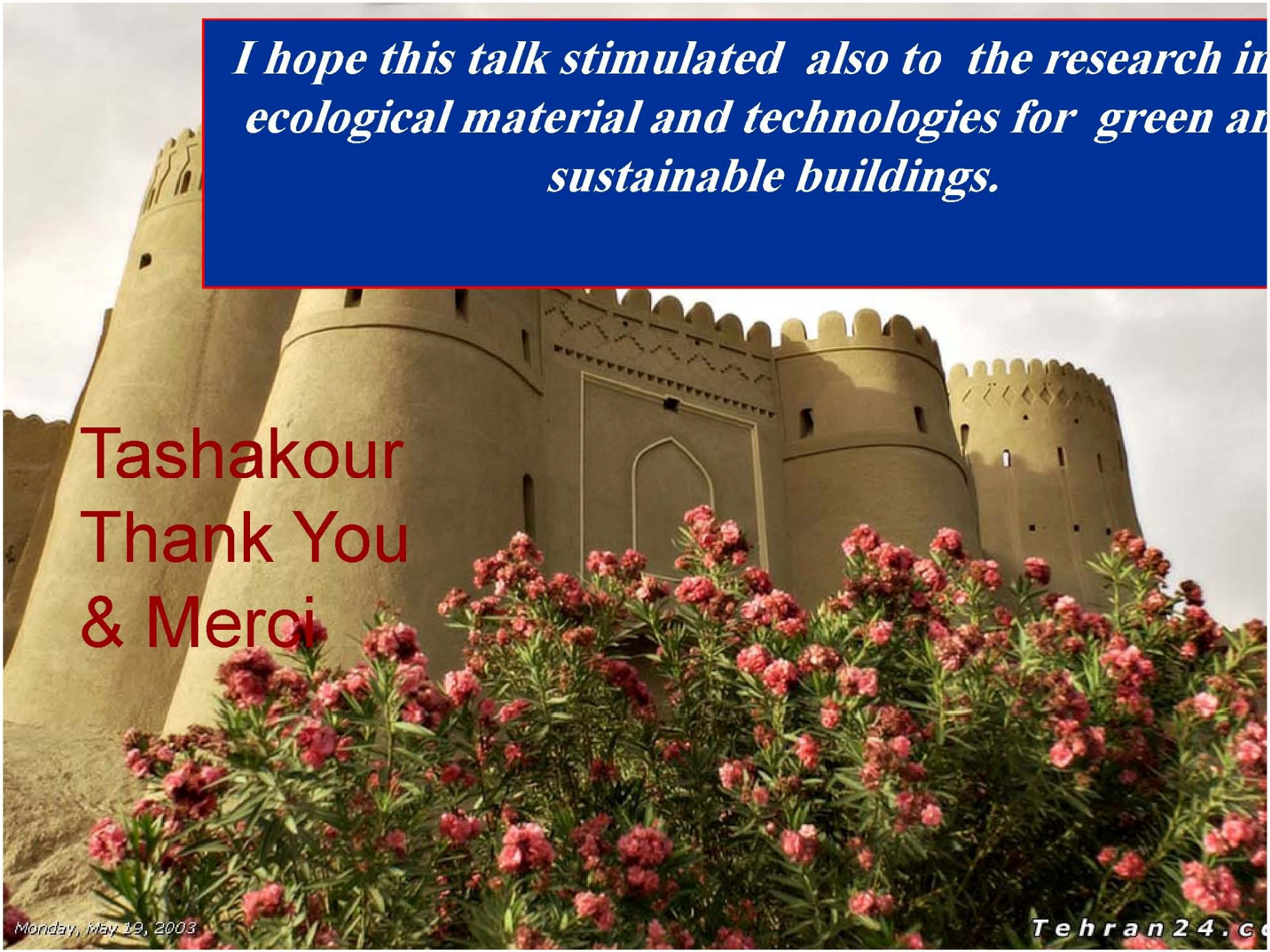


Bamboo growing House

I hope the results of the developed work could be applied for the foundation of the "Road to Energy Efficient and Environmentally Friendly Affordable Construction System"

Congratulation for the initiative




I hope this talk stimulated also to the research in
ecological material and technologies for green an
sustainable buildings.
Tashakour
Thank You
& Merci
Monday, May 19, 2003
Tehran24.c



LEED Exam Review

Water Efficiency, Energy and Atmophere

1. Bioswales support which of the following credits (choose 2)
    A. Brownfield Redevelopment
    B. Stormwater Management: Rate and Quantity
    C. Site Selection
    D. Stormwater Management: Treatment
    E. Water Efficient Landscaping

2. Reducing a building's water use by 40% from the Energy Policy Act baseline earns (choose 3):
    A. Innovation in Design
    B. Heat Island Effect
    C. Resource Reuse
    D. Water Use Reduction: 20%
    E. Stormwater Management
    F. Water Use Reduction: 30%

3. potable water can be described as:
    A. water supplied from wells and best used in site irrigation
    B. wastewater that meets tertiary standards
    C. water that is suitable for drinking and is supplied from wells or municipal systems
    D. Greywater supplied by municipal systems.

4. Which of the following can contribute to the EA Credit 2 (choose 2)?
    A. Passive solar design
    B. Photovoltaic collectors
    C. Daylight harvesting
    D. Solar thermal hot water heating
    E. Wind turbines

5. "xeriscape" refers to:
    A. absence of water in landscape design and installations
    B. use of overhead sprinklers
    C. adoption of water conservation as the primary design element
    D. absence of turf grass

6. construction of a building baseline model establishes:
    A. Building footprint on the site
    B. Instrument by which to test daylighting strategies
    C. Benchmark to measure the effect of reduction in VOC's
    D. Set of initial values against which to compare the effects of specific greening strategies

7. All of the following are examples of Additional Commissioning tasks, except:
    A. a commissioning authority independent of the design team conducts a review of the design documents prior to the construction documentation phase

B. a commissioning authority independent of the design team conducts a review of the design documents prior to the end of the construction documentation phase
C. identification of the Commissioning Team and its responsibilities
D. a commissioning authority independent of the design team reviews contractor submittals

8. Buying 40% of a building's electricity from a renewable energy source will earn which LEED credit?
   A. Renewable Energy
   B. Green Power
   C. Innovation
   D. Optimize Energy Performance
   E. None of the above

9. Which of the following contributes most to energy consumption in core-load-dominated buildings?
   A. electric lighting and occupants
   B. insufficient roof insulation
   C. heat gain through walls
   D. inefficient boilers

10. Greywater can be collected from (choose 2):
   A. toilets
   B. bathroom sinks
   C. urinals
   D. kitchen sinks
   E. showers

11. Drip irrigation can be used to:
   A. meet Energy Policy Act requirements
   B. reduce site water usage
   C. control water loss from leaky faucets
   D. measure water usage

12. Water efficient landscaping credit WE 1.1 requires:
   A. drip irrigation
   B. rainwater capture for use in irrigation
   C. 30% reduction in potable water use for landscaping
   D. 50% reduction in potable water use for landscaping

13. LEED considers each of the following to be renewable energy technologies, except:
   A. Biomass fuels
   B. Wind energy
   C. photovoltaics
   D. geo-thermal heat exchange

14. Which of the following building components are not regulated by ASHRAE 90.1:
    A. heating, ventilation, and air conditioning
    B. service hot water
    C. building envelope
    D. plug loads

15. Which of the following are not regulated by Energy Policy Act 1002?
    A. Urinals
    B. Showerheads
    C. Evaporative coolers
    D. Metering faucets

16. ASHRAE 90.1 describes or refers to:
    A. A method of testing ventilation filters for particulate removal efficiency
    B. Building energy performance standards
    C. Minimum ventilation effectiveness
    D. Standard for measuring air change effectiveness

17. Building Integrated Photovoltaics can be defines as:
    A. PV's that are integrated into the building architecture
    B. PV's used as roof shingles
    C. PV's used as shade devices
    D. All of the above

18. Blackwater can be defined as:
    A. wastewater from irrigation systems that contains organic material
    B. rainwater capture with treatment systems
    C. wastewater from toilets and kitchen sinks that contains organic material
    D. Wastewater emptied into a river.

19. Regulated energy systems, per EA Credit 1, include each of the following except:
    A. HVAC
    B. Interior lighting
    C. Exterior lighting
    D. Service hot water

20. How much potable water is used to flush toilets daily in the US?
    A. 100,000 gallons
    B. 1 million gallons
    C. 5 billion gallons
    D. 10 billion gallons

21. Production of which gas was halted in the U.S in 1995?
    A. HCFC
    B. HFC
    C. CFC
    D. Halon

1. Open Space can be defined as:
    A. Property area minus the development footprint
    B. Property area minus the building footprint
    C. Native landscape area
    D. Previously developed areas that have been returned to public ownership

2. Vegetated or green roofs can apply to which three of the following credits?
    A. Innovation in Design
    B. Heat Island Effect
    C. Resource Reuse
    D. Thermal Comfort
    E. Stormwater Management
    F. Optimize Energy Performance

3. For LEED purposes, a "greenfield" is defined as:
    A. Land that is undeveloped or has not been significantly or adversely impacted by human activity
    B. Land that has previously been developed and is designated as protected open space
    C. Land which prior to acquisition was prime farmland or public parkland
    D. Vegetated or pervious landscape

4. Which of the following is an example of stabilization to control erosion and sedimentation
    A. earth dike
    B. silt fence
    C. sediment trap
    D. permanent seeding

5. "Solar reflectance" refers to:
    A. amount of visible light reflected by a material
    B. ratio of solar energy reflected to total incident solar energy
    C. the opposite of emissivity
    D. the same as emissivity

6. Identify the LEED credit or prerequisite that requires or refers to "staging areas":
    A. Reduced Site Disturbance
    B. Construction Waste Management
    C. Erosion and Sedimentation Control
    D. Construction IAQ Management Plan

7. LEED Alternative Transportation Credit 4 covers each of the following, except
    A. Commuter rail
    B. Bicycles
    C. Alternative fuel vehicles
    D. Mopeds

8. Utilization of bioswales provides advantages most directly towards (choose two):
    A. Water efficient landscaping
    B. Stormwater management
    C. Brownfield redevelopment
    D. Site selection
    E. Stormwater treatment

9. All of the following are undesirable places to build, except:
    A. prime farmland
    B. land that provides habitat for endangered species
    C. land at an elevation within 5 ft of the FEMA 100 yr flood line
    D. land within 500 ft of a wetlands

10. A site can be classified as a brownfield by each of the following, except:
    A. Local agency
    B. Civil engineer
    C. County court
    D. EPA

11. Sustainable Sites Prerequisite 1 references which of the following standards:?
    A. EPA 832/R-92-005
    B. ASHRAE 129-1997
    C. ASHRAE/IESNA 90.1 – 1999
    D. SCAQMD Rule #1168

12. Which of the following is not an example of EPA's Best Management Practices for Stormwater Management:
    A. grassy swales
    B. impervious pavement
    C. porous pavement
    D. dry pond

13. a full cut-off luminaire can contribute to achieving which credit?
    A. Optimize energy performance
    B. Heat island effect
    C. Light pollution reduction
    D. Stormwater management

14. what is required for SS C 6.2?
    A. remove 90% of TSS
    B. remove 40% of TP
    C. remove 80% of TSS and 40% of TP
    D. cut pollutants by 50% beyond pre-development rates

1. Credit Interpretation Rulings are or provide all of the following, except:
    A. Posted in response to written requests for interpretations of credit requirements
    B. Determination of whether a particular strategy can be used to satisfy two different credits at once
    C. Precedents for interpretation of LEED credits regarding specific strategies and applications
    D. Accessible to USGBC members and registered project teams

2. Registration of a LEED project includes each of the following except:
    A. Online access to letter templates
    B. Three credit interpretation rulings
    C. Online project listing
    D. Designation of a project team contact person

3. The LEED Reference Guide does not include which of the following:
    A. Credit Intent
    B. Letter Templates
    C. Credit Requirements
    D. Credit Submittal information

4. LEED registration fees are based on:
    A. Project type
    B. Building square footage
    C. Project location
    D. Building type

5. The LEED Reference Guide is:
    A. a guide of all referenced standards with abstracts regarding environmental policies
    B. a sustainable design guide and user's manual for LEED
    C. a sustainable material resource guide
    D. a green building directory

6. LEED projects are registered by which of the following processes:
    A. Setting up a meeting with the USGBC
    B. Completing the on-line registration at usgbc.org
    C. Completing the automated telephone registration process
    D. Printing and completing the on-line registration form and mailing it to the USGBC

7. The following are all prerequisites for LEED Certification, except:
    A. Low-VOC Materials
    B. Fundamental Building Systems Commissioning
    C. Storage and Collection of Recyclables
    D. Environmental Tobacco Smoke Control

8. Points are credited towards a project's LEED Certifications for:
    A. Involving a LEED AP to guide the project
    B. Meeting the prerequisites
    C. Registering the project during SD
    D. Having all design team members take a LEED workshop

9. All of the following are avenues for technical assistance, except:
    A. LEED Reference Guide
    B. Unlimited free CIR's
    C. Access to posted CIR's
    D. LEED Workshop

10. Green Spec provides:
    A. Commissioning specifications
    B. LEED specifications
    C. Energy efficiency specifications
    D. Detailed listing of green building products

11. All of the following are Versions of the LEED Rating System
    A. LEED EB
    B. LEED Application Guide for Healthcare
    C. LEED NC
    D. LEED CS

12. Each of the following are available on the BuildingGreen website, except:
    A. Environmental Building News
    B. LEED Reference Guide
    C. A directory of articles, products, and case studies related to LEED
    D. Green Spec Directory

13. The USGBC website provides which of the following information for most LEED Certified projects (select 2):
    A. Final LEED scorecard
    B. Project statistics, including design and construction costs
    C. Comparison with other projects
    D. Brief case-study description (in some cases)

14. Within the US, what percentage of electricity is used by buildings?
    A. 20%
    B. 30%
    C. 40%
    D. 60%

15. Where did BREEAM and BEPAC come from?
    A. Canada
    B. United States
    C. Australia
    D. United Kingdom

Materials and Resources, Indoor Environmental Quality

1. How much of their time does the average American spend indoors?
    A. 30%
    B. 40%
    C. 70%
    D. 90%

2. What does ASHRAE stand for?
    A. American Society of Heating, Refrigeration, Architects, and Engineers
    B. American Society of Heating, Refrigeration, and Air-Conditioning Engineers
    C. Association of Standards for Heating, Refrigeration, and Air-Conditioning Engineers
    D. Amercing Society of Heating, Restoration, and Air-Conditioning Engineers

3. Underfloor air distribution systems could contribute to which of the following credits (choose 3):
    A. Optimize Energy Performance
    B. Construction IAQ Management Plan
    C. Ventilation Effectiveness
    D. Indoor Chemical and Pollutant Source Control
    E. Controllability of Systems
    F. Thermal Comfort

4. ASHRAE 62-1999 refers to?
    A. Heating requirements
    B. Lighting levels
    C. Ventilation requirements
    D. Greenhouse gas regulations

5. Materials and Resources Prerequisite 1 requires:
    A. Use of 5% recycled content
    B. Storage and collection of recyclables
    C. Recycling of office paper during design
    D. Construction waste management

6. All of the following describe a materials embodied energy except:
    A. Energy required to harvest, mine, manufacture, and install
    B. Maintenance and operating energy
    C. Cradle to grave
    D. Life cycle assessment

7. What does "FSC" stand for?
    A. Forest Services Coalition
    B. Forest Stewardship Certified
    C. Fir-trading Stewardship Council
    D. Forest Stewardship Council

8. Daylight Factor is a measure of:
    A. The amount of daylight in a space relative to the amount of artificial light in that space
    the reduction in electric lighting power made possible by a given level of daylighting
    B. The amount of daylight in a space relative to the amount available outside the building
    C. The amount of daylight, per unit area, transmitted by a given glazing system

9. Provide capacity for indoor air quality monitoring to help sustain long-tem occupant comfort and well-being is the intent of which credit?
    A. Carbon Dioxide Monitoring
    B. Minimum IAQ Performance
    C. Measurement and verification
    D. Low-emitting Materials

10. What does "VOC" mean?
    A. Volatile Organic Carcinogen
    B. Volatile Off gassing Content
    C. Volatile Organic Compound

11. To satisfy Materials and Resources Prerequisite 1, onsite facilities must be provided to separate, collect, and store which of the following (choose 3):
    A. Plastic
    B. Corrugated cardboard
    C. Paperboard
    D. Metals
    E. Food waste

12. Which credit requires the maintenance of relative humidity levels between 30% and 60%?
    A. Thermal Comfort
    B. Controllability of Systems
    C. Ventilation Effectiveness
    D. Indoor Chemical and Pollutant Source Control

13. ASHRAE 55-1992 refers to which two building conditions (choose 2):
    A. Temperature
    B. Lighting
    C. Humidity
    D. Indoor air quality

14. post-consumer recycled content can be defined as:
    A. Consumer waste that is reused
    B. Consumer waste that has become feedstock for another product
    C. Output from a process that has not been used as part of a consumer product
    D. Consumer waste that has been diverted from a landfill

15. Examples of rapidly renewable materials include (choose 3):
    A. Bamboo flooring
    B. Steel casework
    C. Rubber flooring
    D. Vinyl siding
    E. FSC veneer
    F. Strawboard casework

16. each of the following are considered to contain post-industrial recycled content, except:
    A. composite board containing sawdust from a sawmill
    B. carpet padding with scrap rubber from a tire plant
    C. wallboard, sheathing, or decking made from recycled newspaper
    D. concrete containing fly ash

17. For EQ Credit 4, a point may be earned for low VOC materials in the following categories, except:
    A. Interior paint
    B. Interior adhesives
    C. Exterior adhesives
    D. Carpet

18. salvaged materials may be defined as:
    A. materials harvested within a 10 year cycle
    B. materials with recycled content
    C. material recovered from a precious use
    D. materials that can be reused in the future

19. Which of the flowing are not accounted for in the Controllability credits?
    A. humidity
    B. temperature
    C. airflow
    D. lighting

EXECUTIVE SUMMARY

U.S. Green Building Council Strategic Plan 2009 – 2013

I. Leading Transformation in a Rapidly Changing World

The U.S. Green Building Council has developed its strategic plan for 2009 – 2013 amidst rapidly changing conditions. "Green" is booming. Being green has become mainstream. At the same time, achieving sustainability on a large scale is still very far off. Green buildings and other green products remain very small percentages of total market shares.

The pace of change must increase to prevent significant deterioration of ecological conditions in many places around the world. USGBC is keenly aware of the scope and scale of these challenges—and we are prepared to evolve as needed to mobilize and lead the building community's contribution to the transformation toward sustainable communities.

As our understanding of USGBC's mission broadens, so must the scope of our strategies and programs evolve and expand. This plan sets forth our strategic vision for the next five years.

Key Strategic Issues Facing the Green Building Community

Key strategic issues facing the green building community in general, and USGBC in particular, include:

- Shift in emphasis from individual buildings toward the built environment and broader aspects of sustainability, including a more focused approach to social equity;
- Need for strategies to reduce contribution of the built environment to climate change;
- Rapidly increasing activity of government in green building arena;
- Lack of capacity in the building trades to meet the demand for green building;
- Lack of data on green building performance;
- Lack of education about how to manage, operate, and inhabit green buildings; and,
- Increasing interest in and need for green building expertise internationally.

II. Guiding Principles

Along with its *Vision* and *Mission*, USGBC's *Guiding Principles* provide the foundation upon which the work of the organization stands and the reservoir of intent and imagination out of which its strategy grows. They also serve as touchstones by which USGBC evaluates the success and integrity of its work both inside and outside of the organization.

Fostering Social Equity: USGBC seeks to elevate social equity as a value and outcome integral to sustainable built environments. Because this dimension of sustainability and the triple bottom line has received too little attention both by USGBC and the green building community at large, we have added *Foster Social Equity* as a *Guiding Principle*.

III. Agenda for Transformation: Strategic Goals and Objectives

The strategic goals presented here define the priorities USGBC will pursue to further its mission over the next five to ten years:

- **Sustainable Cities and Communities:** Catalyze and lead the building sector's active participation in the movement to achieve sustainable cities and communities.
- **Climate and Natural Resources:** Lead the dramatic reduction and eventual elimination of building construction and operations' contribution to climate change and natural resource depletion.

- **Green Building Marketplace:** Accelerate green building demand, delivery, and accessibility.
- **Public Policy:** Advocate for effective and comprehensive green building policy and codes at all levels of government.
- **International:** Advance green building around the world by developing certification capacity, sharing knowledge, and collaboratively advancing regionally appropriate and effective green building practices and policies.
- **Organizational Excellence:** Leverage USGBC's organizational structure and capacity to support and catalyze the market transformation required to achieve its mission.

IV. Program: How USGBC Achieves Its Goals

USGBC core programs and competencies guide its choices about how best to pursue its mission and goals.

Leadership and Transformation: USGBC provides leadership to the green building community and society at large by advancing effective, cutting edge innovation in green building vision, theory, practice, design, and construction.

Education: USGBC will continue to raise awareness of critical issues and build capacity among a wide range of sectors within the building community, as well as those who purchase, manage, operate, maintain, and regulate buildings.

Research and Development: Research and development play a vital role in the achievement of USGBC's vision and mission by accelerating the scope and scale of green building. USGBC seeks to drive research critical to the expansion of green building.

Outreach: A strong partnership and close coordination between USGBC and its chapters and members is essential to fulfilling USGBC's mission. USGBC will continually refine the relationship between the national organization and chapters to enable maximum effectiveness in achieving the goals of all.

Advocacy: Societal transformation of the scope and scale required to realize USGBC's vision requires changes in public policy at all levels of government. USGBC will continue to expand the application of direct advocacy both for comprehensive efforts to transform the built environment and for particular legislative or regulatory outcomes.

Collaboration: Large-scale transformation requires creating partnerships, forging alliances, and building coalitions, a collaborative approach intrinsic to USGBC's values.

V. The Path Forward: Implementation

The Executive Management Team (EMT) and Board will work together to establish metrics for evaluation of all objectives and to identify implementation and operational strategies. USGBC will mobilize its many resources and diverse stakeholders to achieve the far-reaching goals set forth in this plan. Specifically, chapters, in collaboration with regional councils, and program steering committees will be responsible for developing annual work plans and focused strategies that align with national goals and objectives.

VI. The Strategic Planning Process

The Strategic Planning Committee, established by the Board in July, 2007, identified key strategic issues facing the green building community and developed strategic goals for the USGBC to address them. The Executive Management Team (EMT) was fully involved from the outset. Meridian Institute facilitated the process, which extended through July, 2008. This plan was adopted by the Board on July 17, 2008.



Green Building Guidelines



Green Building Rating System

For New Construction & Major Renovations

(LEED-NC)

Version 2.1

November 2002

Revised 3/14/03

Introduction

The Leadership in Energy and Environmental Design (LEED™) Green Building Rating System represents the U.S. Green Building Council's effort to provide a national standard for what consistitutes a "green building." Through its use as a design guideline and third-party certification tool, it aims to improve occupant well-being, environmental performance and economic returns of buildings using established and innovative practices, standards and technologies.

Consistent with USGBC policy for the continuous improvement of LEED, Version 2.1 is an administrative update of the LEED 2.0 Rating System for new commercial construction, major renovations and high-rise residential buildings. Its purpose is to address concerns raised by USGBC members and other LEED users by providing technical clarifications and streamlining the documentation requirements for LEED certification. These improvements are expected to simplify the documentation process for project teams and to reduce the costs of documenting LEED credits while retaining the stringency and integrity of the LEED Version 2.0 standards. An approval vote by USGBC membership is not required for Version 2.1 because performance levels have not been altered. Version 2.1 was created through the generous volunteer efforts of the LEED Technical Advisory Groups and with the guidance of the LEED Steering Committee. This document represents general consensus, not unanimous agreement. USGBC gratefully acknowledges the contributions of its committee members.

The new LEED Letter Template is a central component of the Version 2.1 improvements. It is a dynamic tracking and documentation tool that must be used by Version 2.1 project teams in preparing a complete LEED certification submittal. For each credit, the Letter Template prompts LEED practitioners for data, indicates when documentation requirements have been fulfilled adequately for submittal, and serves as a formatting template for the project's initial submittal. Additional support documents will be requested during the certification assessment's audit phase.

This Rating System document states the basic intent, requirements and documentation submittals that are necessary to achieve each prerequisite and voluntary "credit." Projects earn one or more points toward certification by meeting or exceeding each credit's technical requirements. All prerequisites must be achieved in order to qualify for certification. Points add up to a final score that relates to one of four possible levels of certification. See the LEED Checklist for a summary of credit topics and point values. A short description of technologies and strategies is included for each credit to briefly inform those who are unfamiliar with the particular topic. The LEED Reference Guide for Version 2.1—the technical companion to the Rating System and Letter Template—provides further background, explanations and instructions.



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Project Checklist

Sustainable Sites

14 Possible Points

Y	Prereq 1	**Erosion & Sedimentation Control**	Required
Y ? N	Credit 1	**Site Selection**	1
Y ? N	Credit 2	**Urban Redevelopment**	1
Y ? N	Credit 3	**Brownfield Redevelopment**	1
Y ? N	Credit 4.1	**Alternative Transportation**, Public Transportation Access	1
Y ? N	Credit 4.2	**Alternative Transportation**, Bicycle Storage & Changing Rooms	1
Y ? N	Credit 4.3	**Alternative Transportation**, Alternative Fuel Vehicles	1
Y ? N	Credit 4.4	**Alternative Transportation**, Parking Capacity	1
Y ? N	Credit 5.1	**Reduced Site Disturbance**, Protect or Restore Open Space	1
Y ? N	Credit 5.2	**Reduced Site Disturbance**, Development Footprint	1
Y ? N	Credit 6.1	**Stormwater Management**, Rate and Quantity	1
Y ? N	Credit 6.2	**Stormwater Management**, Treatment	1
Y ? N	Credit 7.1	**Heat Island Effect**, Non-Roof	1
Y ? N	Credit 7.2	**Heat Island Effect**, Roof	1
Y ? N	Credit 8	**Light Pollution Reduction**	1

Water Efficiency

5 Possible Points

Y ? N	Credit 1.1	**Water Efficient Landscaping**, Reduce by 50%	1
Y ? N	Credit 1.2	**Water Efficient Landscaping**, No Potable Use or No Irrigation	1
Y ? N	Credit 2	**Innovative Wastewater Technologies**	1
Y ? N	Credit 3.1	**Water Use Reduction**, 20% Reduction	1
Y ? N	Credit 3.2	**Water Use Reduction**, 30% Reduction	1

Energy & Atmosphere

17 Possible Points

Y	Prereq 1	**Fundamental Building Systems Commissioning**	Required
Y	Prereq 2	**Minimum Energy Performance**	Required
Y	Prereq 3	**CFC Reduction in HVAC&R Equipment**	Required
Y ? N	Credit 1	**Optimize Energy Performance**	1–10
Y ? N	Credit 2.1	**Renewable Energy**, 5%	1
Y ? N	Credit 2.2	**Renewable Energy**, 10%	1
Y ? N	Credit 2.3	**Renewable Energy**, 20%	1
Y ? N	Credit 3	**Additional Commissioning**	1
Y ? N	Credit 4	**Ozone Depletion**	1
Y ? N	Credit 5	**Measurement & Verification**	1
Y ? N	Credit 6	**Green Power**	1

Materials & Resources

13 Possible Points

Y		Prereq 1	**Storage & Collection of Recyclables**	Required
Y	?	N	Credit 1.1 **Building Reuse**, Maintain 75% of Existing Shell	1
Y	?	N	Credit 1.2 **Building Reuse**, Maintain 100% of Shell	1
Y	?	N	Credit 1.3 **Building Reuse**, Maintain 100% Shell & 50% Non-Shell	1
Y	?	N	Credit 2.1 **Construction Waste Management**, Divert 50%	1
Y	?	N	Credit 2.2 **Construction Waste Management**, Divert 75%	1
Y	?	N	Credit 3.1 **Resource Reuse**, Specify 5%	1
Y	?	N	Credit 3.2 **Resource Reuse**, Specify 10%	1
Y	?	N	Credit 4.1 **Recycled Content**, Specify 5% (p.c. + 1/2 p.i.)	1
Y	?	N	Credit 4.2 **Recycled Content**, Specify 10% (p.c. + 1/2 p.i.)	1
Y	?	N	Credit 5.1 **Local/Regional Materials**, 20% Manufactured Locally	1
Y	?	N	Credit 5.2 **Local/Regional Materials**, of 20% in MRc5.1, 50% Harvested Locally	1
Y	?	N	Credit 6 **Rapidly Renewable Materials**	1
Y	?	N	Credit 7 **Certified Wood**	1

Indoor Environmental Quality

15 Possible Points

Y		Prereq 1	**Minimum IAQ Performance**	Required
Y		Prereq 2	**Environmental Tobacco Smoke** (ETS) **Control**	Required
Y	?	N	Credit 1 **Carbon Dioxide** (CO_2) **Monitoring**	1
Y	?	N	Credit 2 **Ventilation Effectiveness**	1
Y	?	N	Credit 3.1 **Construction IAQ Management Plan**, During Construction	1
Y	?	N	Credit 3.2 **Construction IAQ Management Plan**, Before Occupancy	1
Y	?	N	Credit 4.1 **Low-Emitting Materials**, Adhesives & Sealants	1
Y	?	N	Credit 4.2 **Low-Emitting Materials**, Paints	1
Y	?	N	Credit 4.3 **Low-Emitting Materials**, Carpet	1
Y	?	N	Credit 4.4 **Low-Emitting Materials**, Composite Wood	1
Y	?	N	Credit 5 **Indoor Chemical & Pollutant Source Control**	1
Y	?	N	Credit 6.1 **Controllability of Systems**, Perimeter	1
Y	?	N	Credit 6.2 **Controllability of Systems**, Non-Perimeter	1
Y	?	N	Credit 7.1 **Thermal Comfort**, Comply with ASHRAE 55-1992	1
Y	?	N	Credit 7.2 **Thermal Comfort**, Permanent Monitoring System	1
Y	?	N	Credit 8.1 **Daylight & Views**, Daylight 75% of Spaces	1
Y	?	N	Credit 8.2 **Daylight & Views**, Views for 90% of Spaces	1

Innovation & Design Process

5 Possible Points

Y	?	N	Credit 1.1 **Innovation in Design**	1
Y	?	N	Credit 1.2 **Innovation in Design**	1
Y	?	N	Credit 1.3 **Innovation in Design**	1
Y	?	N	Credit 1.4 **Innovation in Design**	1
Y	?	N	Credit 2 **LEED™ Accredited Professional**	1

Project Totals

69 Possible Points

☐ ☐ ☐ **Certified** 26-32 points **Silver** 33-38 points **Gold** 39-51 points **Platinum** 52-69 points

Sustainable Sites

SS | WE | EA | MR | EQ | ID

Prerequisite 1

Erosion & Sedimentation Control

Required

Intent

Control erosion to reduce negative impacts on water and air quality.

Requirements

Design a sediment and erosion control plan, specific to the site, that conforms to United States Environmental Protection Agency (EPA) Document No. EPA 832/R-92-005 (September 1992), Storm Water Management for Construction Activities, Chapter 3, OR local erosion and sedimentation control standards and codes, whichever is more stringent. The plan shall meet the following objectives:

- Prevent loss of soil during construction by stormwater runoff and/or wind erosion, including protecting topsoil by stockpiling for reuse.
- Prevent sedimentation of storm sewer or receiving streams.
- Prevent polluting the air with dust and particulate matter.

Submittals

❑ Provide the LEED Letter Template, signed by the civil engineer or responsible party, declaring whether the project follows local erosion and sedimentation control standards or the referenced EPA standard. Provide a brief list of the measures implemented. If local standards and codes are followed, describe how they meet or exceed the referenced EPA standard.

Potential Technologies & Strategies

Adopt an erosion and sediment control plan for the project site during construction. Consider employing strategies such as temporary and permanent seeding, mulching, earth dikes, silt fencing, sediment traps and sediment basins.

SS | WE | EA | MR | EQ | ID

Credit 1

1 Point

Site Selection

Intent

Avoid development of inappropriate sites and reduce the environmental impact from the location of a building on a site.

Requirements

Do not develop buildings, roads or parking areas on portions of sites that meet any one of the following criteria:

- Prime farmland as defined by the United States Department of Agriculture in the United States Code of Federal Regulations, Title 7, Volume 6, Parts 400 to 699, Section 657.5 (citation 7CFR657.5).
- Land whose elevation is lower than 5 feet above the elevation of the 100-year flood as defined by the Federal Emergency Management Agency (FEMA).
- Land which is specifically identified as habitat for any species on Federal or State threatened or endangered lists.
- Within 100 feet of any water including wetlands as defined by United States Code of Federal Regulations 40 CFR, Parts 230-233 and Part 22, and isolated wetlands or areas of special concern identified by state or local rule, OR greater than distances given in state or local regulations as defined by local or state rule or law, whichever is more stringent.
- Land which prior to acquisition for the project was public parkland, unless land of equal or greater value as parkland is accepted in trade by the public landowner (Park Authority projects are exempt).

Submittals

❑ Provide the LEED Letter Template, signed by the civil engineer or responsible party, declaring that the project site meets the credit requirements.

Potential Technologies & Strategies

During the site selection process, give preference to those sites that do not include sensitive site elements and restrictive land types. Select a suitable building location and design the building with the minimal footprint to minimize site disruption. Strategies include stacking the building program, tuck-under parking, and sharing facilities with neighbors.

SS	WE	EA	MR	EQ	ID
Credit 2					

Development Density

1 Point

Intent

Channel development to urban areas with existing infrastructure, protect greenfields and preserve habitat and natural resources.

Requirements

Increase localized density to conform to existing or desired density goals by utilizing sites that are located within an existing minimum development density of 60,000 square feet per acre (two story downtown development).

Submittals

- ❑ Provide the LEED Letter Template, signed by the civil engineer, architect or other responsible party, declaring that the project has achieved the required development densities. Provide density for the project and for the surrounding area.
- ❑ Provide an area plan with the project location highlighted.

Potential Technologies & Strategies

During the site selection process, give preference to urban sites.

SS | WE | EA | MR | EQ | ID

Credit 3

1 Point

Brownfield Redevelopment

Intent

Rehabilitate damaged sites where development is complicated by real or perceived environmental contamination, reducing pressure on undeveloped land.

Requirements

Develop on a site documented as contaminated (by means of an ASTM E1903-97 Phase II Environmental Site Assessment) OR on a site classified as a brownfield by a local, state or federal government agency. Effectively remediate site contamination.

Submittals

- ❑ Provide a copy of the pertinent sections of the ASTM E1903-97 Phase II Environmental Site Assessment documenting the site contamination OR provide a letter from a local, state or federal regulatory agency confirming that the site is classified as a brownfield by that agency.
- ❑ Provide the LEED Letter Template, signed by the civil engineer or responsible party, declaring the type of damage that existed on the site and describing the remediation performed.

Potential Technologies & Strategies

During the site selection process, give preference to brownfield sites. Identify tax incentives and property cost savings. Develop and implement a site remediation plan using strategies such as pump-and-treat, bioreactors, land farming and in-situ remediation.

SS	WE	EA	MR	EQ	ID
Credit 4.1					

Alternative Transportation: Public Transportation Access

1 Point

Intent

Reduce pollution and land development impacts from automobile use.

Requirements

Locate project within 1/2 mile of a commuter rail, light rail or subway station or 1/4 mile of two or more public or campus bus lines usable by building occupants.

Submittals

- ❑ Provide the LEED Letter Template, signed by an appropriate party, declaring that the project building(s) are located within required proximity to mass transit.

- ❑ Provide an area drawing or transit map highlighting the building location and the fixed rail stations and bus lines, and indicate the distances between them. Include a scale bar for distance measurement.

Potential Technologies & Strategies

Perform a transportation survey of future building occupants to identify transportation needs. Site the building near mass transit.

SS | WE | EA | MR | EQ | ID

Credit 4.2

1 Point

Alternative Transportation:
Bicycle Storage & Changing Rooms

Intent

Reduce pollution and land development impacts from automobile use.

Requirements

For commercial or institutional buildings, provide secure bicycle storage with convenient changing/shower facilities (within 200 yards of the building) for 5% or more of regular building occupants. For residential buildings, provide covered storage facilities for securing bicycles for 15% or more of building occupants in lieu of changing/shower facilities.

Submittals

- ❑ For commercial projects: provide the LEED Letter Template, signed by the Architect or responsible party, declaring the distance to bicycle storage and showers from the building entrance and demonstrating that these facilities can accommodate at least 5% of building occupants.

OR

- ❑ For residential projects: provide the LEED Letter Template, signed by the architect or responsible party, declaring the design occupancy for the buildings, number of covered bicycle storage facilities for securing bicycles, and demonstrating that these facilities can accommodate at least 15% of building occupants.

Potential Technologies & Strategies

Design the building with transportation amenities such as bicycle racks and showering/changing facilities.

SS	WE	EA	MR	EQ	ID
Credit 4.3					

Alternative Transportation: Alternative Fuel Vehicles

1 Point

Intent

Reduce pollution and land development impacts from automobile use.

Requirements

Provide alternative fuel vehicles for 3% of building occupants AND provide preferred parking for these vehicles, OR install alternative-fuel refueling stations for 3% of the total vehicle parking capacity of the site. Liquid or gaseous fueling facilities must be separately ventilated or located outdoors.

Submittals

- ❑ Provide the LEED Letter Template and proof of ownership of, or 2 year lease agreement for, alternative fuel vehicles and calculations indicating that alternative fuel vehicles will serve 3% of building occupants. Provide site drawings or parking plan highlighting preferred parking for alternative fuel vehicles.

OR

- ❑ Provide the LEED Letter Template with specifications and site drawings highlighting alternative-fuel refueling stations. Provide calculations demonstrating that these facilities accommodate 3% or more of the total vehicle parking capacity.

Potential Technologies & Strategies

Provide transportation amenities such as alternative fuel refueling stations and carpool/vanpool programs. Consider sharing the costs and benefits of refueling stations with neighbors.

SS | WE | EA | MR | EQ | ID

Credit 4.4

1 Point

Alternative Transportation: Parking Capacity

Intent

Reduce pollution and land development impacts from single occupancy vehicle use.

Requirements

Size parking capacity to meet, but not exceed, minimum local zoning requirements AND provide preferred parking for carpools or vanpools capable of serving 5% of the building occupants; OR add no new parking for rehabilitation projects AND provide preferred parking for carpools or vanpools capable of serving 5% of the building occupants.

Submittals

- ❑ For new projects: provide the LEED Letter Template, signed by the civil engineer or responsible party, stating any relevant minimum zoning requirements and declaring that parking capacity is sized to meet, but not exceed them. State the number of preferred parking spaces for carpools.

OR

- ❑ For rehabilitation projects: provide the LEED Letter Template, signed by the civil engineer or responsible party, declaring that no new parking capacity has been added.State the number of preferred parking spaces for carpools.

Potential Technologies & Strategies

Minimize parking lot/garage size. Consider sharing parking facilities with adjacent buildings.

SS	WE	EA	MR	EQ	ID
Credit 5.1					

Reduced Site Disturbance: Protect or Restore Open Space — 1 Point

Intent

Conserve existing natural areas and restore damaged areas to provide habitat and promote biodiversity.

Requirements

On greenfield sites, limit site disturbance including earthwork and clearing of vegetation to 40 feet beyond the building perimeter, 5 feet beyond primary roadway curbs, walkways and main utility branch trenches, and 25 feet beyond constructed areas with permeable surfaces (such as pervious paving areas, stormwater detention facilities and playing fields) that require additional staging areas in order to limit compaction in the constructed area; OR, on previously developed sites, restore a minimum of 50% of the site area (excluding the building footprint) by replacing impervious surfaces with native or adapted vegetation.

Submittals

- ❑ For greenfield sites: provide the LEED Letter Template, signed by the civil engineer or responsible party, demonstrating and declaring that site disturbance (including earthwork and clearing of vegetation) has been limited to 40 feet beyond the building perimeter, 5 feet beyond primary roadway curbs, walk ways and main utility branch trenches, and 25 feet beyond constructed areas with permeable surfaces. Provide site drawings and specifications highlighting limits of construction disturbance.

OR

- ❑ For previously developed sites: provide a LEED Letter Template, signed by the civil engineer or responsible party, declaring and describing restoration of degraded habitat areas. Include highlighted site drawings with area calculations demonstrating that 50% of the site area that does not fall within the building footprint has been restored.

Potential Technologies & Strategies

Perform a site survey to identify site elements and adopt a master plan for development of the project site. Select a suitable building location and design the building with a minimal footprint to minimize site disruption. Strategies include stacking the building program, tuck-under parking and sharing facilities with neighbors. Establish clearly marked construction boundaries to minimize disturbance of the existing site and restore previously degraded areas to their natural state.

SS | WE | EA | MR | EQ | ID

Credit 5.2

1 Point

Reduced Site Disturbance: Development Footprint

Intent

Conserve existing natural areas and restore damaged areas to provide habitat and promote biodiversity.

Requirements

Reduce the development footprint (defined as entire building footprint, access roads and parking) to exceed the local zoning's open space requirement for the site by 25%. For areas with no local zoning requirements (e.g., some university campuses and military bases), designate open space area adjacent to the building that is equal to the development footprint.

Submittals

❑ Provide a copy of the local zoning requirements highlighting the criteria for open space. Provide the LEED Letter Template, signed by the civil engineer or responsible party, demonstrating and declaring that the open space exceeds the local zoning open space requirement for the site by 25%.

OR

❑ For areas with no local zoning requirements (e.g., some university campuses and military bases), designate open space area adjacent to the building that is equal to the development footprint. Provide a letter from the property owner stating that the open space will be conserved for the life of the building.

Potential Technologies & Strategies

Perform a site survey to identify site elements and adopt a master plan for development of the project site. Select a suitable building location and design the building with a minimal footprint to minimize site disruption. Strategies include stacking the building program, tuck-under parking and sharing facilities with neighbors. Establish clearly marked construction boundaries to minimize disturbance of existing and restore previously degraded areas to their natural state.

SS	WE	EA	MR	EQ	ID
Credit 6.1					

Stormwater Management: Rate and Quantity

1 Point

Intent

Limit disruption and pollution of natural water flows by managing stormwater runoff.

Requirements

If existing imperviousness is less than or equal to 50%, implement a stormwater management plan that prevents the post-development 1.5 year, 24 hour peak discharge rate from exceeding the pre-development 1.5 year, 24 hour peak discharge rate.

OR

If existing imperviousness is greater than 50%, implement a stormwater management plan that results in a 25% decrease in the rate and quantity of stormwater runoff.

Submittals

- ❑ Provide the LEED Letter Template, signed by the civil engineer or responsible party, declaring that the post-development 1.5 year, 24 hour peak discharge rate does not exceed the pre-development 1.5 year 24 hour peak discharge rate. Include calculations demonstrating that existing site imperviousness is less than or equal to 50%.

OR

- ❑ Provide the LEED Letter Template, signed by the civil engineer or responsible party, declaring and demonstrating that the stormwater management strategies result in at least a 25% decrease in the rate and quantity of stormwater runoff. Include calculations demonstrating that existing site imperviousness exceeds 50%.

Potential Technologies & Strategies

Design the project site to maintain natural stormwater flows by promoting infiltration. Specify garden roofs and pervious paving to minimize impervious surfaces. Reuse stormwater volumes generated for non-potable uses such as landscape irrigation, toilet and urinal flushing and custodial uses.

SS | WE | EA | MR | EQ | ID

Credit 6.2

1 Point

Stormwater Management: Treatment

Intent

Limit disruption of natural water flows by eliminating stormwater runoff, increasing on-site infiltration and eliminating contaminants.

Requirements

Construct site stormwater treatment systems designed to remove 80% of the average annual post-development total suspended solids (TSS) and 40% of the average annual post-development total phosphorous (TP) based on the average annual loadings from all storms less than or equal to the 2-year/24-hour storm. Do so by implementing Best Management Practices (BMPs) outlined in Chapter 4, Part 2 (Urban Runoff), of the United States Environmental Protection Agency's (EPA's) *Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters*, January 1993 (Document No. EPA-840-B-92-002) or the local government's BMP document (whichever is more stringent).

Submittals

- ❑ Provide the LEED Letter Template, signed by the civil engineer or responsible party, declaring that the design complies with or exceeds EPA or local government Best Management Practices (whichever set is more stringent) for removal of total suspended solids and total phosphorous.

Potential Technologies & Strategies

Design mechanical or natural treatment systems such as constructed wetlands, vegetated filter strips and bioswales to treat the site's stormwater.

SS | WE | EA | MR | EQ | ID

Credit 7.1

Heat Island Effect: Non-Roof

1 Point

Intent

Reduce heat islands (thermal gradient differences between developed and undeveloped areas) to minimize impact on microclimate and human and wildlife habitat.

Requirements

Provide shade (within 5 years) and/or use light-colored/high-albedo materials (reflectance of at least 0.3) and/or open grid pavement for at least 30% of the site's non-roof impervious surfaces, including parking lots, walkways, plazas, etc.; OR place a minimum of 50% of parking spaces underground or covered by structured parking; OR use an open-grid pavement system (less than 50% impervious) for a minimum of 50% of the parking lot area.

Submittals

- ❑ Provide the LEED Letter Template, signed by the civil engineer or responsible party, referencing the site plan to demonstrate areas of paving, landscaping (list species) and building footprint, and declaring that:
  - ❑ A minimum of 30% of non-roof impervious surfaces areas are constructed with high-albedo materials and/or open grid pavement and/or will be shaded within five years
  - ❑ OR a minimum of 50% of parking spaces have been placed underground or are covered by structured parking
  - ❑ OR an open-grid pavement system (less than 50% impervious) has been used for a minimum of 50% of the parking lot area.

Potential Technologies & Strategies

Shade constructed surfaces on the site with landscape features and minimize the overall building footprint. Consider replacing constructed surfaces (i.e. roof, roads, sidewalks, etc.) with vegetated surfaces such as garden roofs and open grid paving or specify high-albedo materials to reduce the heat absorption.

SS | WE | EA | MR | EQ | ID

Credit 7.2

1 Point

Heat Island Effect: Roof

Intent

Reduce heat islands (thermal gradient differences between developed and undeveloped areas) to minimize impact on microclimate and human and wildlife habitat.

Requirements

Use ENERGY STAR® compliant (highly reflective) AND high emissivity roofing (emissivity of at least 0.9 when tested in accordance with ASTM 408) for a minimum of 75% of the roof surface; OR install a "green" (vegetated) roof for at least 50% of the roof area. Combinations of high albedo and vegetated roof can be used providing they collectively cover 75% of the roof area.

Submittals

- ❑ Provide the LEED Letter Template, signed by the architect, civil engineer or responsible party, referencing the building plan and declaring that the roofing materials comply with the ENERGY STAR® Label requirements and have a minimum emissivity of 0.9. Demonstrate that high-albedo and vegetated roof areas combined constitute at least 75% of the total roof area.

OR

- ❑ Provide the LEED Letter Template, signed by the architect, civil engineer or responsible party, referencing the building plan and demonstrating that vegetated roof areas constitute at least 50% of the total roof area.

Potential Technologies & Strategies

Visit the ENERGY STAR® Web site, www.energystar.gov, to look for compliant products. Consider installing high-albedo and vegetated roofs to reduce heat absorption.

SS	WE	EA	MR	EQ	ID
Credit 8					

Light Pollution Reduction

1 Point

Intent

Eliminate light trespass from the building and site, improve night sky access and reduce development impact on nocturnal environments.

Requirements

Meet or provide lower light levels and uniformity ratios than those recommended by the Illuminating Engineering Society of North America (IESNA) *Recommended Practice Manual: Lighting for Exterior Environments* (RP-33-99). Design exterior lighting such that all exterior luminaires with more than 1000 initial lamp lumens are shielded and all luminaires with more than 3500 initial lamp lumens meet the Full Cutoff IESNA Classification. The maximum candela value of all interior lighting shall fall within the building (not out through windows) and the maximum candela value of all exterior lighting shall fall within the property. Any luminaire within a distance of 2.5 times its mounting height from the property boundary shall have shielding such that no light from that luminaire crosses the property boundary.

Submittals

- ❑ Provide the LEED Letter Template, signed by an appropriate party, declaring that the credit requirements have been met.

Potential Technologies & Strategies

Adopt site lighting criteria to maintain safe light levels while avoiding off-site lighting and night sky pollution. Minimize site lighting where possible and model the site lighting using a computer model. Technologies to reduce light pollution include full cutoff luminaries, low-reflectance surfaces and low-angle spotlights.

SS **WE** EA MR EQ ID

Credit 1.1

Water Efficiency

1 Point

Water Efficient Landscaping: Reduce by 50%

Intent

Limit or eliminate the use of potable water for landscape irrigation.

Requirements

Use high-efficiency irrigation technology OR use captured rain or recycled site water to reduce potable water consumption for irrigation by 50% over conventional means.

Submittals

- ❑ Provide the LEED Letter Template, signed by the architect, engineer or responsible party, declaring that potable water consumption for site irrigation has been reduced by 50%. Include a brief narrative of the equipment used and/or the use of drought-tolerant or native plants.

Potential Technologies & Strategies

Perform a soil/climate analysis to determine appropriate landscape types and design the landscape with indigenous plants to reduce or eliminate irrigation requirements. Use high-efficiency irrigation systems and consider using stormwater and/or greywater for irrigation.

SS | **WE** | EA | MR | EQ | ID

Credit 1.2

Water Efficient Landscaping:
No Potable Use or No Irrigation

1 Point
in addition to
WE 1.1

Intent

Limit or eliminate the use of potable water for landscape irrigation.

Requirements

Use only captured rain or recycled site water to eliminate all potable water use for site irrigation (except for initial watering to establish plants), OR do not install permanent landscape irrigation systems.

Submittals

❑ Provide the LEED Letter Template, signed by the responsible architect and/or engineer, declaring that the project site will not use potable water for irrigation. Include a narrative describing the captured rain system, the recycled site water system, and their holding capacity. List all the plant species used. Include calculations demonstrating that irrigation requirements can be met from captured rain or recycled site water.

OR

❑ Provide the LEED Letter Template, signed by the landscape architect or responsible party, declaring that the project site does not have a permanent landscape irrigation system. Include a narrative describing how the landscape design allows for this.

Potential Technologies & Strategies

Perform a soil/climate analysis to determine appropriate landscape types and design the landscape with indigenous plants to reduce or eliminate irrigation requirements. Consider using stormwater and/or greywater for irrigation.

SS | **WE** | EA | MR | EQ | ID

Credit 2

1 Point

Innovative Wastewater Technologies

Intent

Reduce generation of wastewater and potable water demand, while increasing the local aquifer recharge.

Requirements

Reduce the use of municipally provided potable water for building sewage conveyance by a minimum of 50%, OR treat 100% of wastewater on site to tertiary standards.

Submittals

- ❑ Provide the LEED Letter Template, signed by the architect, MEP engineer or responsible party, declaring that water for building sewage conveyance will be reduced by at least 50%. Include the spreadsheet calculation and a narrative demonstrating the measures used to reduce wastewater by at least 50% from baseline conditions.

OR

- ❑ Provide the LEED Letter Template, signed by the civil engineer or responsible party, declaring that 100% of wastewater will be treated to tertiary standards on site. Include a narrative describing the on-site wastewater treatment system.

Potential Technologies & Strategies

Specify high-efficiency fixtures and dry fixtures such as composting toilets and waterless urinals to reduce wastewater volumes. Consider reusing stormwater or greywater for sewage conveyance or on-site wastewater treatment systems (mechanical and/or natural).

Water Use Reduction: 20% Reduction

1 Point

Intent

Maximize water efficiency within buildings to reduce the burden on municipal water supply and wastewater systems.

Requirements

Employ strategies that in aggregate use 20% less water than the water use baseline calculated for the building (not including irrigation) after meeting the Energy Policy Act of 1992 fixture performance requirements.

Submittals

- ❑ Provide the LEED Letter Template, signed by the MEP engineer or responsible party, declaring that the project uses 20% less water than the baseline fixture performance requirements of the Energy Policy Act of 1992.
- ❑ Provide the spreadsheet calculation demonstrating that water-consuming fixtures specified for the stated occupancy and use of the building reduce occupancy-based potable water consumption by 20% compared to baseline conditions.

Potential Technologies & Strategies

Estimate the potable and non-potable water needs for the building. Use high-efficiency fixtures, dry fixtures such as composting toilets and waterless urinals, and occupant sensors to reduce the potable water demand. Consider reuse of stormwater and greywater for non-potable applications such as toilet and urinal flushing, mechanical systems and custodial uses.

SS **WE** EA MR EQ ID

Credit 3.2

1 Point
in addition to
WE 3.1

Water Use Reduction: 30% Reduction

Intent

Maximize water efficiency within buildings to reduce the burden on municipal water supply and wastewater systems.

Requirements

Employ strategies that in aggregate use 30% less water than the water use baseline calculated for the building (not including irrigation) after meeting the Energy Policy Act of 1992 fixture performance requirements.

Submittals

- ❑ Provide the LEED Letter Template, signed by the MEP engineer or responsible party, declaring that the project uses 30% less water than the baseline fixture performance requirements of the Energy Policy Act of 1992.
- ❑ Provide the spreadsheet calculation demonstrating that water-consuming fixtures specified for the stated occupancy and use of the building reduce occupancy-based potable water consumption by 30% compared to baseline conditions.

Potential Technologies & Strategies

Estimate the potable and non-potable water needs for the building. Use high-efficiency fixtures, dry fixtures such as composting toilets and waterless urinals, and occupant sensors to reduce the potable water demand. Consider reuse of stormwater and greywater for non-potable applications such as toilet and urinal flushing, mechanical systems and custodial uses.

Energy & Atmosphere

SS | WE | **EA** | MR | EQ | ID

Prerequisite 1

Fundamental Building Systems Commissioning

Required

Intent

Verify and ensure that fundamental building elements and systems are designed, installed and calibrated to operate as intended.

Requirements

Implement or have a contract in place to implement the following fundamental best practice commissioning procedures.

- Engage a commissioning team that does not include individuals directly responsible for project design or construction management.
- Review the design intent and the basis of design documentation.
- Incorporate commissioning requirements into the construction documents.
- Develop and utilize a commissioning plan.
- Verify installation, functional performance, training and operation and maintenance documentation.
- Complete a commissioning report.

Submittals

❑ Provide the LEED Letter Template, signed by the owner or commissioning agent(s), confirming that the fundamental commissioning requirements have been successfully executed or will be provided under existing contract(s).

Potential Technologies & Strategies:

Engage a commissioning authority and adopt a commissioning plan. Include commissioning requirements in bid documents and task the commissioning agent to produce a commissioning report once commissioning activities are completed.

SS | WE | EA | MR | EQ | ID

Prerequisite 2

Required

Minimum Energy Performance

Intent

Establish the minimum level of energy efficiency for the base building and systems.

Requirements

Design the building to comply with ASHRAE/IESNA Standard 90.1-1999 (without amendments) or the local energy code, whichever is more stringent.

Submittals

- ❑ Provide a LEED Letter Template, signed by a licensed professional engineer or architect, stating that the building complies with ASHRAE/IESNA 90.1-1999 or local energy codes. If local energy codes were applied, demonstrate that the local code is equivalent to, or more stringent than, ASHRAE/IESNA 90.1-1999 (without amendments).

Potential Technologies & Strategies:

Design the building envelope and systems to maximize energy performance. Use a computer simulation model to assess the energy performance and identify the most cost effective energy measures. Quantify energy performance compared to the baseline building.

CFC Reduction in HVAC&R Equipment

Required

Intent

Reduce ozone depletion.

Requirements

Zero use of CFC-based refrigerants in new base building HVAC&R systems. When reusing existing base building HVAC equipment, complete a comprehensive CFC phase-out conversion.

Submittals

- ❑ Provide a LEED Letter Template, signed by a licensed professional engineer or architect, declaring that the building's HVAC&R systems do not use CFC-based refrigerants.

Potential Technologies & Strategies:

When reusing existing HVAC systems, conduct an inventory to identify equipment that uses CFC refrigerants and adopt a replacement schedule for these refrigerants. For new buildings, specify new HVAC equipment that uses no CFC refrigerants.

1–10 Points

Optimize Energy Performance

Intent

Achieve increasing levels of energy performance above the prerequisite standard to reduce environmental impacts associated with excessive energy use.

Requirements

Reduce design energy cost compared to the energy cost budget for energy systems regulated by ASHRAE/IESNA Standard 90.1-1999 (without amendments), as demonstrated by a whole building simulation using the Energy Cost Budget Method described in Section 11 of the Standard.

New Bldgs.	Existing Bldgs.	Points
15%	5%	1
20%	10%	2
25%	15%	3
30%	20%	4
35%	25%	5
40%	30%	6
45%	35%	7
50%	40%	8
55%	45%	9
60%	50%	10

Regulated energy systems include HVAC (heating, cooling, fans and pumps), service hot water and interior lighting. Non-regulated systems include plug loads, exterior lighting, garage ventilation and elevators (vertical transportation). Two methods may be used to separate energy consumption for regulated systems. The energy consumption for each fuel may be prorated according to the fraction of energy used by regulated and non-regulated energy. Alternatively, separate meters (accounting) may be created in the energy simulation program for regulated and non-regulated energy uses.

If an analysis has been made comparing the proposed design to local energy standards and a defensible equivalency (at minimum) to ASHRAE/IESNA Standard 90.1-1999 has been established, then the comparison against the local code may be used in lieu of the ASHRAE Standard.

Project teams are encouraged to apply for innovation credits if the energy consumption of non-regulated systems is also reduced.

Optimize Energy Performance

1–10 Points

(continued)

Submittals

- ❑ Complete the LEED Letter Template incorporating a quantitative summary table showing the energy saving strategies incorporated in the building design.
- ❑ Demonstrate via summary printout from energy simulation software that the design energy cost is less than the energy cost budget as defined in ASHRAE/IESNA 90.1-1999, Section 11.

Potential Technologies & Strategies

Design the building envelope and building systems to maximize energy performance. Use a computer simulation model to assess the energy performance and identify the most cost-effective energy efficiency measures. Quantify energy performance as compared to a baseline building.

SS | WE | **EA** | MR | EQ | ID

Credit 2.1

1 Point

Renewable Energy: 5%

Intent

Encourage and recognize increasing levels of on-site renewable energy self-supply in order to reduce environmental impacts associated with fossil fuel energy use.

Requirements

Supply at least 5% of the building's total energy use (as expressed as a fraction of annual energy cost) through the use of on-site renewable energy systems.

Submittals

- ❑ Provide the LEED Letter Template, signed by the architect, owner or responsible party, declaring that at least 5% of the building's energy is provided by on-site renewable energy. Include a narrative describing on-site renewable energy systems installed in the building and calculations demonstrating that at least 5% of total energy costs are supplied by the renewable energy system(s).

Potential Technologies & Strategies

Assess the project for non-polluting and renewable energy potential including solar, wind, geothermal, low-impact hydro, biomass and bio-gas strategies. When applying these strategies, take advantage of net metering with the local utility.

SS | WE | **EA** | MR | EQ | ID

Credit 2.2

Renewable Energy: 10%

1 Point
in addition to
EA 2.1

Intent

Encourage and recognize increasing levels of self-supply through renewable technologies to reduce environmental impacts associated with fossil fuel energy use.

Requirements

Supply at least 10% of the building's total energy use (as expressed as a fraction of annual energy cost) through the use of on-site renewable energy systems.

Submittals

- ❑ Provide the LEED Letter Template, signed by the architect, owner or responsible party, declaring that at least 10% of the building's energy is provided by on-site renewable energy. Include a narrative describing on-site renewable energy systems installed in the building and calculations demonstrating that at least 10% of total energy costs are supplied by the renewable energy system(s).

Potential Technologies & Strategies

Assess the project for non-polluting renewable energy potential including solar, wind, geothermal, low-impact hydro, biomass and bio-gas strategies. When applying these strategies, take advantage of net metering with the local utility.

SS | WE | **EA** | MR | EQ | ID

Credit 2.3

1 Point
in addition to
EA 2.1 and 2.2

Renewable Energy: 20%

Intent

Encourage and recognize increasing levels of self-supply through renewable technologies to reduce environmental impacts associated with fossil fuel energy use.

Requirements

Supply at least 20% of the building's total energy use (as expressed as a fraction of annual energy cost) through the use of on-site renewable energy systems.

Submittals

- ❑ Provide the LEED Letter Template, signed by the architect, owner or responsible party, declaring that at least 20% of the building's energy is provided by on-site renewable energy. Include a narrative describing on-site renewable energy systems installed in the building and calculations demonstrating that at least 20% of total energy costs are supplied by the renewable energy system(s).

Potential Technologies & Strategies

Assess the project for non-polluting and renewable energy potential including solar, wind, geothermal, low-impact hydro, biomass and bio-gas strategies. When applying these strategies, take advantage of net metering with the local utility.

Additional Commissioning

1 Point

Intent

Verify and ensure that the entire building is designed, constructed and calibrated to operate as intended.

Requirements

In addition to the Fundamental Building Commissioning prerequisite, implement or have a contract in place to implement the following additional commissioning tasks:

1. A commissioning authority independent of the design team shall conduct a review of the design prior to the construction documents phase.
2. An independent commissioning authority shall conduct a review of the construction documents near completion of the construction document development and prior to issuing the contract documents for construction.
3. An independent commissioning authority shall review the contractor submittals relative to systems being commissioned.
4. Provide the owner with a single manual that contains the information required for re-commissioning building systems.
5. Have a contract in place to review building operation with O&M staff, including a plan for resolution of outstanding commissioning-related issues within one year after construction completion date.

Submittals

- ❑ Provide the LEED Letter Template, signed by the owner or independent commissioning agent(s) as appropriate, confirming that the required additional commissioning tasks have been successfully executed or will be provided under existing contract(s).

Potential Technologies & Strategies

Engage the commissioning authority early in the design phases.

1 Point

Ozone Protection

Intent

Reduce ozone depletion and support early compliance with the Montreal Protocol.

Requirements

Install base building level HVAC and refrigeration equipment and fire suppression systems that do not contain HCFCs or Halons.

Submittals

- ❑ Provide the LEED Letter Template, signed by the architect or engineer, stating that HVAC&R systems as-built are free of HCFCs and Halons.

Potential Technologies & Strategies

When reusing buildings, inventory existing building systems using refrigerants and fire suppression chemicals and replace those that contain HCFCs or Halons. For new buildings, specify refrigeration and fire suppression systems that use no HCFCs or Halons.

Measurement and Verification

1 Point

Intent

Provide for the ongoing accountability and optimization of building energy and water consumption performance over time.

Requirements

Install continuous metering equipment for the following end-uses:

- Lighting systems and controls
- Constant and variable motor loads
- Variable frequency drive (VFD) operation
- Chiller efficiency at variable loads (kW/ton)
- Cooling load
- Air and water economizer and heat recovery cycles
- Air distribution static pressures and ventilation air volumes
- Boiler efficiencies
- Building-related process energy systems and equipment
- Indoor water risers and outdoor irrigation systems

Develop a Measurement and Verification plan that incorporates the monitoring information from the above end-uses and is consistent with Option B, C or D of the 2001 *International Performance Measurement & Verification Protocol (IPMVP) Volume I: Concepts and Options for Determining Energy and Water Savings.*

Submittals

- ❑ Provide the LEED Letter Template, signed by the licensed engineer or other responsible party, indicating that metering equipment has been installed for each end-use and declaring the option to be followed under IPMVP version 2001.
- ❑ Provide a copy of the M&V plan following IPMVP, 2001version, including an executive summary.

Potential Technologies & Strategies

Model the energy and water systems to predict savings. Design the building with equipment to measure energy and water performance. Draft a Measurement & Verification Plan to apply during building operation that compares predicted savings to those actually achieved in the field.

SS | WE | **EA** | MR | EQ | ID

Credit 6

1 Point

Green Power

Intent

Encourage the development and use of grid-source, renewable energy technologies on a net zero pollution basis.

Requirements

Provide at least 50% of the building's electricity from renewable sources by engaging in at least a two-year renewable energy contract. Renewable sources are as defined by the Center for Resource Solutions (CRS) Green-e products certification requirements.

Submittals

- ❑ Provide the LEED Letter Template, signed by the owner or other responsible party, documenting that the supplied renewable power is equal to 50% of the project's energy consumption and the sources meet the Green-e definition of renewable energy.
- ❑ Provide a copy of the two-year electric utility purchase contract for power generated from renewable sources.

Potential Technologies & Strategies

Determine the energy needs of the building and investigate opportunities to engage in a green power contract with the local utility. Green power is derived from solar, wind, geothermal, biomass or low-impact hydro sources. Green power may be procured from a Green-e certified power marketer, a Green-e accredited utility program, through Green-e certified Tradable Renewable Certificates, or from a supply that meets the Green-e renewable power definition. Visit www.green-e.org for details about the Green-e program.

Materials & Resources

SS | WE | EA | **MR** | EQ | ID

Prerequisite 1

Storage & Collection of Recyclables

Required

Intent

Facilitate the reduction of waste generated by building occupants that is hauled to and disposed of in landfills.

Requirements

Provide an easily accessible area that serves the entire building and is dedicated to the separation, collection and storage of materials for recycling including (at a minimum) paper, corrugated cardboard, glass, plastics and metals.

Submittals

- ❑ Provide the LEED Letter Template, signed by the architect or owner, declaring that the area dedicated to recycling is easily accessible and accommodates the building's recycling needs.
- ❑ Provide a plan showing the area(s) dedicated to recycled material collection and storage.

Potential Technologies & Strategies

Designate an area for recyclable collection and storage that is appropriately sized and located in a convenient area. Identify local waste handlers and buyers for glass, plastic, office paper, newspaper, cardboard and organic wastes. Instruct occupants on building recycling procedures. Consider employing cardboard balers, aluminum can crushers, recycling chutes and other waste management technologies to further enhance the recycling program.

SS | WE | EA | **MR** | EQ | ID

Credit 1.1

1 Point

Building Reuse:
Maintain 75% of Existing Walls, Floors and Roof

Intent

Extend the life cycle of existing building stock, conserve resources, retain cultural resources, reduce waste and reduce environmental impacts of new buildings as they relate to materials manufacturing and transport.

Requirements

Maintain at least 75% of existing building structure and shell (exterior skin and framing, excluding window assemblies and non-structural roofing material).

Submittals

- ❑ Provide the LEED Letter Template, signed by the architect, owner or other responsible party, listing the retained elements and declaring that the credit requirements have been met.

Potential Technologies & Strategies

Consider reuse of existing buildings, including structure, shell and non-shell elements. Remove elements that pose contamination risk to building occupants and upgrade outdated components such as windows, mechanical systems and plumbing fixtures. Quantify the extent of building reuse.

SS | WE | EA | **MR** | EQ | ID

Credit 1.2

Building Reuse:
Maintain 100% of Existing Walls, Floors and Roof

1 Point
in addition to
MR 1.1

Intent

Extend the life cycle of existing building stock, conserve resources, retain cultural resources, reduce waste and reduce environmental impacts of new buildings as they relate to materials manufacturing and transport.

Requirements

Maintain an additional 25% (100% total) of existing building structure and shell (exterior skin and framing, excluding window assemblies and non-structural roofing material).

Submittals

- ❑ Provide the LEED Letter Template, signed by the architect, owner or other responsible party, demonstrating the retained elements and declaring that the credit requirements have been met.

Potential Technologies & Strategies

Consider reuse of existing buildings, including structure, shell and non-shell elements. Remove elements that pose contamination risk to building occupants and upgrade outdated components such as windows, mechanical systems and plumbing fixtures. Quantify the extent of building reuse.

SS | WE | EA | **MR** | EQ | ID

Credit 1.3

1 Point
in addition to
MR 1.1 and 1.2

Building Reuse: Maintain 100% of Shell/Structure and 50% of Non-Shell/Non-Structure

Intent

Extend the life cycle of existing building stock, conserve resources, retain cultural resources, reduce waste and reduce environmental impacts of new buildings as they relate to materials manufacturing and transport.

Requirements

Maintain 100% of existing building structure and shell (exterior skin and framing, excluding window assemblies and non-structural roofing material) AND at least 50% of non-shell areas (interior walls, doors, floor coverings and ceiling systems).

Submittals

- ❑ Provide the LEED Letter Template, signed by the architect, owner or other responsible party, demonstrating the retained elements and declaring that the credit requirements have been met.

Potential Technologies & Strategies

Consider reuse of existing buildings, including structure, shell and non-shell elements. Remove elements that pose contamination risk to building occupants and upgrade outdated components such as windows, mechanical systems and plumbing fixtures. Quantify the extent of building reuse.

SS	WE	EA	MR	EQ	ID
Credit 2.1					

Construction Waste Management:
Divert 50% From Landfill

1 Point

Intent

Divert construction, demolition and land clearing debris from landfill disposal. Redirect recyclable recovered resources back to the manufacturing process. Redirect reusable materials to appropriate sites.

Requirements

Develop and implement a waste management plan, quantifying material diversion goals. Recycle and/or salvage at least 50% of construction, demolition and land clearing waste. Calculations can be done by weight or volume, but must be consistent throughout.

Submittals

- ❑ Provide the LEED Letter Template, signed by the architect, owner or other responsible party, tabulating the total waste material, quantities diverted and the means by which diverted, and declaring that the credit requirements have been met.

Potential Technologies & Strategies

Establish goals for landfill diversion and adopt a construction waste management plan to achieve these goals. Consider recycling land clearing debris, cardboard, metal, brick, concrete, plastic, clean wood, glass, gypsum wallboard, carpet and insulation. Designate a specific area on the construction site for recycling and track recycling efforts throughout the construction process. Identify construction haulers and recyclers to handle the designated materials. Note that salvage may include donation of materials to charitable organizations such as Habitat for Humanity.

SS | WE | EA | **MR** | EQ | ID

Credit 2.2

1 Point
in addition to
MR 2.1

Construction Waste Management:
Divert 75% From Landfill

Intent

Divert construction, demolition and land clearing debris from landfill disposal. Redirect recyclable recovered resources back to the manufacturing process. Redirect reusable materials to appropriate sites.

Requirements

Develop and implement a waste management plan, quantifying material diversion goals. Recycle and/or salvage an additional 25% (75% total) of construction, demolition and land clearing waste. Calculations can be done by weight or volume, but must be consistent throughout.

Submittals

- ❑ Provide the LEED Letter Template, signed by the architect, owner or other responsible party, tabulating the total waste material, quantities diverted and the means by which diverted, and declaring that the credit requirements have been met.

Potential Technologies & Strategies

Establish goals for landfill diversion and adopt a construction waste management plan to achieve these goals. Consider recycling land clearing debris, cardboard, metal, brick, concrete, plastic, clean wood, glass, gypsum wallboard, carpet and insulation. Designate a specific area on the construction site for recycling and track recycling efforts throughout the construction process. Identify construction haulers and recyclers to handle the designated materials. Note that salvage may include donation of materials to charitable organizations such as Habitat for Humanity.

SS	WE	EA	MR	EQ	ID
Credit 3.1					

Resource Reuse: 5%

1 Point

Intent

Reuse building materials and products in order to reduce demand for virgin materials and to reduce waste, thereby reducing impacts associated with the extraction and processing of virgin resources.

Requirements

Use salvaged, refurbished or reused materials, products and furnishings for at least 5% of building materials.

Submittals

- ❑ Provide the LEED Letter Template, signed by the architect, owner or other responsible party, declaring that the credit requirements have been met and listing each material or product used to meet the credit. Include details demonstrating that the project incorporates the required percentage of reused materials and products and showing their costs and the total cost of materials for the project.

Potential Technologies & Strategies

Identify opportunities to incorporate salvaged materials into building design and research potential material suppliers. Consider salvaged materials such as beams and posts, flooring, paneling, doors and frames, cabinetry and furniture, brick and decorative items.

SS | WE | EA | **MR** | EQ | ID

Credit 3.2

1 Point
in addition to
MR 3.1

Resource Reuse: 10%

Intent

Reuse building materials and products in order to reduce demand for virgin materials and to reduce waste, thereby reducing impacts associated with the extraction and processing of virgin resources.

Requirements

Use salvaged, refurbished or reused materials, products and furnishings for at least 10% of building materials.

Submittals

- ❑ Provide the LEED Letter Template, signed by the architect, owner or other responsible party, declaring that the credit requirements have been met and listing each material or product used to meet the credit. Include details demonstrating that the project incorporates the required percentage of reused materials and products and showing their costs and the total cost of all materials for the project.

Potential Technologies & Strategies

Identify opportunities to incorporate salvaged materials into building design and research potential material suppliers. Consider salvaged materials such as beams and posts, flooring, paneling, doors and frames, cabinetry and furniture, brick and decorative items.

Recycled Content: 5% (post-consumer + 1/2 post-industrial) — 1 Point

Intent

Increase demand for building products that incorporate recycled content materials, therefore reducing impacts resulting from extraction and processing of new virgin materials.

Requirements

Use materials with recycled content such that the sum of post-consumer recycled content plus one-half of the post-industrial content constitutes at least 5% of the total value of the materials in the project.

The value of the recycled content portion of a material or furnishing shall be determined by dividing the weight of recycled content in the item by the total weight of all material in the item, then multiplying the resulting percentage by the total value of the item.

Mechanical and electrical components shall not be included in this calculation. Recycled content materials shall be defined in accordance with the Federal Trade Commission document, *Guides for the Use of Environmental Marketing Claims, 16 CFR 260.7 (e)*, available at www.ftc.gov/bcp/grnrule/guides980427.htm.

Potential Technologies & Strategies

Establish a project goal for recycled content materials and identify material suppliers that can achieve this goal. During construction, ensure that the specified recycled content materials are installed and quantify the total percentage of recycled content materials installed.

Submittals

- ❑ Provide the LEED Letter Template, signed by the architect, owner or other responsible party, declaring that the credit requirements have been met and listing the recycled content products used. Include details demonstrating that the project incorporates the required percentage of recycled content materials and products and showing their cost and percentage(s) of post-consumer and/or post-industrial content, and the total cost of all materials for the project.

SS | WE | EA | **MR** | EQ | ID

Credit 4.2

1 Point
in addition to
MR 4.1

Recycled Content: 10% (post-consumer + 1/2 post-industrial)

Intent

Increase demand for building products that incorporate recycled content materials, therefore reducing the impacts resulting from extraction and processing of new virgin materials.

Requirements

Use materials with recycled content such that the sum of post-consumer recycled content plus one-half of the post-industrial content constitutes at least 10% of the total value of the materials in the project.

The value of the recycled content portion of a material or furnishing shall be determined by dividing the weight of recycled content in the item by the total weight of all material in the item, then multiplying the resulting percentage by the total value of the item.

Mechanical and electrical components shall not be included in this calculation. Recycled content materials shall be defined in accordance with the Federal Trade Commission document, *Guides for the Use of Environmental Marketing Claims, 16 CFR 260.7 (e)*, available at www.ftc.gov/bcp/grnrule/guides980427.htm.

Submittals

- ❑ Provide the LEED Letter Template, signed by the architect, owner or other responsible party, declaring that the credit requirements have been met and listing the recycled content products used. Include details demonstrating that the project incorporates the required percentage of recycled content materials and products and showing their cost and percentage(s) of post-consumer and/or post-industrial content, and the total cost of all materials for the project.

Potential Technologies & Strategies

Establish a project goal for recycled content materials and identify material suppliers that can achieve this goal. During construction, ensure that the specified recycled content materials are installed and quantify the total percentage of recycled content materials installed.

Regional Materials: 20% manufactured regionally

1 Point

Intent

Increase demand for building materials and products that are extracted and manufactured within the region, thereby supporting the regional economy and reducing the environmental impacts resulting from transportation .

Requirements

Use a minimum of 20% of building materials and products that are manufactured* regionally within a radius of 500 miles.

* Manufacturing refers to the final assembly of components into the building product that is furnished and installed by the tradesmen. For example, if the hardware comes from Dallas, Texas, the lumber from Vancouver, British Columbia, and the joist is assembled in Kent, Washington; then the location of the final assembly is Kent, Washington.

Submittals

- ❑ Provide the LEED Letter Template, signed by the architect or responsible party, declaring that the credit requirements have been met. Include calculations demonstrating that the project incorporates the required percentage of regional materials/products and showing their cost, percentage of regional components, distance from project to manufacturer, and the total cost of all materials for the project.

Potential Technologies & Strategies

Establish a project goal for locally sourced materials and identify materials and material suppliers that can achieve this goal. During construction, ensure that the specified local materials are installed and quantify the total percentage of local materials installed.

SS | WE | EA | **MR** | EQ | ID

Credit 5.2

1 Point
in addition to
MR 5.1

Regional Materials: 50% extracted regionally

Intent

Increase demand for building materials and products that are extracted and manufactured within the region, thereby supporting the regional economy and reducing the environmental impacts resulting from transportation.

Requirements

Of the regionally manufactured materials documented for MR Credit 5.1, use a minimum of 50% of building materials and products that are extracted, harvested or recovered (as well as manufactured) within 500 miles of the project site.

Submittals

- ❑ Provide the LEED Letter Template, signed by the architect or responsible party, declaring that the credit requirements have been met. Include calculations demonstrating that the project incorporates the required percentage of regional materials/products and showing their cost, percentage of regional components, distance from project to manufacturer, and the total cost of all materials for the project.

Potential Technologies & Strategies

Establish a project goal for locally sourced materials and identify materials and material suppliers that can achieve this goal. During construction, ensure that the specified local materials are installed and quantify the total percentage of local materials installed.

SS	WE	EA	MR	EQ	ID
Credit 6					

Rapidly Renewable Materials

1 Point

Intent

Reduce the use and depletion of finite raw materials and long-cycle renewable materials by replacing them with rapidly renewable materials.

Requirements

Use rapidly renewable building materials and products (made from plants that are typically harvested within a ten-year cycle or shorter) for 5% of the total value of all building materials and products used in the project.

Submittals

- ❑ Provide the LEED Letter Template, signed by the architect or responsible party, declaring that the credit requirements have been met. Include calculations demonstrating that the project incorporates the required percentage of rapidly renewable products. Show their cost and percentage of rapidly renewable components, and the total cost of all materials for the project.

Potential Technologies & Strategies

Establish a project goal for rapidly renewable materials and identify materials and suppliers that can achieve this goal. Consider materials such as bamboo flooring, wool carpets, straw board, cotton batt insulation, linoleum flooring, poplar OSB, sunflower seed board, wheatgrass cabinetry and others. During construction, ensure that the specified rapidly renewable materials are installed.

SS | WE | EA | **MR** | EQ | ID

Credit 7

1 Point

Certified Wood

Intent

Encourage environmentally responsible forest management.

Requirements

Use a minimum of 50% of wood-based materials and products, certified in accordance with the Forest Stewardship Council's Principles and Criteria, for wood building components including, but not limited to, structural framing and general dimensional framing, flooring, finishes, furnishings, and non-rented temporary construction applications such as bracing, concrete form work and pedestrian barriers.

Submittals

- ❑ Provide the LEED Letter Template, signed by the architect, owner or responsible party, declaring that the credit requirements have been met and listing the FSC-certified materials and products used. Include calculations demonstrating that the project incorporates the required percentage of FSC-certified materials/products and their cost together with the total cost of all materials for the project. For each material/product used to meet these requirements, provide the vendor's or manufacturer's Forest Stewardship Council chain-of-custody certificate number.

Potential Technologies & Strategies

Establish a project goal for FSC-certified wood products and identify suppliers that can achieve this goal. During construction, ensure that the FSC-certified wood products are installed and quantify the total percentage of FSC-certified wood products installed.

Indoor Environmental Quality

SS | WE | EA | MR | **EQ** | ID

Prerequisite 1

Minimum IAQ Performance

Required

Intent

Establish minimum indoor air quality (IAQ) performance to prevent the development of indoor air quality problems in buildings, thus contributing to the comfort and well-being of the occupants.

Requirements

Meet the minimum requirements of voluntary consensus standard ASHRAE 62-1999, Ventilation for Acceptable Indoor Air Quality, and approved Addenda (see ASHRAE 62-2001, Appendix H, for a complete compilation of Addenda) using the Ventilation Rate Procedure.

Submittals

- ❑ Provide the LEED Letter Template, signed by the mechanical engineer or responsible party, declaring that the project is fully compliant with ASHRAE 62-1999 and all published Addenda and describing the procedure employed in the IAQ analysis (Ventilation Rate Procedure).

Potential Technologies & Strategies

Design the HVAC system to meet the ventilation requirements of the referenced standard. Identify potential IAQ problems on the site and locate air intakes away from contaminant sources.

SS | WE | EA | MR | **EQ** | ID

Prerequisite 2

Required

Environmental Tobacco Smoke (ETS) Control

Intent

Prevent exposure of building occupants and systems to Environmental Tobacco Smoke (ETS).

Requirements

Zero exposure of non-smokers to ETS by EITHER:

- prohibiting smoking in the building and locating any exterior designated smoking areas away from entries and operable windows;

OR

- providing a designated smoking room designed to effectively contain, capture and remove ETS from the building. At a minimum, the smoking room must be directly exhausted to the outdoors with no recirculation of ETS-containing air to the non-smoking area of the building, enclosed with impermeable deck-to-deck partitions and operated at a negative pressure compared with the surrounding spaces of at least 7 PA (0.03 inches of water gauge).
- Performance of the smoking rooms shall be verified by using tracer gas testing methods as described in the ASHRAE Standard 129-1997. Acceptable exposure in non-smoking areas is defined as less than 1% of the tracer gas concentration in the smoking room detectable in the adjoining non-smoking areas. Smoking room testing as described in ASHRAE Standard 129-1997 is required in the contract documents and critical smoking facility systems testing results must be included in the building commissioning plan and report or as a separate document.

Submittals

❑ Provide the LEED Letter Template, signed by the building owner or responsible party, declaring that the building will be operated under a policy prohibiting smoking.

OR

❑ Provide the LEED Letter Template, signed by the mechanical engineer or responsible party, declaring and demonstrating that designated smoking rooms are exhausted to the outdoors with no recirculation of ETS-containing air to the non-smoking area of the building, enclosed with impermeable deck-to-deck partitions, operated at a negative pressure compared with the surrounding spaces of at least 7 PA (0.03 inches of water gauge), and performance has been verified using the method described in the credit requirements.

SS | WE | EA | MR | EQ | ID

Prerequisite 2

Environmental Tobacco Smoke (ETS) Control

Required

(continued)

Potential Technologies & Strategies

Prohibit smoking in the building or provide separate smoking rooms with isolated ventilation systems.

SS | WE | EA | MR | **EQ** | ID

Credit 1

1 Point

Carbon Dioxide (CO_2) Monitoring

Intent

Provide capacity for indoor air quality (IAQ) monitoring to help sustain long-term occupant comfort and well-being.

Requirements

Install a permanent carbon dioxide (CO_2) monitoring system that provides feedback on space ventilation performance in a form that affords operational adjustments. Refer to the CO_2 differential for all types of occupancy in accordance with ASHRAE 62-2001, Appendix D.

Submittals

- ❑ Provide the LEED Letter Template, signed by the mechanical engineer or responsible party, declaring and summarizing the installation, operational design and controls/zones for the carbon dioxide monitoring system. For mixed-use buildings, calculate CO_2 levels for each separate activity level and use.

Potential Technologies & Strategies

Design the HVAC system with carbon dioxide monitoring sensors and integrate these sensors with the building automation system (BAS).

Ventilation Effectiveness

1 Point

Intent

Provide for the effective delivery and mixing of fresh air to support the safety, comfort and well-being of building occupants.

Requirements

For mechanically ventilated buildings, design ventilation systems that result in an air change effectiveness (Eac) greater than or equal to 0.9 as determined by ASHRAE 129-1997. For naturally ventilated spaces demonstrate a distribution and laminar flow pattern that involves not less than 90% of the room or zone area in the direction of air flow for at least 95% of hours of occupancy.

Submittals

- ❑ For mechanically ventilated spaces: provide the LEED Letter Template, signed by the mechanical engineer or responsible party, declaring that the design achieves an air change effectiveness (Eac) of 0.9 or greater in each ventilated zone. Complete the table summarizing the air change effectiveness achieved for each zone.

OR

- ❑ For mechanically ventilated spaces: provide the LEED Letter Template, signed by the mechanical engineer or responsible party, declaring that the design complies with the recommended design approaches in ASHRAE 2001 Fundamentals Chapter 32, Space Air Diffusion.

OR

- ❑ For naturally ventilated spaces: provide the LEED Letter Template, signed by the mechanical engineer or responsible party, declaring that the design provides effective ventilation in at least 90% of each room or zone area in the direction of airflow for at least 95% of hours of occupancy. Include a table summarizing the airflow simulation results for each zone. Include sketches indicating the airflow pattern for each zone.

Potential Technologies & Strategies

Design the HVAC system and building envelope to optimize air change effectiveness. Air change effectiveness can be optimized using a variety of ventilation strategies including displacement ventilation, low-velocity ventilation, plug-flow ventilation such as under floor or near floor delivery, and operable windows. Test the air change effectiveness of the building after construction.

SS | WE | EA | MR | **EQ** | ID

Credit 3.1

1 Point

Construction IAQ Management Plan: During Construction

Intent

Prevent indoor air quality problems resulting from the construction/renovation process in order to help sustain the comfort and well-being of construction workers and building occupants.

Requirements

Develop and implement an Indoor Air Quality (IAQ) Management Plan for the construction and pre-occupancy phases of the building as follows:

- During construction meet or exceed the recommended Design Approaches of the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guideline for Occupied Buildings under Construction, 1995, Chapter 3.
- Protect stored on-site or installed absorptive materials from moisture damage.
- If air handlers must be used during construction, filtration media with a Minimum Efficiency Reporting Value (MERV) of 8 must be used at each return air grill, as determined by ASHRAE 52.2-1999.
- Replace all filtration media immediately prior to occupancy. Filtration media shall have a Minimum Efficiency Reporting Value (MERV) of 13, as determined by ASHRAE 52.2-1999 for media installed at the end of construction.

Submittals

❑ Provide the LEED Letter Template, signed by the general contractor or responsible party, declaring that a Constuction IAQ Management Plan has been developed and implemented, and listing each air filter used during construction and at the end of construction. Include the MERV value, manufacturer name and model number.

AND EITHER

❑ Provide 18 photographs—six photographs taken on three different occasions during construction—along with identification of the SMACNA approach featured by each photograph, in order to show consistent adherence to the credit requirements

OR

❑ Declare the five Design Approaches of SMACNA IAQ Guideline for Occupied Buildings under Construction, 1995, Chapter 3, which were used during building construction. Include a brief description of some of the important design approaches employed.

Construction IAQ Management Plan: During Construction

1 Point

(continued)

Potential Technologies & Strategies

Adopt an IAQ management plan to protect the HVAC system during construction, control pollutant sources and interrupt contamination pathways. Sequence the installation of materials to avoid contamination of absorptive materials such as insulation, carpeting, ceiling tile and gypsum wall board.

SS | WE | EA | MR | **EQ** | ID

Credit 3.2

1 Point

Construction IAQ Management Plan: Before Occupancy

Intent

Prevent indoor air quality problems resulting from the construction/renovation process in order to help sustain the comfort and well-being of construction workers and building occupants.

Requirements

Develop and implement an Indoor Air Quality (IAQ) Management Plan for the pre-occupancy phase as follows:

- After construction ends and prior to occupancy conduct a minimum two-week building flush-out with new Minimum Efficiency Reporting Value (MERV) 13 filtration media at 100% outside air. After the flush-out, replace the filtration media with new MERV 13 filtration media, except the filters solely processing outside air.

OR

- Conduct a baseline indoor air quality testing procedure consistent with the United States Environmental Protection Agency's current *Protocol for Environmental Requirements, Baseline IAQ and Materials, for the Research Triangle Park Campus, Section 01445.*

Submittals

❑ Provide the LEED Letter Template, signed by the architect, general contractor or responsible party, describing the building flush-out procedures and dates.

OR

❑ Provide the LEED Letter Template, signed by the architect or responsible party, declaring that the referenced standard's IAQ testing protocol has been followed. Include a copy of the testing results.

Potential Technologies & Strategies

Prior to occupancy, perform a two week building flush-out or test the contaminant levels in the building.

Low-Emitting Materials: Adhesives & Sealants

1 Point

Intent

Reduce the quantity of indoor air contaminants that are odorous, potentially irritating and/or harmful to the comfort and well-being of installers and occupants.

Requirements

The VOC content of adhesives and sealants used must be less than the current VOC content limits of South Coast Air Quality Management District (SCAQMD) Rule #1168, AND all sealants used as fillers must meet or exceed the requirements of the Bay Area Air Quality Management District Regulation 8, Rule 51.

Submittals

- ❑ Provide the LEED Letter Template, signed by the architect or responsible party, listing the adhesives and sealants used in the building and declaring that they meet the noted requirements.

Potential Technologies & Strategies

Specify Low-VOC materials in construction documents. Ensure that VOC limits are clearly stated in each section where adhesives and sealants are addressed.

SS | WE | EA | MR | **EQ** | ID

Credit 4.2

1 Point

Low-Emitting Materials: Paints and Coatings

Intent

Reduce the quantity of indoor air contaminants that are odorous, potentially irritating and/or harmful to the comfort and well-being of installers and occupants.

Requirements

VOC emissions from paints and coatings must not exceed the VOC and chemical component limits of Green Seal's Standard GS-11 requirements.

Submittals

- ❑ Provide the LEED Letter Template, signed by the architect or responsible party, listing all the interior paints and coatings used in the building that are addressed by Green Seal Standard GS-11 and stating that they comply with the current VOC and chemical component limits of the standard.

Potential Technologies & Strategies

Specify Low-VOC paints and coatings in construction documents. Ensure that VOC limits are clearly stated in each section where paints are addressed.

SS	WE	EA	MR	EQ	ID
Credit 4.3					

Low-Emitting Materials: Carpet

1 Point

Intent

Reduce the quantity of indoor air contaminants that are odorous, potentially irritating and/or harmful to the comfort and well-being of installers and occupants.

Requirements

Carpet systems must meet or exceed the requirements of the Carpet and Rug Institute's Green Label Indoor Air Quality Test Program.

Submittals

- ❑ Provide the LEED Letter Template, signed by the architect or responsible party, listing all the carpet systems used in the building and stating that they comply with the current VOC limits of the Carpet and Rug Institute's Green Label Indoor Air Quality Test Program.

Potential Technologies & Strategies

Specify Low-VOC carpet products and systems in construction documents. Ensure that VOC limits are clearly stated where carpet systems are addressed.

SS | WE | EA | MR | **EQ** | ID

Credit 4.4

1 Point

Low-Emitting Materials: Composite Wood

Intent

Reduce the quantity of indoor air contaminants that are odorous, potentially irritating and/or harmful to the comfort and well-being of installers and occupants.

Requirements

Composite wood and agrifiber products must contain no added urea-formaldehyde resins.

Submittals

- ❑ Provide the LEED Letter Template, signed by the architect or responsible party, listing all the composite wood products used in the building and stating that they contain no added urea-formaldehyde resins.

Potential Technologies & Strategies

Specify wood and agrifiber products that contain no added urea-formaldehyde resins.

Indoor Chemical & Pollutant Source Control

1 Point

Intent

Avoid exposure of building occupants to potentially hazardous chemicals that adversely impact air quality.

Requirements

Design to minimize pollutant cross-contamination of regularly occupied areas:

- Employ permanent entryway systems (grills, grates, etc.) to capture dirt, particulates, etc. from entering the building at all high volume entryways.
- Where chemical use occurs (including housekeeping areas and copying/printing rooms), provide segregated areas with deck to deck partitions with separate outside exhaust at a rate of at least 0.50 cubic feet per minute per square foot, no air re-circulation and maintaining a negative pressure of at least 7 PA (0.03 inches of water gauge).
- Provide drains plumbed for appropriate disposal of liquid waste in spaces where water and chemical concentrate mixing occurs.

Submittals

❑ Provide the LEED Letter Template, signed by the architect or responsible party, declaring that:

- Permanent entryway systems (grilles, grates, etc.) to capture dirt, particulates, etc. are provided at all high volume entryways.
- Chemical use areas and copy rooms have been physically separated with deck-to-deck partitions; independent exhaust ventilation has been installed at 0.50 cfm/square foot and that a negative pressure differential of 7 PA has been achieved.
- In spaces where water and chemical concentrate mixing occurs, drains are plumbed for environmentally appropriate disposal of liquid waste.

Potential Technologies & Strategies

Design separate exhaust and plumbing systems for rooms with contaminants to achieve physical isolation from the rest of the building. Install permanent architectural entryway systems such as grills or grates to prevent occupant-borne contaminants from entering the building.

SS | WE | EA | MR | **EQ** | ID

Credit 6.1

1 Point

Controllability of Systems: Perimeter Spaces

Intent

Provide a high level of thermal, ventilation and lighting system control by individual occupants or specific groups in multi-occupant spaces (i.e. classrooms or conference areas) to promote the productivity, comfort and well-being of building occupants.

Requirements

Provide at least an average of one operable window and one lighting control zone per 200 square feet for all regularly occupied areas within 15 feet of the perimeter wall.

Submittals

- ❑ Provide the LEED Letter Template, signed by the architect or responsible party, demonstrating and declaring that for regularly occupied perimeter areas of the building a minimum of one operable window and one lighting control zone are provided per 200 square feet on average.

Potential Technologies & Strategies

Design the building with occupant controls for airflow, temperature and lighting. Strategies to consider include lighting controls, task lighting and operable windows.

SS | WE | EA | MR | **EQ** | ID

Credit 6.2

Controllability of Systems: Non-Perimeter Spaces

1 Point

Intent

Provide a high level of thermal, ventilation and lighting system control by individual occupants or specific groups in multi-occupant spaces (i.e. classrooms or conference areas) to promote the productivity, comfort and well-being of building occupants.

Requirements

Provide controls for each individual for airflow, temperature and lighting for at least 50% of the occupants in non-perimeter, regularly occupied areas.

Submittals

- ❑ Provide the LEED Letter Template, signed by the architect or responsible party, demonstrating and declaring that controls for individual airflow, temperature and lighting are provided for at least 50% of the occupants in non-perimeter, regularly occupied areas.

Potential Technologies & Strategies

Design the building with occupant controls for airflow, temperature and lighting. Strategies to consider include task lighting and underfloor HVAC systems with individual diffusers.

SS | WE | EA | MR | **EQ** | ID

Credit 7.1

1 Point

Thermal Comfort: Compliance with ASHRAE 55-1992

Intent

Provide a thermally comfortable environment that supports the productivity and well-being of building occupants.

Requirements

Comply with ASHRAE Standard 55-1992, Addenda 1995, for thermal comfort standards including humidity control within established ranges per climate zone. For naturally ventilated buildings, utilize the adaptive comfort temperature boundaries, using the 90% acceptability limits as defined in the California High Performance Schools (CHPS) Best Practices Manual, Appendix C – A Field Based Thermal Comfort Standard for Naturally Ventilated Buildings, Figure 2.

Submittals

- ❑ For mechanically ventilated spaces: provide the LEED Letter Template, signed by the engineer or responsible party, declaring that the project complies with ASHRAE Standard 55-1992, Addenda 1995. Include a table that identifies each thermally controlled zone, and that summarizes for each zone the temperature and humidity control ranges and the method of control used.

OR

- ❑ For naturally ventilated spaces: provide the LEED Letter Template, signed by the engineer or responsible party declaring that the project complies with the 90% acceptability limits of the adaptive comfort temperature boundaries in the California High Performance Schools (CHPS) Best Practices Manual Appendix C – A Field Based Thermal Comfort Standard for Naturally Ventilated Buildings, Figure 2.

Potential Technologies & Strategies

Establish temperature and humidity comfort ranges and design the building envelope and HVAC system to maintain these comfort ranges.

SS | WE | EA | MR | **EQ** | ID

Credit 7.2

Thermal Comfort: Permanent Monitoring System

1 Point
in addition to
EQ 7.1

Intent

Provide a thermally comfortable environment that supports the productivity and well-being of building occupants.

Requirements

Install a permanent temperature and humidity monitoring system configured to provide operators control over thermal comfort performance and the effectiveness of humidification and/or dehumidification systems in the building.

Submittals

- ❑ Provide the LEED Letter Template, signed by the engineer or responsible party, declaring that a permanent temperature and humidity monitoring system will operate throughout all seasons to permit control of the building zones within the seasonal thermal comfort ranges defined in ASHRAE 55-1992, Addenda 1995. Confirm that the temperature and humidity controls were (or will be) tested as part of the scope of work for Energy and Atmosphere Prerequisite 1, Fundamental Building Systems Commissioning. Include the document name and section number where the commissioning work is listed.

Potential Technologies & Strategies

Establish temperature and humidity comfort ranges and design the building envelope and HVAC system to maintain these comfort ranges. Install and maintain a temperature and humidity monitoring system in the building to automatically adjust building conditions as appropriate.

SS | WE | EA | MR | **EQ** | ID

Credit 8.1

1 Point

Daylight and Views: Daylight 75% of Spaces

Intent

Provide for the building occupants a connection between indoor spaces and the outdoors through the introduction of daylight and views into the regularly occupied areas of the building.

Requirements

Achieve a minimum Daylight Factor of 2% (excluding all direct sunlight penetration) in 75% of all space occupied for critical visual tasks. Spaces excluded from this requirement include copy rooms, storage areas, mechanical plant rooms, laundry and other low occupancy support areas. Other exceptions for spaces where tasks would be hindered by the use of daylight will be considered on their merits.

Submittals

- ❑ Provide the LEED Letter Template signed by the architect or responsible party. Provide area calculations that define the daylight zone and provide prediction calculations or daylight simulation.

Potential Technologies & Strategies

Design the building to maximize interior daylighting. Strategies to consider include building orientation, shallow floor plates, increased building perimeter, exterior and interior permanent shading devices, high performance glazing and photo-integrated light sensors. Predict daylighting via calculations or model daylighting strategies with a physical or computer model to assess footcandle levels and daylight factors achieved.

SS	WE	EA	MR	EQ	ID
Credit 8.2					

Daylight and Views: Views for 90% of Spaces

1 Point

Intent

Provide for the building occupants a connection between indoor spaces and the outdoors through the introduction of daylight and views into the regularly occupied areas of the building.

Requirements

Achieve direct line of sight to vision glazing for building occupants in 90% of all regularly occupied spaces. Examples of exceptions include copy rooms, storage areas, mechanical, laundry and other low occupancy support areas. Other exceptions will be considered on their merits.

Submittals

- ❑ Provide the LEED Letter Template and calculations describing, demonstrating and declaring that the building occupants in 90% of regularly occupied spaces will have direct lines of site to perimeter glazing. Provide drawings highlighting the direct line of sight zones.

Potential Technologies & Strategies

Design the building to maximize view opportunities.

SS | WE | EA | MR | EQ | **ID**

Credit 1

Innovation & Design Process

1-4 Points

Innovation in Design

Intent

To provide design teams and projects the opportunity to be awarded points for exceptional performance above the requirements set by the LEED Green Building Rating System and/or innovative performance in Green Building categories not specifically addressed by the LEED Green Building Rating System.

Requirements

Credit 1.1 (1 point)	In writing, identify the **intent** of the proposed innovation credit, the proposed **requirement** for compliance, the proposed **submittals** to demonstrate compliance, and the **design approach** (strategies) that might be used to meet the requirements.
Credit 1.2 (1 point)	Same as Credit 1.1
Credit 1.3 (1 point)	Same as Credit 1.1
Credit 1.4 (1 point)	Same as Credit 1.1

Submittals

- ❑ Provide the proposal(s) within the LEED Letter Template (including intent, requirement, submittals and possible strategies) and relevant evidence of performance achieved.

Potential Technologies & Strategies

Substantially exceed a LEED performance credit such as energy performance or water efficiency. Apply strategies or measures that are not covered by LEED such as acoustic performance, education of occupants, community development or lifecycle analysis of material choices.

SS	WE	EA	MR	EQ	ID
Credit 2.1					

LEED Accredited Professional

1 Point

Intent

To support and encourage the design integration required by a LEED Green Building project and to streamline the application and certification process.

Requirement

At least one principal participant of the project team that has successfully completed the LEED Accredited Professional exam

Submittals

- ❑ Provide the LEED Letter Template stating the LEED Accredited Professional's name, title, company and contact information. Include a copy of this person's LEED Accredited Professional Certificate.

Potential Technologies & Strategies

Attending a LEED Accredited Professional Training Workshop is recommended but not required. Study the LEED Reference Guide. Successfully pass the LEED accreditation exam.

ABOUT GREEN STAR

The mission of the Green Building Council of Australia (GBCA) is to develop a sustainable property industry for Australia and drive the adoption of green building practices through market-based solutions. This will be achieved through the Green Star environmental rating tools, by leveraging broad sector support and by encouraging the adoption of sustainability measures within legislative frameworks.

OVERVIEW:

The GBCA is committed to providing world class rating tools to measure the environmental performance of buildings across a range of building types. Through the use of robust methodologies and a consistent framework, the GBCA has created a suite of Green Star tools that:

- Are suited to the Australian climatic, ecological, regulatory and commercial environments;
- Provide weighting between diverse environmental concerns to ensure a clearly communicable single measure of green;
- Reward best practice and therefore compliment the activities of others in legislating minimum environmental performance standards in planning schemes and the building code;
- Provide the maximum opportunity for widespread adoption through clearly stated credit criteria and low cost of implementation;
- Are freely available and also provides for independent third party accredited assessment through the Green Building Council of Australia;
- Are continually refined and enhanced to reflect a market in transition and environmental impact information; and
- Are supported by a non-commercial professional training and accreditation process;
- Are informed by the success and failure of similar schemes overseas; and,
- Include different building types and the distinct stages of a buildings life cycle.

THE GREEN STAR FRAMEWORK:

The framework is based on other international rating tools, including the Building Research Establishment's BREEAM rating tools and the US Green Building Council's LEED rating system. Green Star is a points-based system that evaluates buildings across the following environmental impact categories:

- Management,
- Indoor Environment Quality,
- Energy,
- Transport,
- Water,
- Materials,
- Land Use and Ecology,
- Emissions, and
- Innovation

Green Star is unique among rating tools in the world through its application of weightings between environmental impact credit categories such as Energy and Water, to match the differing environmental conditions and requirements in the various Australian states and jurisdictions. This means that Green Star can effectively rate buildings across all geographical locations within Australia.

Points are awarded in each credit for documentation that demonstrates that the project has met the overall objectives of the relevant Green Star rating tool.

The Green Star rating is determined by comparing the overall score with the rating scale shown below.

SCORE	RATING	CATEGORY
45-59	Four Star	"Best Practice"
60-74	Five Star	"Australian Excellence"
75+	Six Star	"World Leader"

EXISTING GREEN STAR TOOLS

Green Star – Office (V3 2008);



Green Star – Office Interiors (V1 2005, V1.2 2008);



Green Star – Office Existing Building EXTENDED PILOT (re-released 2007);



Green Star – Shopping Centre Design PILOT (2006);



Green Star – Healthcare PILOT (2006);



Green Star – Education PILOT (2007)



Green Star - Multi Unit Residential PILOT (2008)



Green Star - Mixed Use PILOT (2008)



In order to be an effective Green Star rating tool, each credit must satisfy the following criteria:

- Can be benchmarked against best practice;
- Is relevant to the top 25% of the market;
- Can be demonstrated at the construction completion;
- Can be documented in a simple and cost efficient manner;
- Is quantifiable and can be measured without subjective interpretation;
- Addresses a valid environmental concern; and
- Is specific to the building's potential performance not its actual use in operations.

DEVELOPMENT PROCESS OF THE GREEN STAR RATING TOOLS

The Green Star rating tools are developed via Technical Working Groups (TWG); GBCA member-only committees consisting of experts in engineering, architecture, indoor environment quality, and building materials; as well as representatives from industry, government and academia.

Once developed, all tools are approved by the GBCA's Technical Steering Committee and Board of Directors. The GBCA prides itself on thorough stakeholder engagement and has a well-defined public review process. All PILOT tools are available to the public on the GBCA website and the PILOT process lasts for at least 90 days. Up to six sponsors and members have the opportunity to have PILOT projects assessed during this time.

All public feedback and recommendations for improvement are presented to the TWG. Once refinements to the tool have been made and agreed upon by the TWG, the tool is once again reviewed by the Technical Steering Committee and Board of Directors prior to release of the final version.

The final version of the Green Star tool is published on the GBCA website and an accompanying Technical Manual is published, explaining each credit and required documentation in detail. Any member of the public is now eligible to have a project assessed and to receive an official Green Star certified rating.

GREEN STAR – PUBLIC BUILDINGS

The Green Star – Public Building rating tool will be created to inform, assess and appraise both the design and the completed construction of a wide variety of public buildings across Australia. The rating tool will be aimed to address the very specific functions and environmental circumstances as well as the position of public buildings within the market, and will aim to focus on developments which are built for public and community use, likely to include (but possibly not be limited to) Community Centres, Exhibition Centres and Art Galleries, Museums, Convention Centres, Libraries, Cinemas, Theatres and Concert Halls.

It will rate the environmental attributes of new public buildings as well as additions to and substantial refurbishments of existing public buildings. The tool assigns a Green Star rating to the physical building and its services, independent of its tenants' operations or behaviour.

Projects will initially be able to undergo assessment of the design documentation (under Green Star – Public Building Design) and after further development of the completed construction (under Green Star – Public Building As Built).

To qualify for assessment, the building must meet the following Eligibility Criteria: A minimum of 80% of the building's gross floor area (GFA) must be Class 9b Building of a Public Nature, as defined by the BCA but to exclude educational facilities. If other BCA classes are present within the building, those areas must represent less than 20% of the GFA and be included in the assessment as required by the Credit Criteria.

The Green Star – Public Building Certified Rating will comparable with Green Star Certified ratings for other facility types. In other words, a 5 Star Green Star – Public Building As Built certified development will exhibit a degree of industry leadership comparable to that of a 5 Star Green Star – Office As Built certified development.

THE MARKET:

The target audience for the Green Star – Public Building rating tool will consist of community building specialists, private developers, designers and contractors, as well as state and local governments.

The tool will principally enable public building owners and developers to minimise the environmental impacts of their developments, capitalise on the environmental benefits of their initiatives, and receive recognition for more environmentally sustainable design.

The Green Star – Public Buildings rating tool will also provide state and local governments with a framework for providing planning guidelines and development incentives to the property industry, as well as assisting public building investors and developers with the assessment and consideration of more environmentally sustainable building practices.

Application of a Building Environmental Assessment, CASBEE, and its Influence on the Building Market

Junko Endo[1 a], Shuzo Murakami [2 b] and Toshiharu Ikaga [3 c]

[1] Senior Consultant, Nikken Sekkei Research Institute,
Daiichi Teko Bldg. 5F, 1-8-2, Marunouchi, Chiyoda-ku, Tokyo 100-0005, Japan
[2, 3] Professor, Department of System Design Engineering, Faculty of Science and Technology, Keio University, 3-14-1 Hiyoshi, Kohoku-ku, Yokohama 223-8522, Japan
[a] endouj@nikken.co.jp, [b] murakami@sd.keio.ac.jp, [c] ikaga@sd.keio.ac.jp

ABSTRACT

CASBEE (Comprehensive Assessment System for Building Environmental Efficiency) is an environmental labelling method for buildings, based on assessment of the environmental performance of buildings. The framework of basic and extended CASBEE tools as a structured assessment system is called the "CASBEE family." CASBEE consists of a set of four basic assessment tools, namely "CASBEE for Pre-design" (CASBEE-PD), "CASBEE for New Construction" (CASBEE-NC), "CASBEE for Existing Building" (CASBEE-EB) and "CASBEE for Renovation" (CASBEE-RN). These correspond to the individual stages of the building's lifecycle. There are also needs for detailed assessment targeting specific environmental aspects. "CASBEE-HI", as an extended tool, assesses efforts made in buildings to alleviate the heat island effect. A new tool called "CASBEE for Urban Development" (CASBEE-UD), is developed for assessment of a group of buildings. The basic concept of each tool is defined, and their applications in terms of building' life stages and their associated users are examined. Some local authorities introduced CASBEE into their building administration as assessment methods for their sustainable building reporting systems. This requires building owners to submit a planning document assessing the environmental performance of their buildings to the authorities. In April 2004, the city of Nagoya introduced "CASBEE Nagoya". Introduction of CASBEE followed in the city of Osaka, Yokohama, Kyoto, and other municipals.

KEYWORDS: Environmental policy, Local characteristics, Sustainable Building Reporting System, Information disclosure, Sogo Sekkei Seido, Building permission

1. INTRODUCTION

The development of the Comprehensive Assessment System for Building Environmental Efficiency (CASBEE) was started in 2001 with the assistance of Japanese Ministry of Land, Infrastructure and Transportation (MLIT). To date, a series of CASBEE tools have been elaborated and released for the wide range of building types. This paper presents the concept and framework of the assessment method and its application, especially administrative use of CASBEE by local governments.

2. THE FRAMEWORK; CASBEE-FAMILY

2.1 Building Lifecycle and CASBEE-Family

CASBEE consists of a set of four basic assessment tools which include, "CASBEE for Pre-design" (CASBEE-PD), "CASBEE for New Construction" (CASBEE-NC), "CASBEE for Existing Buildings"

(CASBEE-EB) and "CASBEE for Renovation" (CASBEE-RN), which correspond to the individual stages of a building's lifecycle as shown in Figure 1. These tools can be applied for many types of buildings, such as offices, schools, retail stores, restaurants, halls, hospitals, hotels and apartments. These tools are basically designed to assess single buildings. "CASBEE Family" is the collective name for these four tools and the extended tools for specific purposes (Japan Sustainable Building Consortium, 2006). Figure 2 shows the scope of the CASBEE-Family.

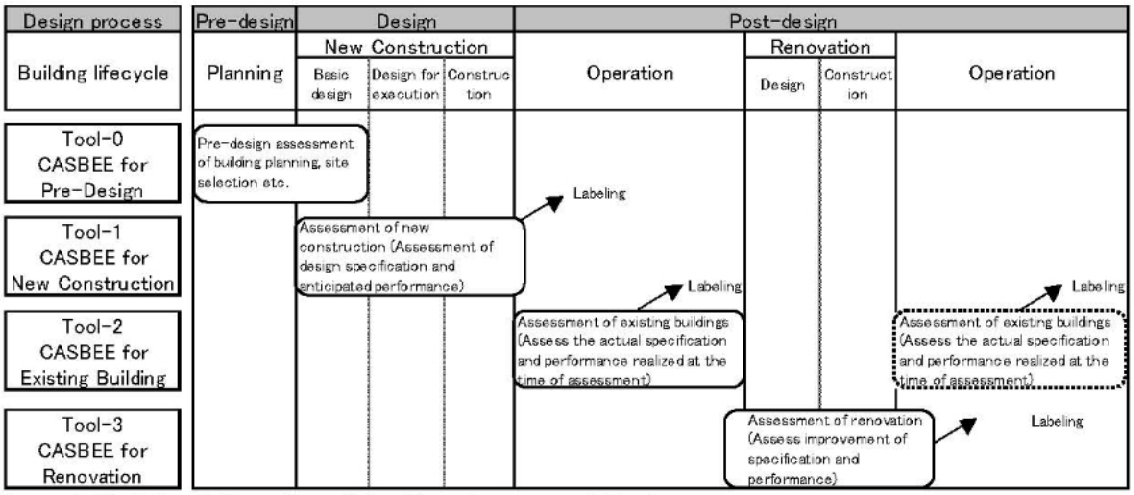

Figure 1. Building Lifecycle and the Four Assessment Tools

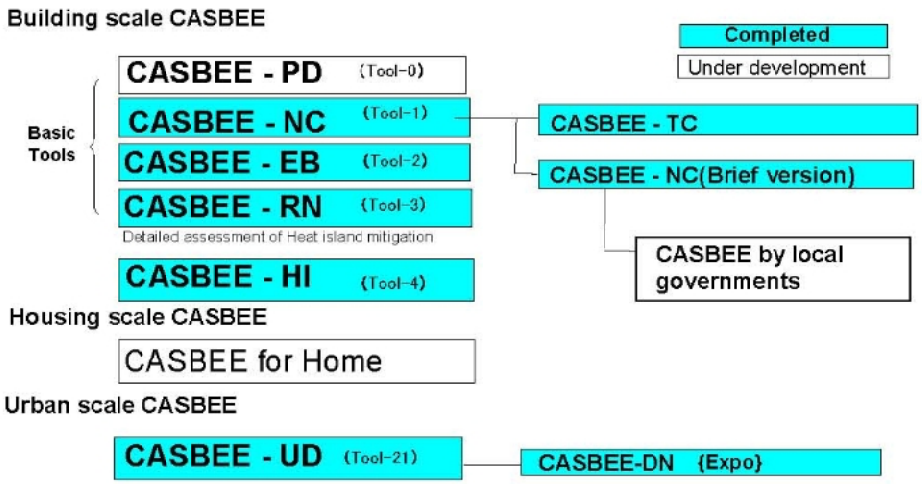

Figure 2. Scope of CASBEE-Family

CASBEE for Pre-design (CASBEE-PD) aims to assist the owner, planner and others involved in the planning (pre-design) stage of the project. It can be used to assist in grasping issues such as the basic environmental impact of the project, in selecting a suitable site, and to evaluate the environmental performance of the project in the pre-design stage .

CASBEE for New Construction (CASBEE-NC) is used by architects and engineers to increase the BEE value of a building during the design process. This can be used as a design support tool as well as a self check list. This tool, formerly named DfE (Design for Environment) tool, makes assessments based on the design specifications and the anticipated performance. Rebuilding projects are assessed by CASBEE-NC. As environmental performance and assessment criteria change over time, the results

of assessments under "CASBEE for New Construction" only remain valid for three years after the completion of construction.

CASBEE for Existing Building (CASBEE-EB) targets existing building stock, based on operation records for at least one year after completion. The tool was also developed to be applicable to asset assessment. This assessment tool evaluates achieved performance or installation when the assessment is made. The result is valid for 5 years. It can be used as a labelling tool to declare the environmental performance of buildings. CASBEE-EB is also utilized to support building maintenance. Building owners, such as the real estate sector and large enterprises, may use it as a self-evaluation tool for mid-term and long-term management plans.

CASBEE for Renovation (CASBEE-RN) is designed to evaluate the performances of existing buildings based on predicted performance and specifications with renovation. It can be used for building-stock renovation, and to generate proposals for building-operation monitoring, commissioning and upgrade design with a view to ESCO (Energy Service Company) projects. It is valid for three years after completion of the renovation work. This tool can be used to evaluate the degree of improvement (increased BEE), relative to the level that preceded renovation. CASBEE-RN may also assess improvement of specific performance in relation to the purpose of the renovation. For instance, the BEE for energy saving can be presented, that is determined by the scores for assessment categories especially related to energy saving renovation, such as Energy and Indoor environment.

2.2 Extended Tools of CASBEE

The basic CASBEE tool suite is applicable to a diverse range of individual applications. Several extended tools have been developed as shown in Table 1.

Table 1. Extended CASBEE tools for specific purposes (as of January 2007)

Name	Application	Outline
CASBEE for Temporary Construction	Temporary Construction	Currently adapted to exhibition facilities.
CASBEE for New Construction (Brief version)	Simple preliminary assessment	Simplified edition of CASBEE for New Construction.
CASBEE used by local governments	For individual local areas	CASBEE for New Construction (Brief version), tailored to regional characteristics
CASBEE-HI	Assessment on the efforts in alleviating the heat island phenomenon	Detailed assessment of the heat island effect using CASBEE
CASBEE for Home	Houses	Pilot version is released for Detached House
CASBEE for Urban Development	Urban scale development	Assessment of groups of buildings for urban scale development

CASBEE for Temporary Construction (CASBEE-TC) was developed as an extension to CASBEE for New Construction for evaluating temporary buildings constructed specifically for short-term use, such as expo pavilions. Buildings of this type have short-term lifecycles, and therefore consideration must concentrate largely on material use and recycling in the construction and the demolition phases. The scoring criteria and weighting reflect the features of this type of buildings. So far, the tool has been completed in a version limited to exhibition facilities.

Assessment using CASBEE for New Construction may take 3~7 days, including the time required to prepare documents necessary as the basis for scoring. "CASBEE for New Construction (Brief version)" was developed to meet the growing need for a tool to handle objectives such as a simplified setting of the Building Environmental Efficiency level and preparation of documents for submission to

government agencies. It makes a simplified, provisional assessment possible in around two hours (excluding time for the preparation of an Energy Saving Plan).

CASBEE is used by local authorities in construction administration, namely sustainable building reporting systems. They can tailor CASBEE for New Construction (Brief version) to local conditions, such as climate and prioritized policies. Examples are "CASBEE Nagoya," "CASBEE Osaka" and "CASBEE Yokohama." Assessment results by CASBEE-Nagoya are reported as shown Figure 3.

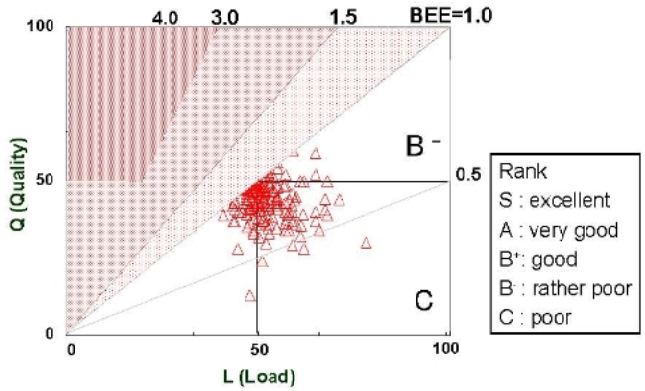

Figure 3. Assessment results of new building projects in Nagoya City using CASBEE-Nagoya

Assessment of the heat island effect is essential in major urban areas, such as Tokyo and Osaka. "CASBEE for Heat Island Relaxation" (CASBEE-HI) is a tool aiming for more detailed quantitative assessment of heat island relaxation measures in building design. In CASBEE-HI, the criteria deal with more detailed conditions in the outdoor thermal environment and the heat island load to surroundings. (These are also addressed in CASBEE-NC.) CASBEE-HI is also evaluated with the concept of eco-efficiency.

The four basic tools are not applied to detached houses, although they are applied to apartments. "CASBEE for Home" is being developed for detached houses. Pilot version is released in July 2006.

CASBEE for Urban Development is applied to projects including multiple buildings. This tool considers the human efforts and effects of group of buildings, other than these of single buildings, which improve the environmental performance of the urban area as a whole. As a specialized tool, "CASBEE for District Neighbourhoods (Expo) version March 2005" has been completed and was used to assess the site plan of the World Expo 2005 Aichi, Japan.

3. ADMINISTRATIVE USE OF CASBEE

3.1 Outline of "Sustainable building reporting systems"

Local governments are enthusiastic in adopting environmental performance assessment for their building administration in Japan. In recent years, many major cities in Japan have been adopting "Sustainable building reporting systems" as an environmental policy in their building administration. To operate this system, these local authorities utilize an environment performance evaluation method for buildings as policy instruments. The system appear to have become a very strong driving force in spreading environmental measures in building construction, and consequently environmental performance assessment of buildings is carried out in many buildings.

Table 2 shows local authorities that have introduced sustainable building reporting systems. Most governments adopt CASBEE for their reporting systems. Under required ordinances and guidelines, building owners are asked to carry out comprehensive assessment of their buildings' environmental performance when a building above a certain size is newly constructed. These results must be reported to the authority and the authority must publish the submitted assessment results of environmental

performance. Most authorities use the Internet to disclose the results and the summary of environmental measures taken by the building owner to improve environmental performance. The system is designed to promote voluntary actions by building owners for the environment through information disclosure to the local residents, by showing which building owners are active in environmental measures.

Table 2. Administrative use of environmental performance assessment tool for buildings by local governments

Municipals*	Started	Subject Building
Tokyo Metropolitan Government**	2002.06	New construction over 10,000 m^2 total floor area
Nagoya City	2004.04	New construction or extension over 2,000 m2 total floor area
Osaka city	2004.10	New construction over 5,000 m^2 total floor area or New construction applied for extra maximum floor-area ratio more than 1,000 m^2 site area
Yokohama city	2005.07	New construction or extension over 5,000 m^2 total floor area
Kyoto city	2005.10	New construction or extension more than 2,000 m^2 total floor area
Kyoto prefecture	2006.04	New construction or extension more than 2,000 m^2 total floor area
Osaka prefecture	2006.04	New construction or extension over 5,000 m^2 total floor area
Kobe city	2006.08	New construction or extension more than 5,000 m^2 total floor area or New construction applied for extra floor-area ratio more than 2,000 m^2 total floor area
Kaswasaki city	2006.10	New construction or extension over 5,000 m^2 total floor area
Hyogo prefecture	2006.10	New construction or extension more than 5,000 m^2 total floor area

* Shizuoka prefecture, Fukuoka City and Sapporo City will also introduce CASBEE.
** The system does not use CASBEE as assessment tool

3.2 Localized CASBEE for "Sustainable building reporting systems" by local governments

Now that CASBEE has been developed to a level where it is applicable to new buildings, as CASBEE for New Construction (CASBEE-NC). "CASBEE for New Construction (brief version)" have been developed to meet the growing need for a simpler version of CASBEE-NC that saves time for document preparation. CASBEE-NC (brief version) is now widely used by the sustainable building reporting systems. On the other hand, CASBEE is also intended to take regional conditions into consideration as background for the assessment. Local characteristics such as infrastructure, local economy, climate and history may be different. Local authorities that use this tool can tailor it to local conditions, such as climate and prioritized policies. Changes are generally made by modifying the weighting coefficients. Flexible response to regional character is a common feature of all elements of CASBEE. One example is "CASBEE-Nagoya". CASBEE-Nagoya has its own scoring guidelines that instruct some criteria in relation to local contexts, such as materials from local industry, and that define some excluding criteria (Noda, H. 2004). Another example is CASBEE-Osaka that altered weighting coefficient from the original to reflect the high priority they give to heat island policy. The city of Osaka also started administrative use of CASBEE from October 1, 2004, changing the weights of Q-1 Indoor environment from 0.4 to 0.3 and Q-3 Outdoor environment on site from 0.3 to 0.4 (City of Osaka).

3.2 Advanced application of CASBEE to promote sustainable buildings in the building markets

Further, it is possible to provide incentives to buildings which gain high ratings with CASBEE. In May 2004, Osaka city established the guidelines called CASBEE Osaka, which went into effect since October 2004. This guideline applies to buildings over 5,000 m^2 of total floor space, or buildings of over 1,000 m^2 of site area. These buildings cover approximately 40% of total floor area of annual new construction in Osaka city. In Osaka city, the rating should at least reach the B^+ class, the third of CASBEE's five grades, if the approval for an administrative scheme, called "sougou sekkei seido," is given to the building being assessed (Osaka City, 2004). The maximum floor-area ratio of the building can be increased in this scheme. The city of Osaka is the first municipality to make rating by CASBEE Osaka a condition in qualifying for the scheme.

Financial support can be provided for high score buildings assessed by CASBEE. The city of Osaka subsidizes residential buildings that are A-ranked by CASBEE. The city of Nagoya also subsidizes the residential buildings selected in order of BEE value by CASBEE. In Kawasaki city, developers who are selling multi residential units must publish CASBEE results in their advertisements to inform consumers about the environmental performance of the buildings (Kawasaki city). Financial sector, such as banks, may utilize such information to offer better interest rates to the consumers who buy environmentally high performance residential units.

6. CONCLUSIONS

CASBEE is intended to serve various applications in the market. Local governments seem to be the most active in introducing CASBEE for practical use. The scope of CASBEE is summarized as below.
(1) "CASBEE Family" is the collective name for CASBEE's four basic assessment tools, "CASBEE for Pre-design," "CASBEE for New Construction," "CASBEE for Existing Building" and "CASBEE for Renovation", and the extended tools for specific purposes.
(2) Some extended tools for specific purposes have been developed, such as CASBEE for Temporary Construction (exhibition facilities), CASBEE for New Construction (Brief version) and its variations reflecting local conditions, CASBEE-HI. "CASBEE for Urban Development" broadened assessment to cover efforts applied to areas including multiple buildings.
(3) Local governments seem to be the most active in introducing CASBEE for practical use. CASBEE Nagoya and CASBEE Osaka were first enacted in 2004 as tools for the sustainable building reporting systems. These governments make use of market system to promote sustainable building through providing incentives to buildings which gain high ratings with CASBEE.

Acknowledgements
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Kawasaki city website; http://www.city.kawasaki.jp/30/30kansin/home/casbee/

Housing & Building National Research Center

SUSTAINABLE LOW-COST SANITATION SOLUTIONS

-Applications & Lessons Learnt from the Egyptian Context-

Doaa M. El-Sherif *PhD., Arch.*

Ass. Prof.; Executive Director-Central Training Department;
Housing and Building National Research Center (HBRC);
Egypt













SUSTAINABLE LOW-COST SANITATION SOLUTIONS

This paper reports the results of the research titled:

"Synthesis of National and International Case Studies on Pro-poor, Low-cost Sanitation Solutions in Peri-Urban Areas"

The research was the result of a co-operative approach between the following organizations:

- The Housing & Building National Research Centre (HBRC); Main Coordinator.
- The International Water & Sanitation Centre (IRC) - The Netherlands.
- The United Nations Center for Human Settlements (UN-Habitat) Sustainable Cities Program (SCP); the Sponsor.



SUSTAINABLE LOW-COST SANITATION SOLUTIONS

The research was conducted In association with the following partners:

- Holding Company for Water and Wastewater, Cairo. (HCWW)
- National Organization for Potable Water and Sanitary Drainage, (NOPWASD)
- Ministry of Irrigation and Water Resources (MIWR)
- Center of Environment & Development for the Arab Region and Europe & EWP- Egyptian Water Partnership (CEDARE)
- The Arab Office for Youth and Environment (AOYE)
- Cairo University; Civil Engineering Center for Research & Studies, Faculty of Engineering.



SUSTAINABLE LOW-COST SANITATION SOLUTIONS

Research Team Members

HBRC:

Team Leader

Dr. Arch. Doaa Mahmoud El-Sherif

Team Members

Dr. Waleed Abdel-Halim

Eng. Mohamed Nazih

Assistant Members

Eng. Ahmed Rabee

Eng. Dina Essam El-Din

IRC:

Mrs. Deirdre Casella

UN-Habitat:

Prof. Dr. Ali El-Faramawi



Agenda

1. Research Main activities
2. Background about the problem
3. The need for unconventional/low cost sanitation systems
4. The documented case studies
5. Analytical Reflection & Key Lessons Learnt
6. Recommendations
7. Conclusions; Proposed "Program of Action" at the Local Level



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SUSTAINABLE LOW-COST SANITATION SOLUTIONS

Main Activities

National Scoping Study

Investigating a no. of Case-studies

Documenting the Case-studies

National Workshop

Presenting & Analyzing the Case-studies

Strategic Vision for low-cost provision

Institutional

Technical

Financial



The National Scoping Study

- The study focused mainly on low-cost participatory solutions in order to cover in particular the thousands of Egyptian Villages which are badly in need of such solutions.

- The study started with investigating the successful case studies and the potential partners.

- The scoping study entailed documentation and listing of several successful Egyptian case studies in the provision of sanitation services through low cost solutions.



The National Workshop

❖ The National Workshop was organized and executed at the HBRC premises during the period 2-3 April 2006.

❖ The aims of the workshop were:

- ❖ Discussing the documented experiences for low-cost sanitation solutions in peri-urban areas.
- ❖ Investigating the main factors affecting the provision of low cost sanitation in Egypt through discussing three main aspects namely; *Technical/Financial/ Institutional.*

❖ The recommendations which came out of this national workshop are presented at the end of this presentation.



The National Workshop

Institutional group

Technical group

Financial group











Agenda

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7. Conclusions; Proposed "Program of Action" at the Local Level



Background about the problem

- The vast majority of the Egyptian population (91.3% receives piped potable water. The achievements in water supply would enable 100% coverage of all over Egyptian population within few months.

- Only urban centers and some larger rural villages possess sanitation facilities. Only 56% of cities and urban centers are covered by sanitation systems and less than 4% of the villages (rural or peri-urban areas).



Background about the problem

- The sanitation systems in Egypt always relied on two traditional approaches:
  - The first is concerned with *cities and capitals* where typical designs of *conventional systems* were always the domain technology applied.
  - The second is concerned with *villages and per-urban areas* which was rather worse with much less service availability and lower income levels and standards of living. The main applied technique was the *"bottomless trenches"* where waste is either buried directly under the sanitation facility or either inside or outside house premises depending on practices of each village.



Background about the problem

Conventional Systems

- The conventional systems are sometimes good for application in urban areas and densely populated capitals and cities. This is especially in cases where large spaces for the construction of the wastewater treatment units are required. Also, the time needed for construction is, in many cases, a controlling factor for technology selection.
- Disadvantages that were experienced with the application of these conventional treatment options included;
  - Remarkably high capital cost,
  - High operation & maintenance (O&M) cost
  - Requirement of highly skilled and well trained technicians and process experts.



Background about the problem

Bottomless trenches Systems

- The typical standard diameter of these units per each household was found to be 1 to 2 meter with varying depths up to 5 meters.

- In case of permeable sandy soil with a lower population density and low ground water table, this approach stands to be reliable and acceptable option.

- However, with the majority of Egyptian rural villages with silt soil, coupled with dense population and high ground water table, these approaches turned out to be a dramatic burden on rural users.



Background about the problem

Bottomless trenches Systems

- The emptying of one of these trenches should be carried out 3–4 times a month with an unaffordable cost for low income rural citizens.

- Villages without sanitation facilities can be expected to continue discharging their raw sewage to nearby agricultural drains or in many cases to canals as well causing severe damage to the surrounding environment. Contamination of water surfaces by untreated raw domestic sewage negatively impacts human health of downstream users and limits drainage water reuse.
- It's estimated that 100 billion EGP are needed to cover the thousands of villages with conventional sanitation systems



Agenda

1. Research Main activities
2. Background about the problem
3. **The need for unconventional/low cost sanitation systems**
4. The documented case studies
5. Analytical Reflection & Key Lessons Learnt
6. Recommendations
7. Conclusions; Proposed "Program of Action" at the Local Level



The need for unconventional/ low cost sanitation systems

- During the last decades of the twentieth century, alternative solutions for provision of sanitation were put into practice in Egypt.

- These unconventional programs, embrace innovative technologies and new social approaches; raised concerns about community/institution participation in both the implementation and the operation & maintenance (O&M) of low-cost sanitation systems.

- The objectives and results obtained from the Egyptian extended experiences enabled the defining of proper state-of-the-art technologies for peri-urban & rural areas in Egypt in order to ensure low cost and energy conserving treatment options.



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The Documented Case- Studies

The main partners and their case studies presented during the national workshop

ORGANIZATION	CASE STUDY	LOCATION
National Organization for Potable Water & Sewage Drainage (NOPWASD) and the Holding Company for Water & Wastewater.	The Implementation of UASB & RBC Low cost Systems	(Fisha Sleem) & (Nahttay) villages in Gharbeiya governorate.
The Arab Office for Youth & Environment (AOYE).	Implementation of the Grey Water Treatment Facility System	(Gaafar) village in Bani Sweif Governorate, (Nazlet Kaab) in Assuit, (Al Nasseireya) village in Menya.
•The Ministry of Water Resources and Irrigation (MWRI).	The Implementation of a Modified UASBR System	(Abdel Kerim Eissa) village in Sonoruss in Fayoum
•Centre of Environment and Development for the Arab Region and Europe (CEDARE) & Egyptian Water Partnership (EWP).	Septic Tank / Gravel Plant Channel: Low Cost Wastewater Treatment Technology	(Al Noweira) village – in Bani Soweif Governorate
•HBRC and Civil Engineering Center for Research & Studies, Faculty of Engineering, Cairo University.	Choosing and evaluation techniques for appropriate sanitation solutions in Egyptian villages	Demonstration on Sohag Governorate



The Documented Case- Studies





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Analytical Reflection & Key Lessons Learnt

Factors contributed to the success of the case studies

- Raising public awareness in the beginning of the project in order to determine the main problems and set project priorities by the participation of the main stakeholders themselves. The technical aspect comes later.

- The involvement of different groups of stakeholders, highly affected the success of the project, specifically when their roles & contributions were defined very clearly from the beginning.

- The choice of the technology applied was depending on the following criteria:

  - The size of village (no. of inhabitants & density)
  - Community acceptance of the chosen technology.
  - Availability of land in the village, this differs in Delta from Upper Egypt villages.
  - The cost of the technology, it should be a low cost one and there should be contributions from the local community in cash or in- kind.



Analytical Reflection & Key Lessons Learnt

Factors contributed to the success of the case studies

- Operation & maintenance (O&M) were done through a participatory approach to guarantee low cost by one of the following options:
  - O & M done by beneficiaries via local CDAs at low cost fee per household.
  - O & M done by beneficiaries in cooperation with city council or the governorate.
  - O & M shouldn't need highly qualified labor.
  - Labor required for O & M could be hired from unemployed youth from the village itself.
- The produced biogas was used for cooking, heating or generating electricity when higher quantity of waste water is available.



Analytical Reflection & Key Lessons Learnt

Factors contributed to the success of the case studies

- The treated water was reused or discharged into agricultural drains after insurance of its compliance with the standards.

- Local NGOs or CDAs were used to provide training programs for the community members on the operation of the chosen technology, or mobilize the community or raising awareness and communicate with the community giving guidance & support for the proper management of the system. Unemployed youth were in some cases hired for the same roles.

- A computer based selection tool was presented in one of the cases. The tool was designed and tested considering technical, economical, environmental and social aspects as well as community participation. Based on the results obtained from this tool, a master plan for rural sanitation systems could be developed taking into consideration the National context and plans.



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Main Recommendations

Two levels of Recommendations:

- ***Recommendations at the National Level:***
  - ***"Outcomes of the National Workshop"***

- ***Recommendations at the Local Level:***
  - ***"Main Points to be considered in Low-Cost Provision***



Recommendations at the National Level:

"Outcomes of the National Workshop"

Concerning the Financial & Technical aspects

- It is necessary to create a high consulting committee including all stakeholders whether governmental, non-governmental, donor agencies and beneficiaries to present them with the findings of all case studies and implemented low cost sanitary systems.
- The necessity of developing a strategic plan as well as an action plan at the national level which correspond to the circumstances of each area
- Documentation of previous expertise and lessons learned from international case studies with focus on the developing countries.
- The necessity of finding and revising a definition for low cost systems.



Recommendations at the National Level:

"Outcomes of the National Workshop"

Concerning the Financial & Technical aspects

- To ensure the sustainability, the chosen system should be tried, proven successful and guarantees the technical skills for operation, maintenance, follow-up and control as well as ensure the financial budget needed.
- It is also necessary to find a clear set of criteria to accredit and evaluate the practice after 5 years of its initiation to assess its results and outcomes.
- Revision of legislation which relates to the reuse of treated water or wastes of treatment process.
- To spread awareness regarding the new suggested systems in order to achieve social acceptance and encourage local and public participation.
- The operation and maintenance tasks should be assigned to experienced bodies such as community associations or private companies.



Recommendations at the National Level:

"Outcomes of the National Workshop"

Concerning the Institutional aspects

- Conducting "Training of Trainers" programs to support and enhance the role and capacity of the executing bodies.
- Establish a database for low cost sanitary systems.
- All relevant bodies and stakeholders should be invited to participate, discuss and accredit the systems.
- Encourage and motivate the role of the civil society and the private sector in the participation process in sanitary works.
- Develop awareness programs for families starting from the young generations.



Recommendations at the Local Level:

"Main Points to be considered in Low-Cost Provision"

- There is not one single technology with the potential to solve all problems in every context. Sanitation solutions must be locally relevant and acceptable.
- Locally driven solutions deliver significant improvements for large numbers without large-scale external funding.
- High levels of community control in design, construction and management ensure appropriate technology and sustainable services.
- Gap between costs and capacity of low-income households to pay can be minimized.



Recommendations at the Local Level:

"Main Points to be considered in Low-Cost Provision"

- New facilities – community managed – can make special allowances for individuals or households unable to afford to pay official price.
- Implementation on a large scale requires cooperation with government agencies and organizations.
- When all stakeholders - from local level, to governorate, to national level - are involved in the learning and decision making processes about what suitable solutions will best meet the local sanitation needs then resulting solutions are more sustainable in the long term.



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7. **Conclusions;**

   Proposed "Program of Action" at the Local Level



Conclusions

Proposed Program of Action at the local level

The Proposed Program of Action consists of four phases:

Phase one: Data Collection

- Total Population
- Defining main stakeholders and their interests
- Investigate all issues related to the Hydrology, Soil Conditions and Groundwater Levels
- Wastewater Discharge quantities and qualities
- Distance to nearest Drain, Pumping Station, Treatment Plant
- Level of community awareness
- Ability of citizens to participate (cash, in-kind and decision making processes)
- Availability of Community Development Associations (CDA)
- Availability of land (location in Delta or Upper Egypt)



Conclusions

Proposed Program of Action at the local level

Phase two: Strategy Formulation

- Raising awareness
- Mobilize community participation through participatory priority setting
- Participatory decision-making about service type, levels, etc
- Agree on financing tools



Conclusions

Proposed Program of Action at the local level

Phase three: Action Planning

- Organize awareness campaigns regarding good behavior trends, technology options
- Design & conduct programs to mobilize stakeholders participation
- Analyze collected data in participation of all stakeholders
- Choose appropriate technology through stakeholders' participation
- Define each stakeholder ability to participate in funding
- Public awareness of the selected wastewater management system
- Collecting fund
- Full detailed design of the selected option of Wastewater Management System
- Implementation
- Define participatory Operation & Maintenance system
- Provide training programs on operation and maintenance of the system for the responsible team



Conclusions

Proposed Program of Action at the local level

Phase four: Institutionalization

- Establish partnerships
- Define roles & responsibilities clearly
- Develop Mechanisms for sustainability such as:
    - self-dependent O & M system with strategic vision for extension to meet future demand,
    - policy of capacity development and employment of youth or unemployed from the village, and,
    - Sustainable mechanism for collecting payment in equitable manner.



Thanks for your Attention



Sustainable Development

Improving living conditions without destroy the natural resources

National project

For

construction with local materials & appropriate technologies with youths

- **Human**
- **Earth**
- **Appropriate technologies**







Hany Elminiawy

ADAPT EGYPT

أشوكـــــا



المبدع الإجتماعى/المبدعة الإجتماعية:

أشخاص ذوى رؤية عملية يحركهم و يدفعهم
الرغبة القوية فى تحقي التغيير الاجتماعى

الأرض



... من الانجيل

" يشبه إنساناً بنى بيتاً وحفر وعمق ووضع الأساس على الصخر فلما حدث سيل صدم النهر ذلك البيت فلم يقدر أن يزعزعه لأنه كان مؤسساً على الصخر . وأما الذي يسمع ولا يعمل فيشبه إنساناً بنى بيته على الأرض من دون أساس . فصدمه النهر فسقط حالاً وكان خراب ذلك البيت عظيماً".
(لوقا6 : 48 ،49)

" فرحاً مع الفرحين وبكاءاً مع الباكين . مهتمين بعضكم لبعض إهتماماً واحداً".
(رسالة رومية12 : 15 ،16) .

" لا يطلب أحد ما هو لنفسه بل كل واحد ما هو للآخر".
(رسالة كورنثوس الأولى10 : 24) .

الإنسان



أنشودة النيل :



التقنية الموائمة



... من القرآن الكريم

"و لكم في الأرض مستقر و متاع الى حين".
(البقرة – 36).

"وبوأكم في الأرض تتخذون من سهولها قصوراً و تنحتون الجبال بيوتا".
(الأعراف – 74).

"الذي جعل لكم الأرض مهداً و سلك لكم فيها سبلاً و أنزل من السماء ماءا".
(طه – 53).



"الحمد لك يا أيها النيل الذي ينبع من الأرض ، والذي يأتي ليطعم مصر، صاحب الطبيعة الخفية ، ظلام في رابعة النهار .....

وحينما كنت وحيدا (لا شئ غيرك) ، خلقت الناس وجميع الماشية والغزلان، وجميع ما على الأرض مما يمشي على رجليه وما في عليين مما يطير بأجنحته ، وفي الأقطار العالية سوريا وكوش وأرض مصر .





المنطقة أو الإقليم	نوع مادة البناء المتوفرة
جنوب الوادى (النوبة)	الأحجار الجرانيتية ـ الأحجار الرملية
الصعيد العالى	الطمى ـ الزلط ـ الرمل ـ الأحجار الجيرية ـ الطفلة
وسط الصعيد	الطفلة (الصلصال) والطمى ـ الزلط ـ الرمل ـ الطفلة ـ الأحجار الجيرية
الوادى الجديد	الطمى والطفلة والأحجار الرملية ـ الرمل ـ الطفلة
الصعيد الأدنى	الأحجار الجيرية الرملية ـ الزلط ـ الرمل ـ الجبس ـ الطفلة
من القاهرة والدلتا	الطمى ـ الرمل
[illegible]	[illegible]
[illegible]	الأحجار الجيرية ـ الزلط ـ الرمل ـ الجبس ـ الطفلة
[illegible]	[illegible]
[illegible]	الرمل والطوب الرملى والأحجار الجيرية ـ الزلط [illegible] ـ [illegible] الرمل
[illegible]	الأحجار [illegible] ـ الرمل ـ الجبس
البحر الأحمر	زلط ـ الرمل ـ الجبس ـ الطفلة
[illegible]	الرمل ـ الجبس ـ الطفلة ـ الأحجار الجيرية











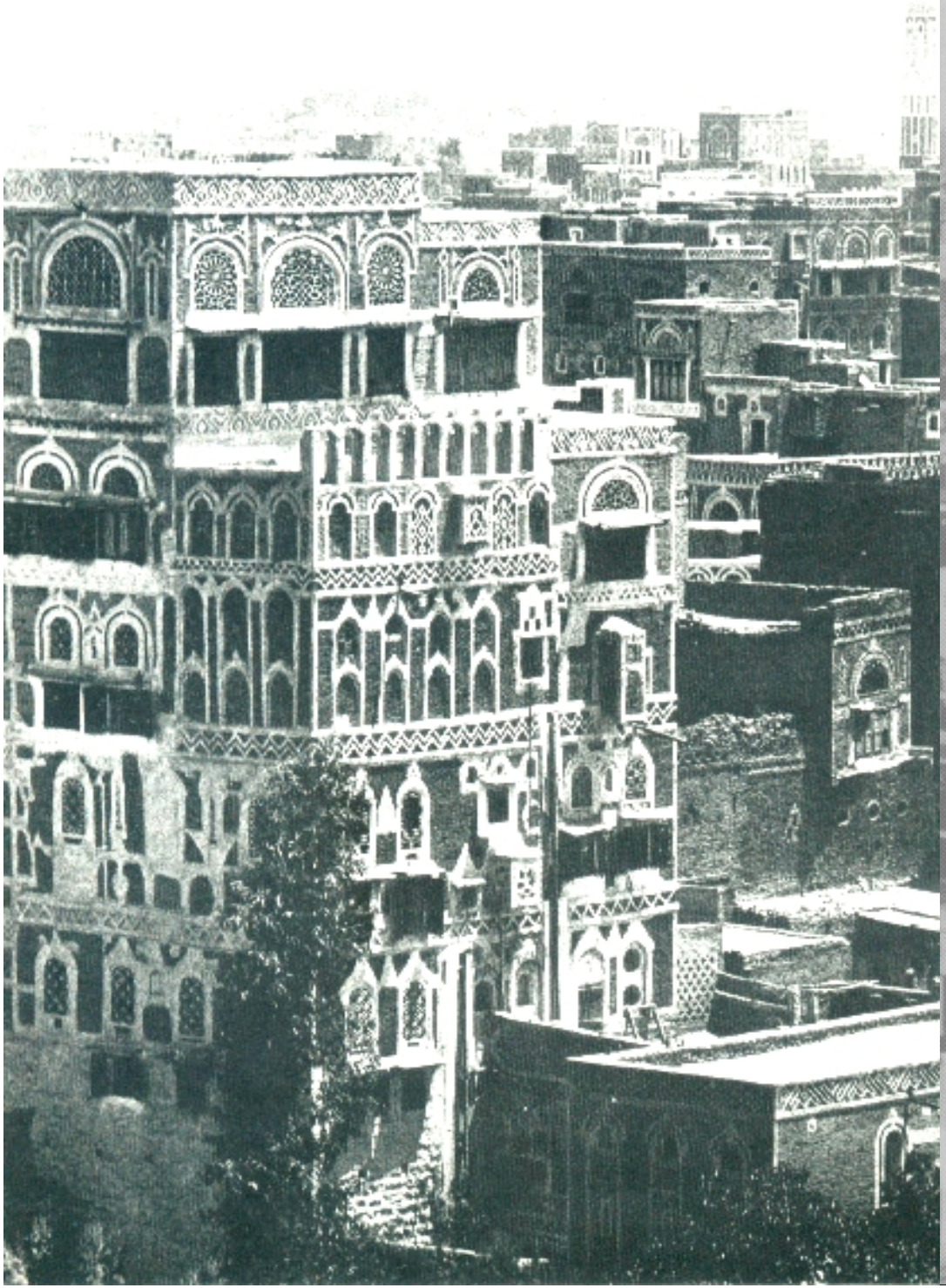








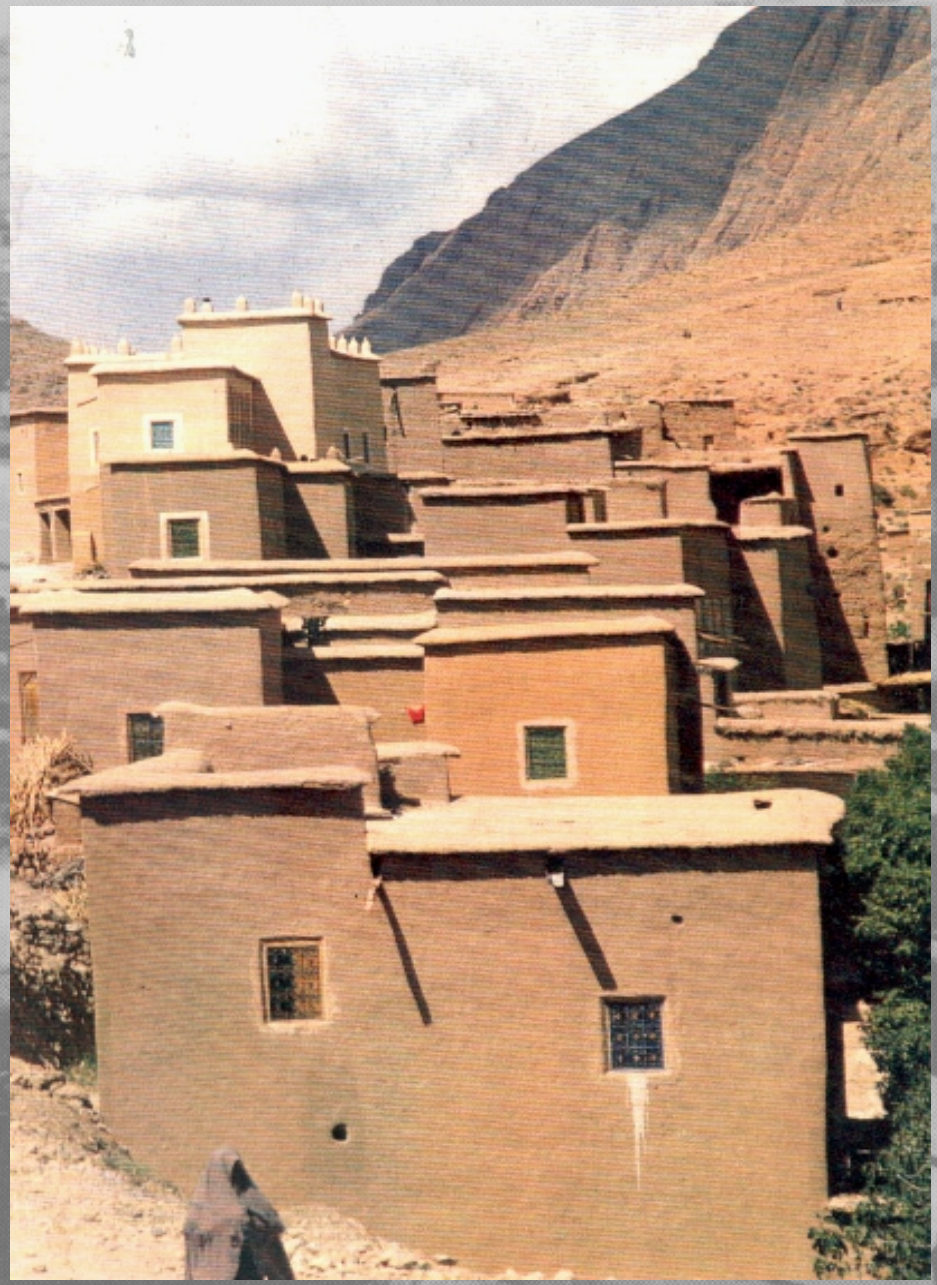
البناء بالمواد المحلية و مشاركة السكان لحل مشكلة الإسكان الإقتصادى



- الاستخدام الواعى لموارد التربة فى عمليات البناء

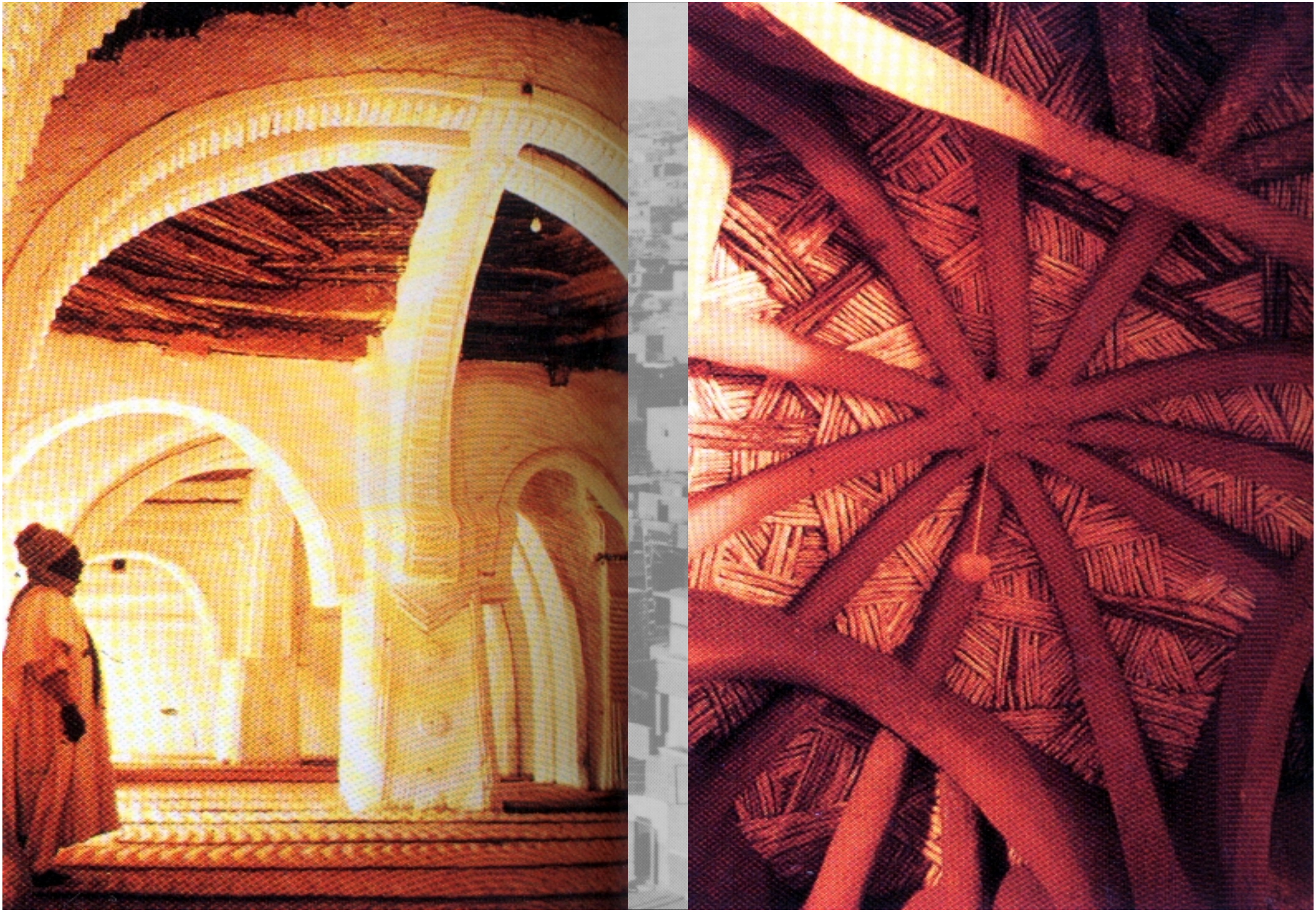
- العمارة التقليدية بمصر و سوريا وحضر موت باليمن والعراق وتونس والجزائر ونجد كانت مثالا رائعاً لتلك العلاقة

Desert arch. rational performance with local climatic & Geomorphology condition













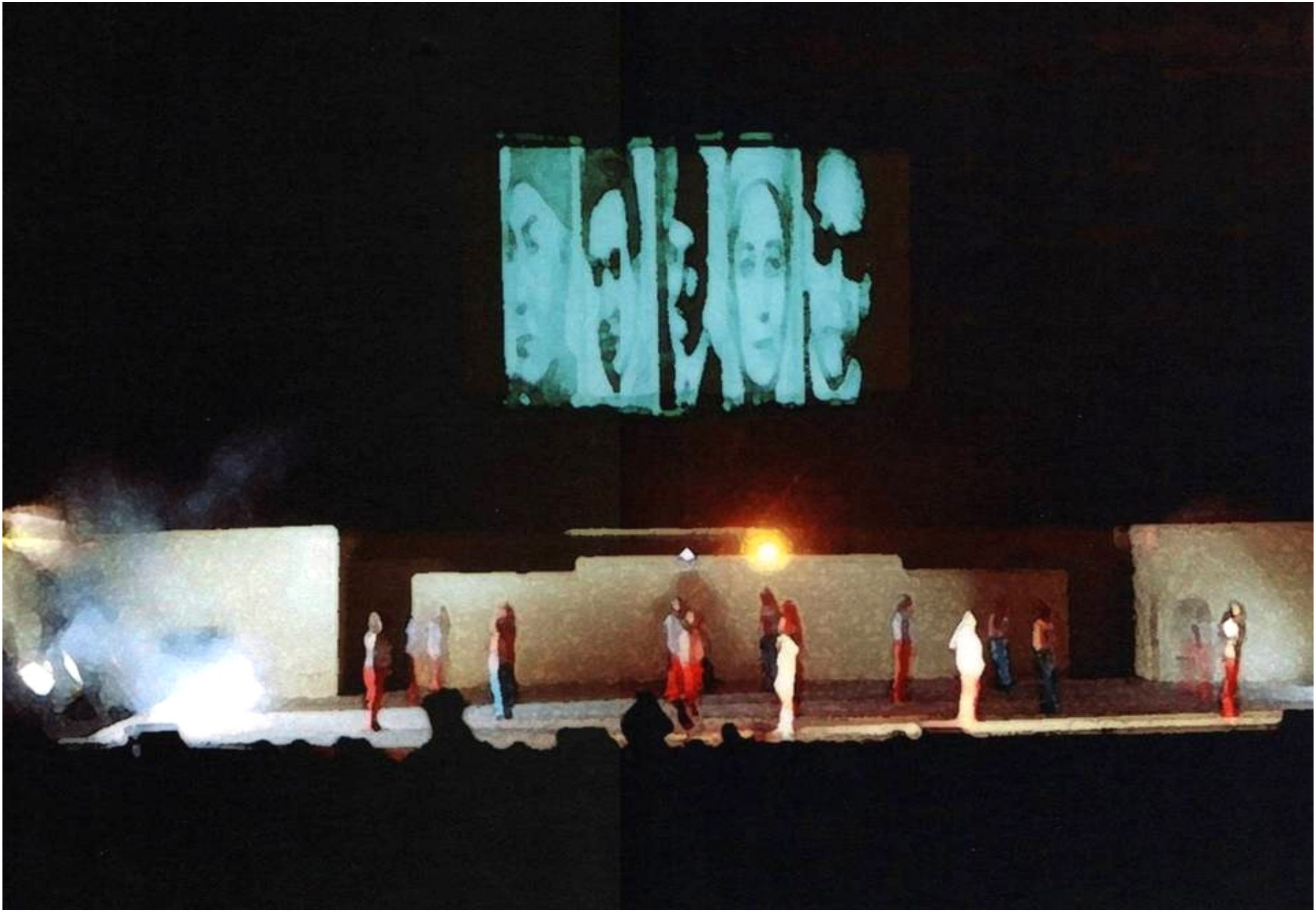






Open air theatre with local materials





























Using bricks to build gardens fans and shops for women
Manshit Naser - Egypt











مركز الشباب

قبل التطوير









أثناء التطوير

مركز الشباب

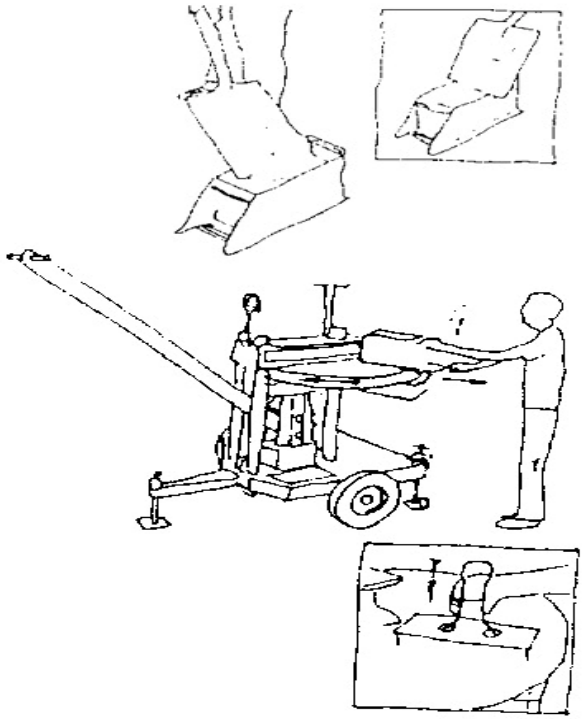
The Construction with youths participation

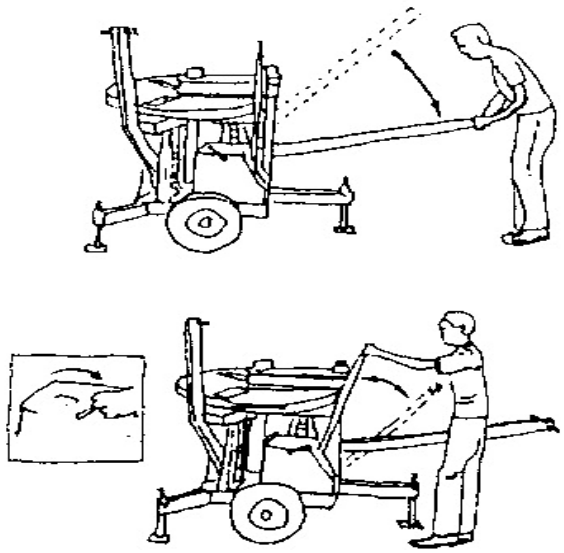


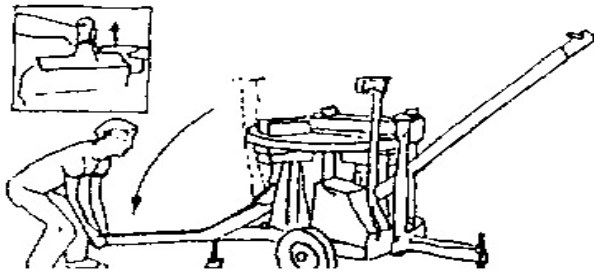


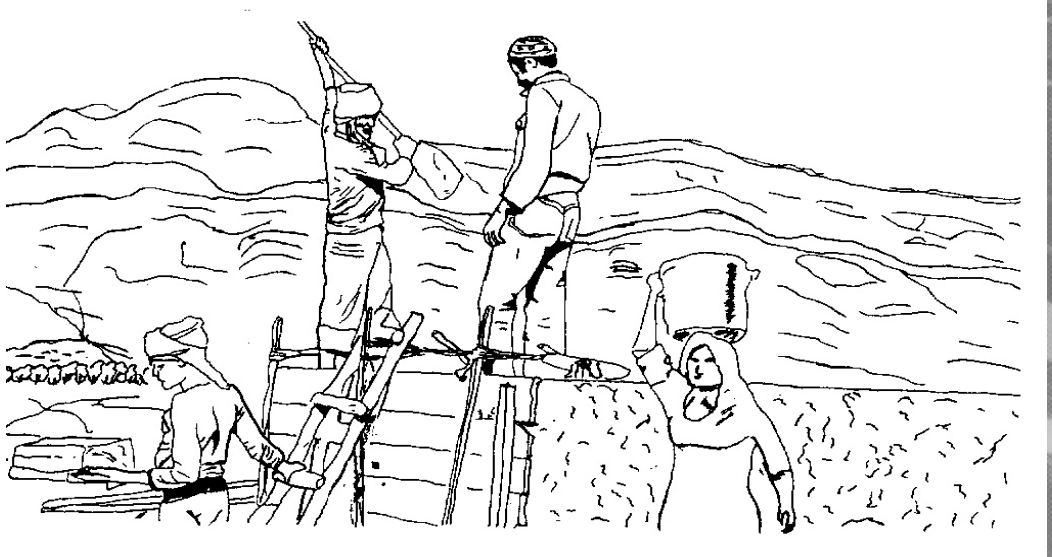














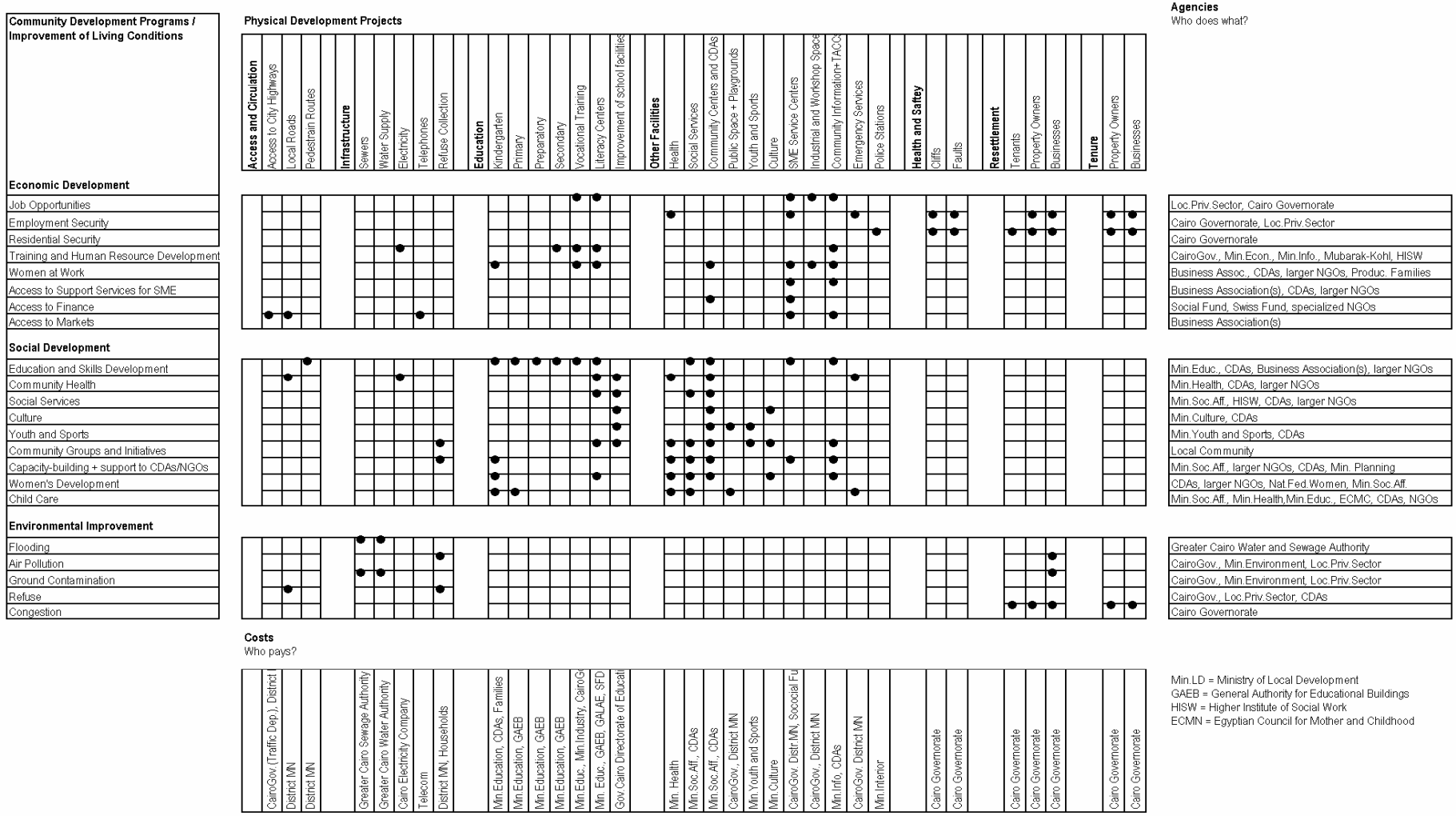



2006/02/09



Volunteer Work **العمل التطوعي**

MATRIX SHOWING INTERRELATIONS OF INTERVENTIONS AND RESPONSIBILITES



Min.LD = Ministry of Local Development
GAEB = General Authority for Educational Buildings
HISW = Higher Institute of Social Work
ECMN = Egyptian Council for Mother and Childhood



Environment **البيئة**



Tree Planting **الزراعة**



Responsibility **المسئولية**



Team Work **روح الجماعة**



Citizenship **الانتماء**









الأنشطة الصيفية بالمدارس

وسط سيناء

الشرفات

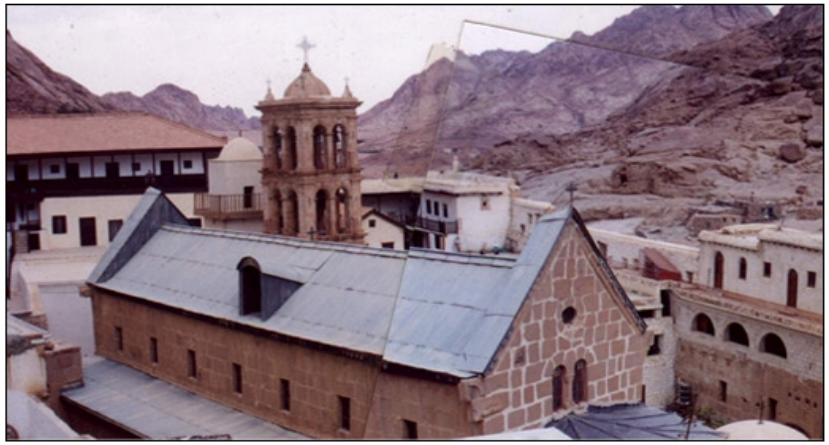
5-Terraces





الأسقف





عناصر خاصة

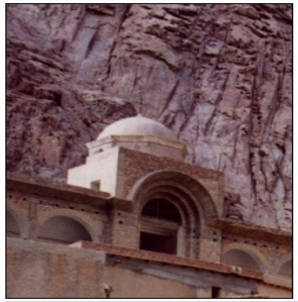
(السلالم – الأبراج ...)





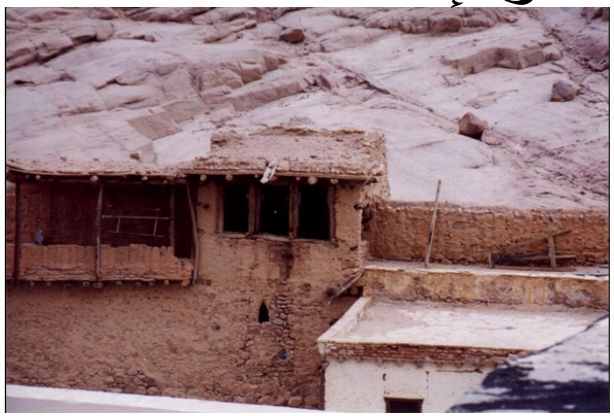


المداخل والممرات






المواد والإنشاء






الحوائط والفتحات










Visitors center Saint Catherine-Sinai with local granite & local workers (Bedouin)



Interior View visitors centre







متحف دنشواي



متحف دنشواي









Algeria
400 Housing units







Algeria
600 Housing units
Lime stone







البناء بالحجر المحلي



جزء من الواجهة الجانبية

روعي في تخطيط المنطقة خلق نسيج عمراني صحراوي (مغلق) و خلق أماكن مظللة كثيرة مع الحفاظ على العادات و التقاليد بالنسبة للمسكن أو لمجموعة المساكن، و كذلك خلق الفراغات الإجتماعية خارجياً (أحواش عامة...) و داخلياً (مناطق لعب أطفال).

و روعي في تصميم مباني الإسكان أن تكون ذات أسقف مزدوجة لتلطيف الحرارة داخلياً.



ممرات مشاة شبه مغطاة



بواكي على شارع رئيسي



فراغ اجتماعي للمرأة و ممر مشاة خاص

مدرسة ثانوية

وادي سوف – الجزائر ١٩٧٧





جزء من الفراغ الاجتماعي للأطفال



فراغ اجتماعي



ممرات و فراغات اجتماعية و مداخل

دلتا

مجموعة دراسات

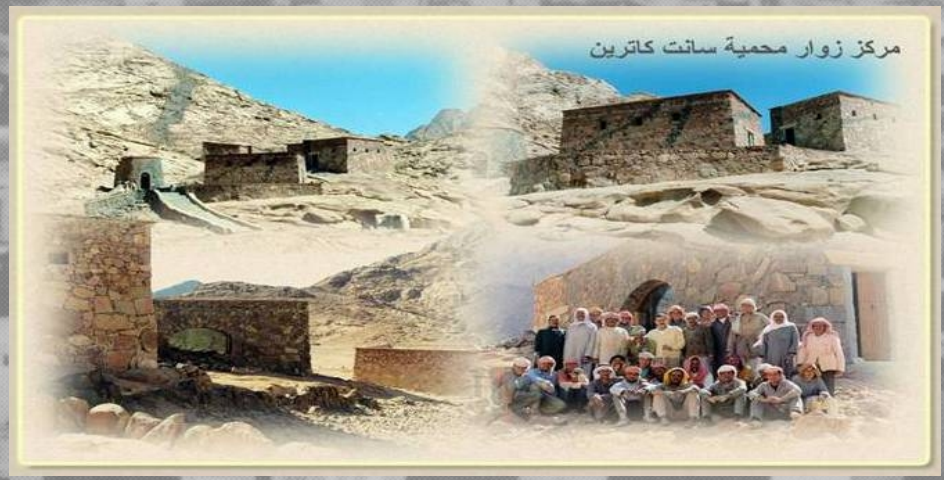
العمارة المحلية

هاني المنياوي

عبد الرحمن المنياوي

... نماذج من أعمال المكتب









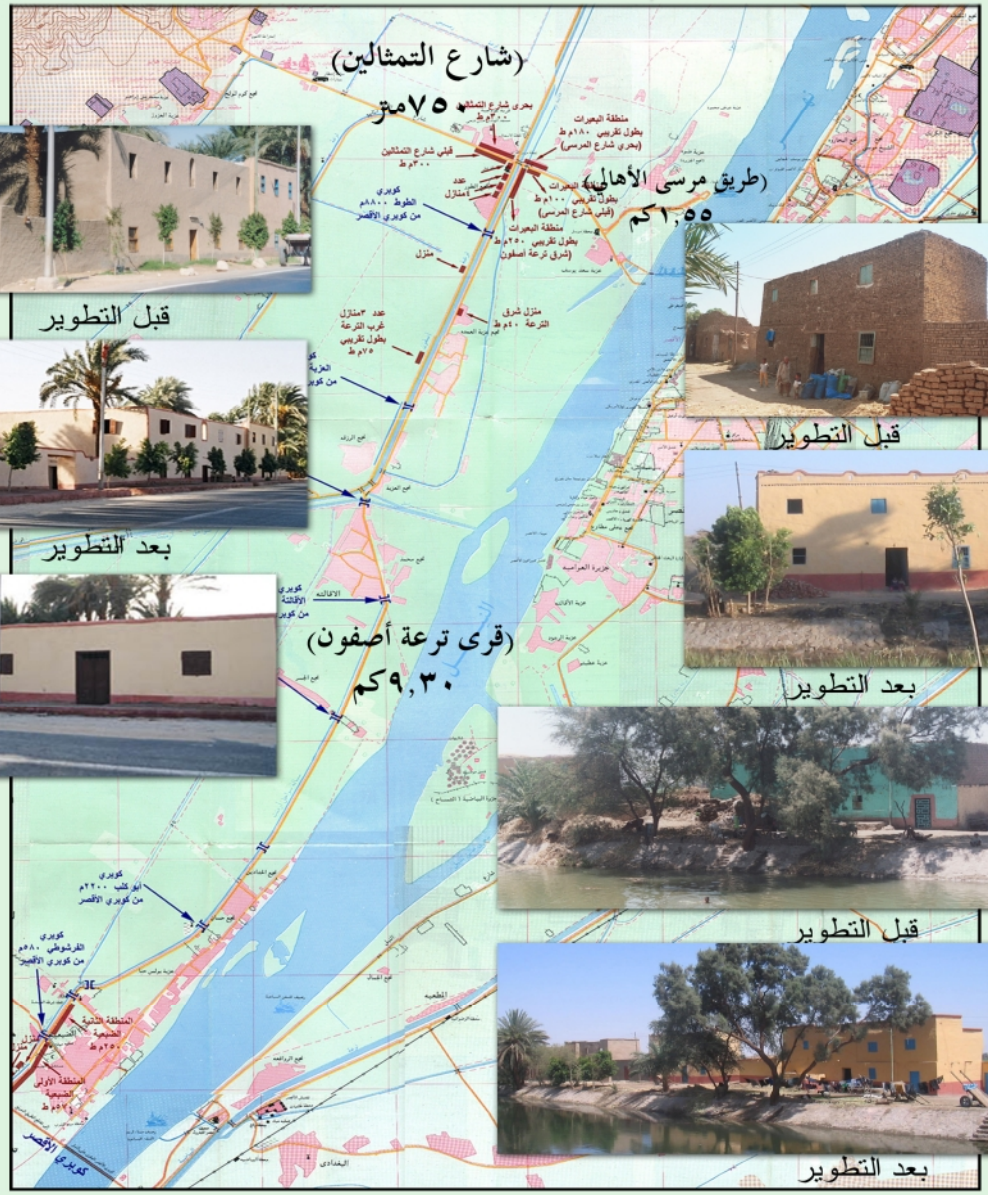


التصور المبدئي
لتطوير المسار السياحي بالأقصر
المنطقة الثالثة





وزارة الثقافة
التنسيق الحضاري للمسار السياحى بالاقصر
إستخدام المفردات والمواد المحلية



Rehabilitation of rural housing with local materials (Luxor - Egypt)



Before



After

وزارة الثقافة
التنسيق الحضاري للمسار السياحى بالاقصر
إستخدام المفردات المعمارية والمواد المحلية



قبل التطوير



بعد التطوير



قبل التطوير



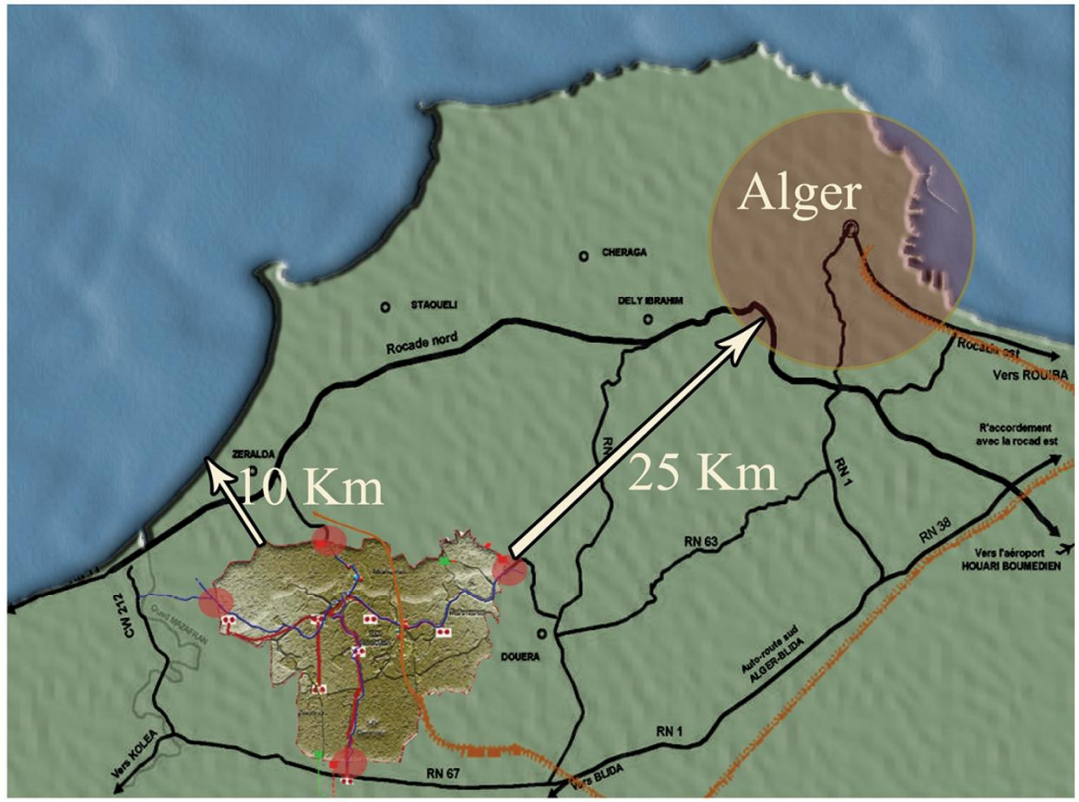
بعد التطوير



Sidi Abdellah doit être vu comme projet pilote et directeur pour les villes nouvelle dans le cadre du développement des besoins de services, de l'expansion de l'habitat et dans le but de d'aboutir a l'intégration avec l'ensemble de la région

Il est impératif de prendre en considération :

- L'évolution technologique, la communication, la santé, la recherche scientifique, les services divers.



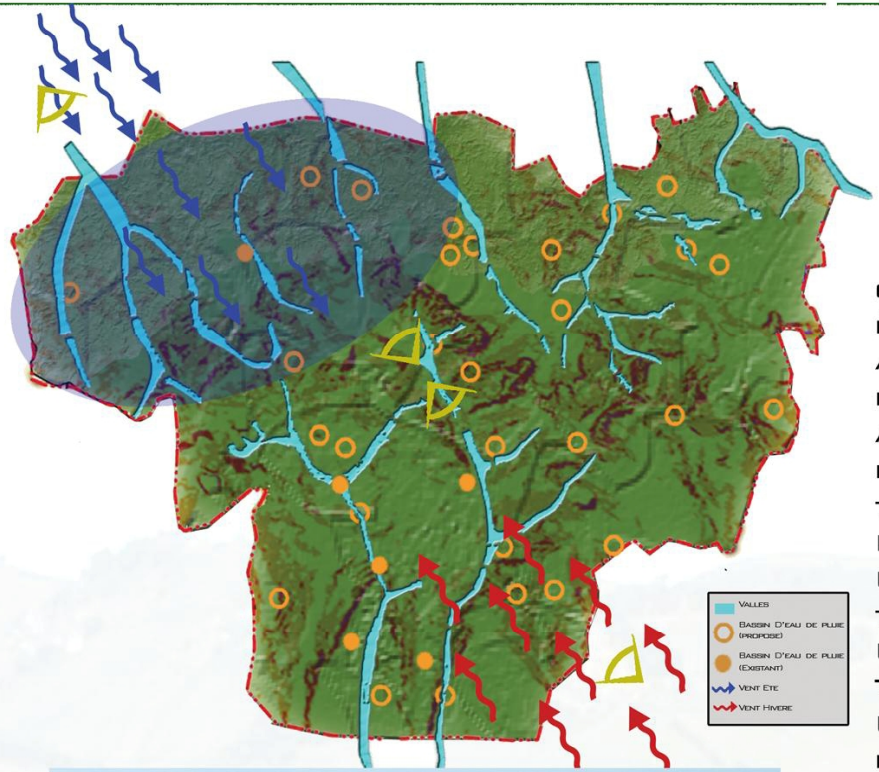
Relation entre la place étudiée et l'eentourage:Utilisation du spectacle de la mère, donc améliorer le part d' habitat et le part touristique Utilisation des routes et des chemin de Fère pour servir la région






La culture et connaissance de la vie avec la nature et L'energie et les techniques

- Le changement climatique dans le monde entier et son impact sur la planification et le développement des villes arabes, ainsi que sa symbiose avec les données du site.





Etudes de la nature

climat chaud st sec en été , pluvieux en hiver

atteindre de couvrir la plus grande espaces d avec des tentes ou des différents types de végétations

Hydrographique:

Utilize comme moyen de transport

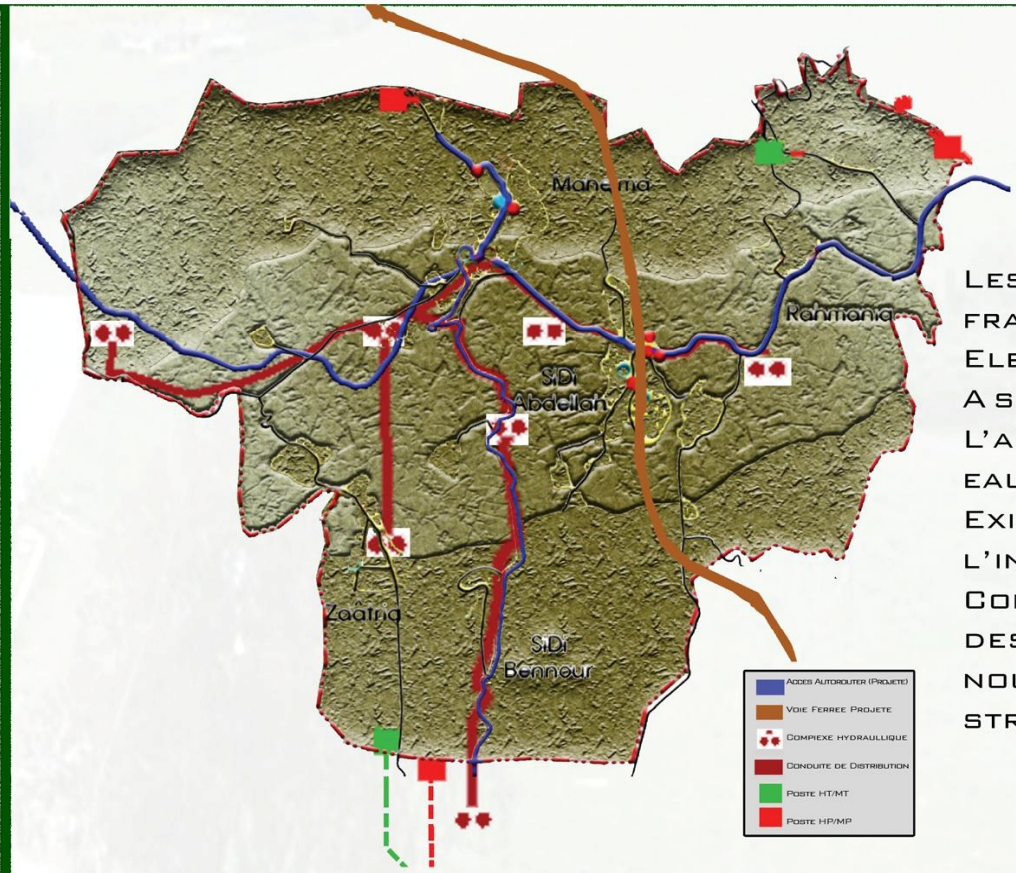
Utiliser dans l'irrigation

T topographie:

Utiliser les différences entre les altitudes dans l'orientation du vue des différents spectacles



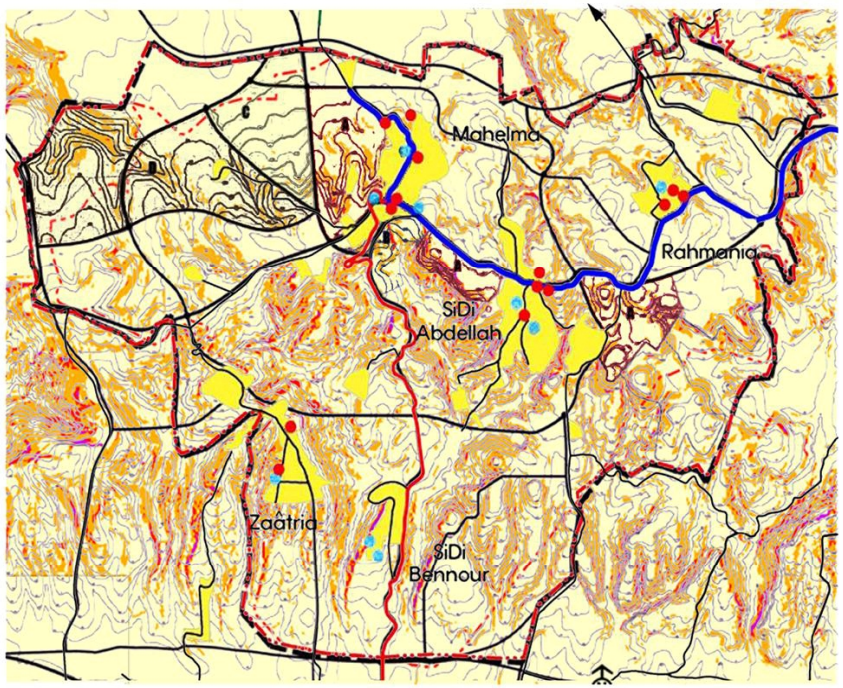
La prise eu compte de la relation entre l'intérieur et l'extérieur, 'voir et être vu".



Les réseaux et infrastructures
Electricité, Gaz, Assainissement, L'alimentation en eau potable
Existence de l'industrie
Conduction simple des réseaux à la nouvelle cite construites



- **Le Rationalisme,** voir une lecture évaluative des données, (l'accès a' la zone, les données climatique, la nature des sols – la geotopologie – les catastrophes).
- Plan explicative du processus de sismicité – l'érosion – les glissements,



Sismicité

Usage des codes internationaux de résistance de la sismicité

Etudies urbaine et de population

Liaison autoroutière et routière :

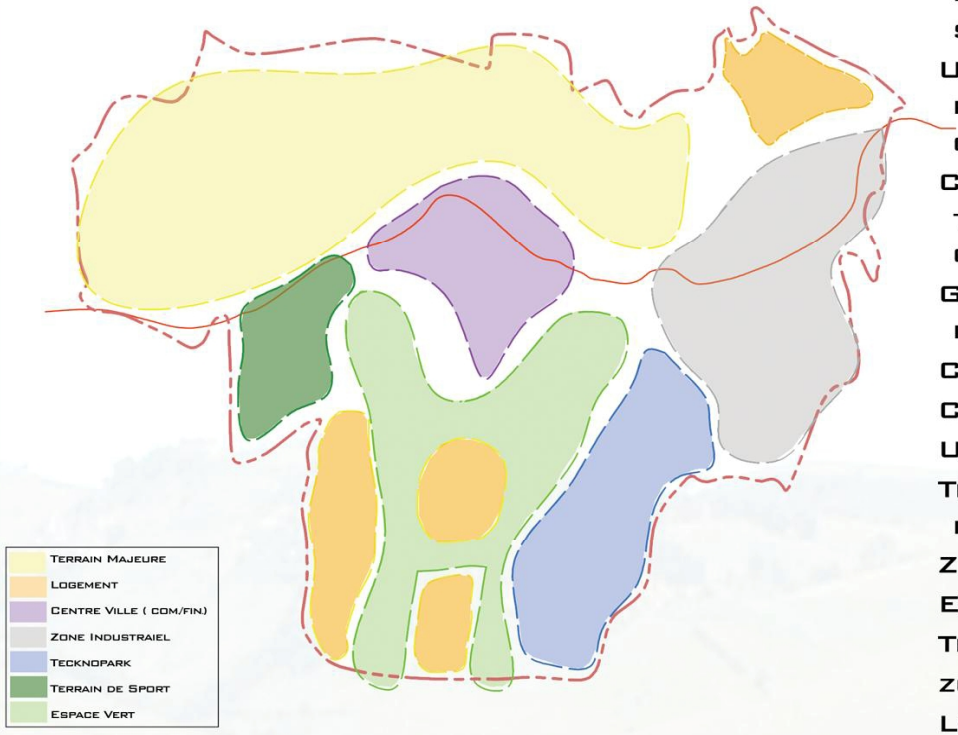
Définir les places facilement accessibles

Mettre le place industrielles autours la route nationale

Villages existantes représentent des noyaux d'attraction (villes anciennes)



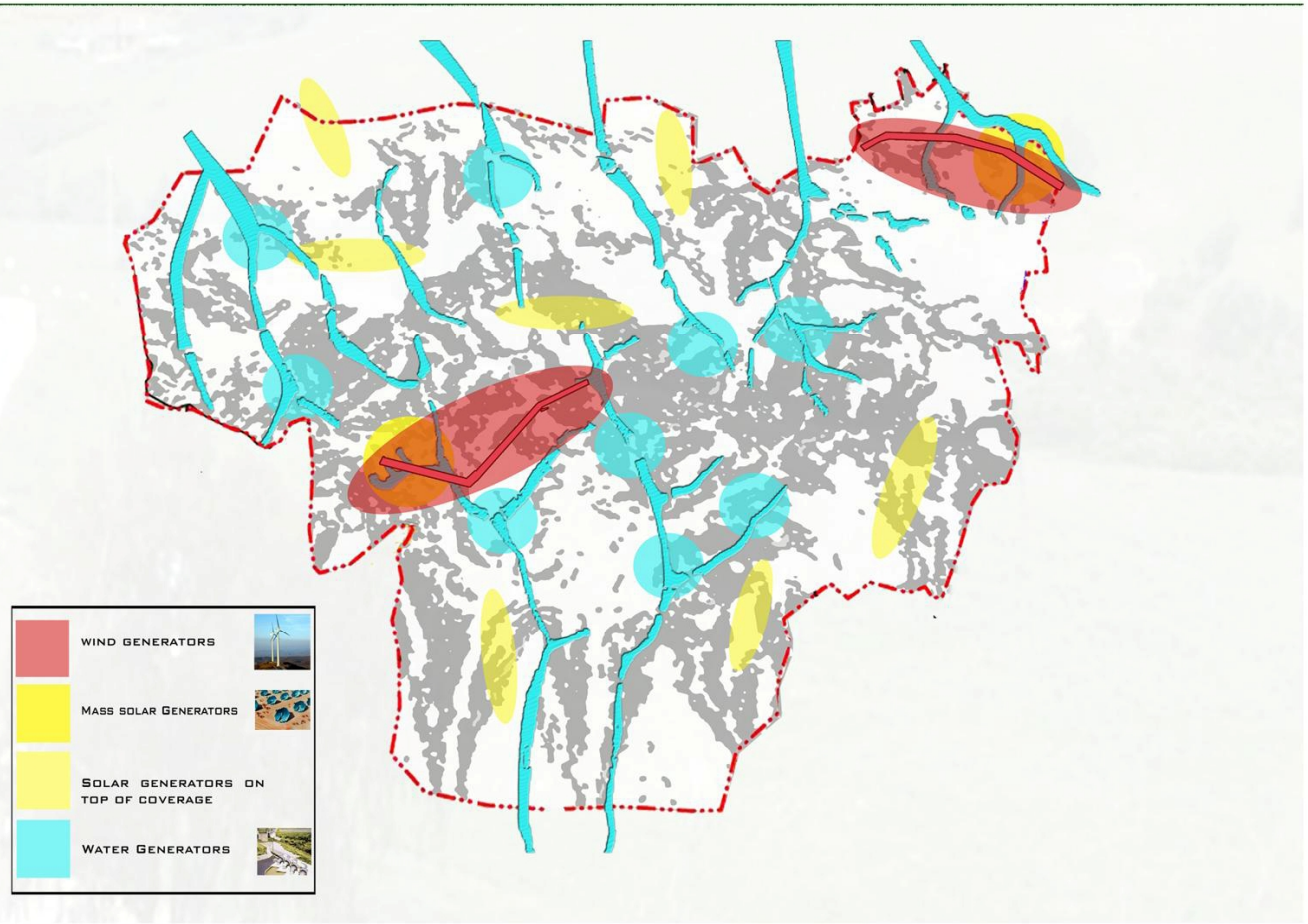
- une profonde lecture de l'occupation du sol, "les groupements existants", permettant d'élaborer un plan de développement urbain adéquat, avec la perspective de recréer le concept de "down town, voir " centre de ville traditionnelle".
- La projection de contres de formation des jeunes, aussi que des ateliers de productions pour subvenir aux besoins de l'évolution probable de la ville (étape importante pour combattre le chômage).
- Prendre en considération l'augmentation du nombre de la population des villages au moment de la nouvelle projection urbaine.
- La prise en compte et la révision de la propriété actuelle des terrains.



terrain majeure :Zone résidentielle (Haute standing)
Usage touristiqueTerrain de golfCentre commercial
Centre touristique:Centre culturel
Générateurs d'énergie du vent
Centre commercial
Centre Financial
Usage touristique
Travaux de formation des jeunes
Zone sportive
Espaces verte
Terrain spécialiser
zone résidentielle
Logements commerciaux
Logement pour universitaires et étudiants

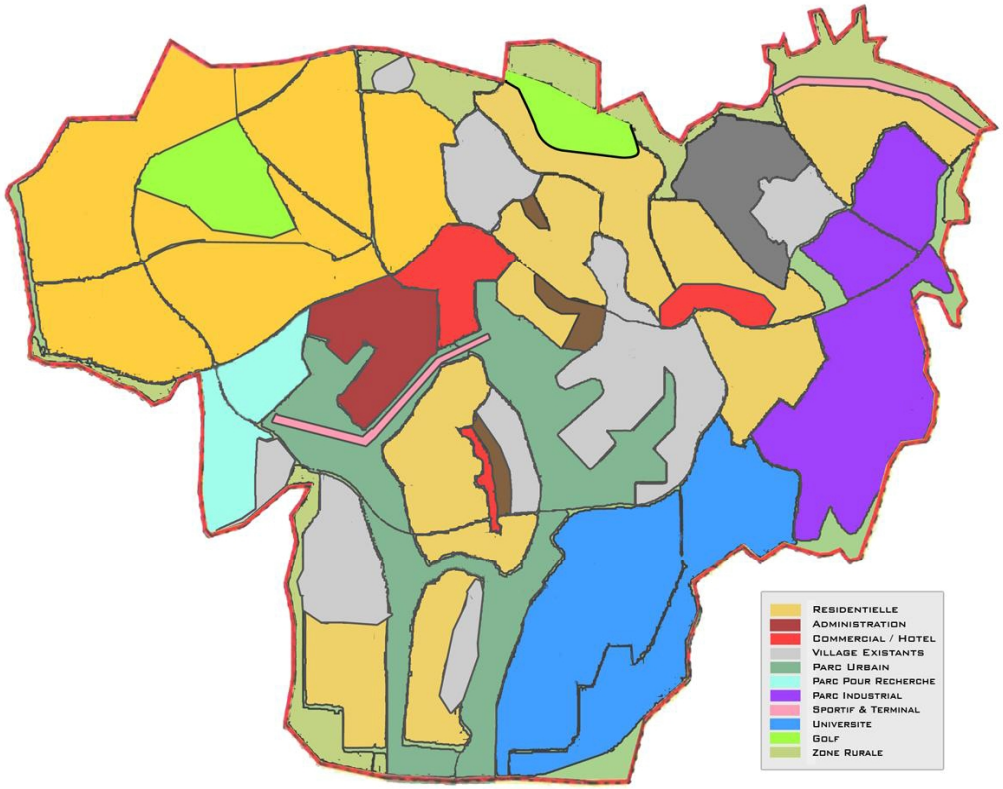


- Présenter des alternatives pour l'énergie (voir l'énergie propre), plus précisément, le soleil et le vent.





Golf	145 Ha
Espace Vert	661.85 Ha
Universite	140 Ha
TechnoParc	70 Ha
CyberParc	60 Ha
Multimedia	30 Ha
Recherche	50Ha
Recreationel	40 Ha
Commercial	70 HA
Hopital	20 Ha
Hotel	20 Ha
Sport	93.3 Ha
Administration	18.72 Ha
Resedentiel	1287.4 Ha
Industrial	278.3 Ha
Total	**2984.57 Ha**





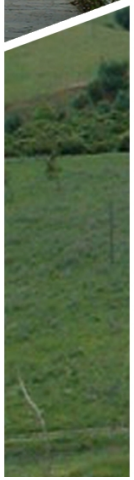
Sub Unites

Module City

Land Use





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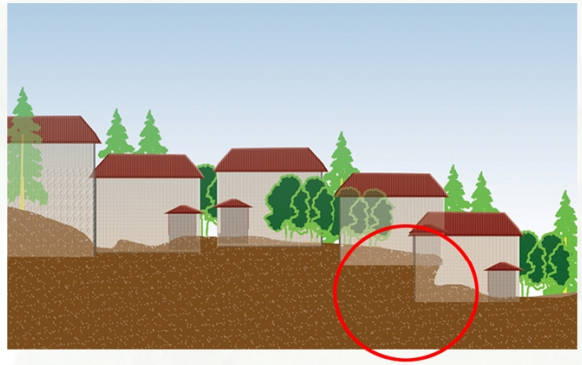
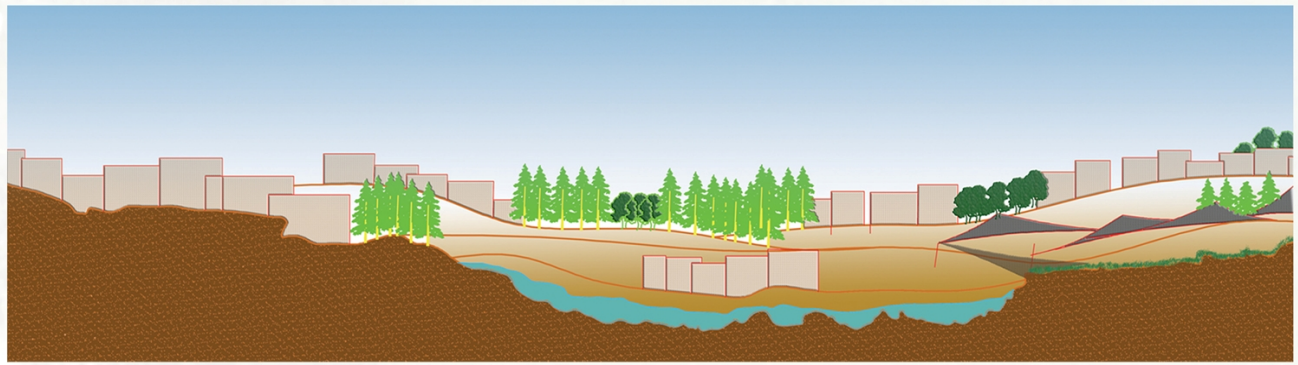
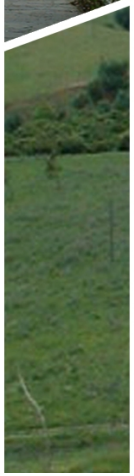




Zone 1

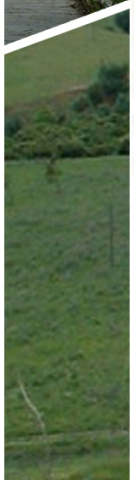





Zone 2



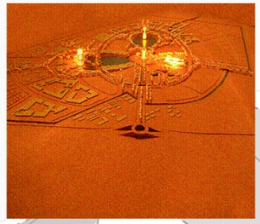


Zone 3















ABOUT USGBC

OUR MISSION

To transform the way buildings and communities are designed, built and operated, enabling an environmentally and socially responible, healthy and prosperous environment that improves the quality of life.

OUR VISION

Buildings and communities will regenerate and sustain the health and vitality of all life within a generation.

FOUNDED

1993

MEMBER ORGANIZATIONS

15,000+

SQUARE FEET COMMERCIAL BUILDING SPACE INVOLVED IN LEED

3.6 billion+

History in Brief

The U.S. Green Building Council (USGBC) is a nonprofit organization composed of leaders working to advance buildings that are environmentally responsible, profitable and healthy places to live and work. Driving its mission to transform the built environment is USGBC's LEED® (Leadership in Energy and Environmental Design) Green Building Rating System,™ which is accessible online and supported by a robust LEED education workshop program and the LEED Professional Accreditation program, administered through the Green Building Certification Institute. USGBC supports a rich education and research agenda, including Greenbuild, the cutting-edge international conference and expo focused on green building. USGBC also supports an aggressive education and advocacy program delivered at the local level through more than 75 chapters across the United States.

{ Industry-led and consensus-driven, USGBC is as diverse as the marketplace it serves. }

Since its founding in 1993, USGBC has been focused on fulfilling the building and construction industry's vision for its own transformation to high-performance green building. Today, it includes more than 15,000 member organizations. As a testament to its leadership, in the past five years alone, USGBC's membership has grown by more than 500%, and to date more than 3 billion square feet of building space are involved with the LEED program.

Industry-led and consensus-driven, USGBC is as diverse as the marketplace it serves. Its membership includes architects, engineers, contractors, real-estate professionals, government agencies and more. Leaders from within each of these sectors participate in the development of the LEED Rating Systems and the direction of the Council through volunteer service on USGBC's open committees.

USGBC Programs

LEED GREEN BUILDING RATING SYSTEM

LEED is a voluntary, consensus-based national certification system for developing high-performance, sustainable buildings. Employees of USGBC's member organizations, representing every sector of the building industry, developed and continue to refine LEED. LEED addresses all building types, including new construction, commercial interiors, core and shell, operations and maintenance, homes, neighborhoods and specific applications such as retail, multiple buildings/ campuses, schools, healthcare, laboratories and lodging.

Based on well-founded scientific standards, LEED emphasizes state-of-the-art strategies for sustainable site development, water savings, energy efficiency, materials selection, indoor environmental quality and design innovation. LEED promotes expertise in green building through a comprehensive system offering project certification, professional accreditation, training and practical resources.

USGBC
EDUCATION
PROVIDER
PROGRAM

EDUCATION PROVIDER PROGRAM

USGBC's Education Provider Program facilitates access to high-quality professional development courses to further enrich the knowledge and understanding of green building theory, techniques and trends for building professionals. A trained team of third-party professionals reviews courses submitted by USGBC members or chapters to ensure their exceptional quality, and approved courses are included in a wide-reaching online course catalog.

WORKSHOPS

Educational workshops are available online or in person in cities across the United States and internationally, and are conducted by top green building practitioners. USGBC's full-day and half-day sessions address the varied needs of LEED practitioners by exploring topics specific to individual building types or areas of professional practice as well as critical market issues such as the economics of LEED-certified projects.

LEED PROFESSIONAL ACCREDITATION

The LEED Professional Accreditation program is administered through the Green Building Certification Institute (GBCI). GBCI is a separately incorporated entity formed with the support of USGBC to allow for balanced, objective management of the accreditation program, including exam development, registration and delivery.

A LEED Accredited Professional™ (AP) is an individual who has demonstrated the ability to serve on a LEED project team and who has proven, detailed knowledge of LEED project certification requirements and processes. A LEED AP has a command of integrated design principles. LEED accreditation is awarded to building industry practitioners who successfully demonstrate these proficiencies on a comprehensive exam.

USGBC CHAPTERS

USGBC has more than 75 local chapters throughout the United States. Chapters provide local green building resources, education and leadership opportunities. Local chapter members can connect with green building experts in their area, develop local green building strategies and tour green building projects.

EMERGING GREEN BUILDERS

USGBC's Emerging Green Builders program provides educational opportunities and resources to students and young professionals with the goal of integrating these future leaders into the green building movement.

GREENBUILD

Greenbuild is the cutting-edge conference and exposition dedicated to green building. Launched in 2002, it has quickly become the can't-miss event for the green building industry. Each year, tens of thousands of professionals from all over the world are drawn to Greenbuild by outstanding educational sessions and speakers, green building tours, special seminars and networking events, and a huge exhibit hall featuring the newest products and technologies.

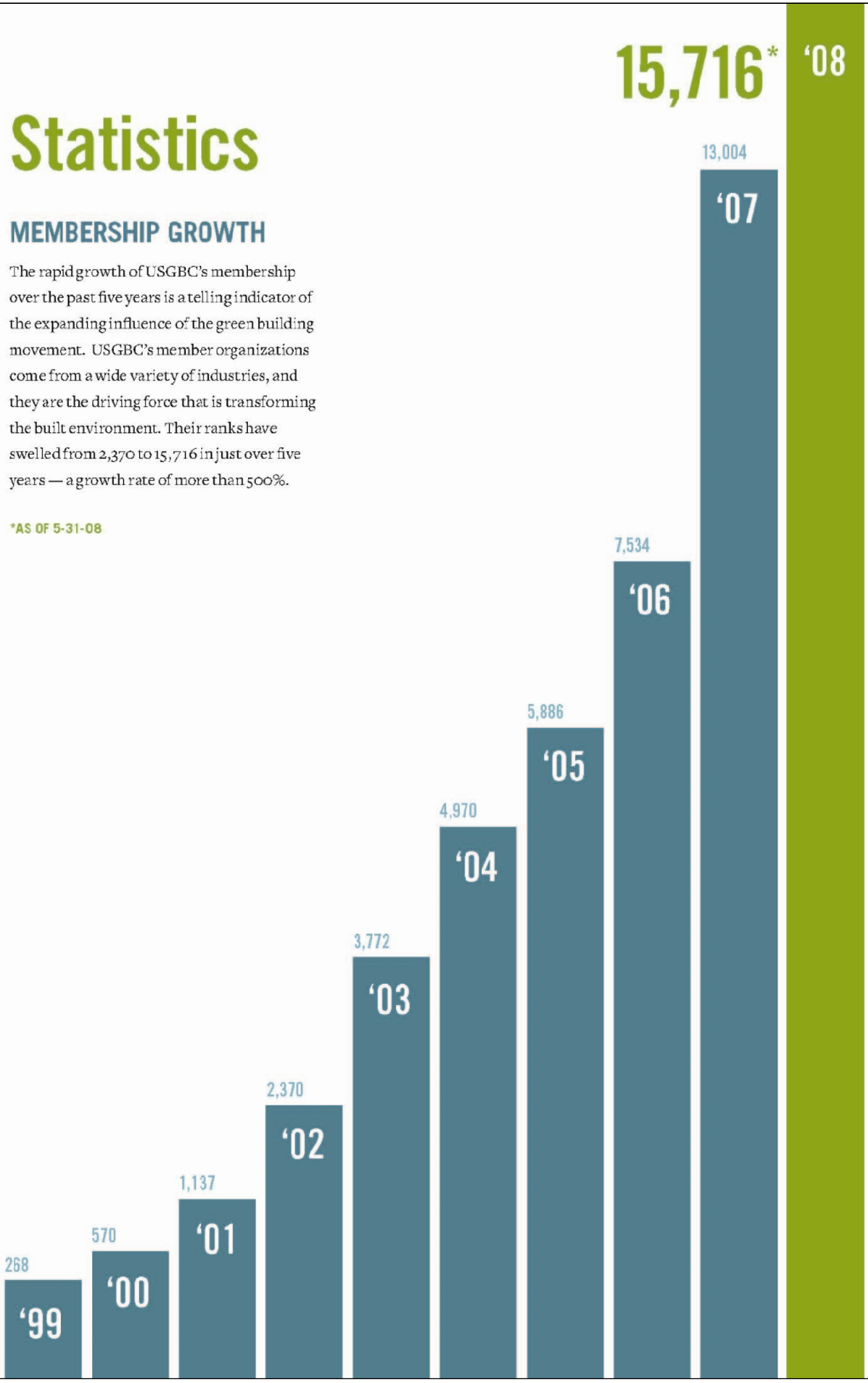


Statistics

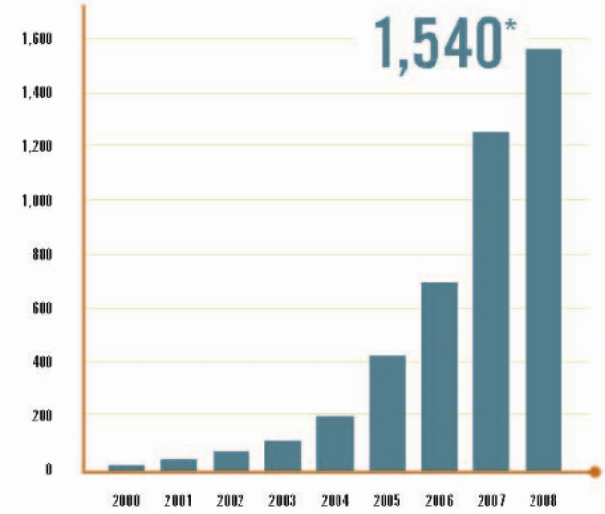
MEMBERSHIP GROWTH

The rapid growth of USGBC's membership over the past five years is a telling indicator of the expanding influence of the green building movement. USGBC's member organizations come from a wide variety of industries, and they are the driving force that is transforming the built environment. Their ranks have swelled from 2,370 to 15,716 in just over five years — a growth rate of more than 500%.

*AS OF 5-31-08

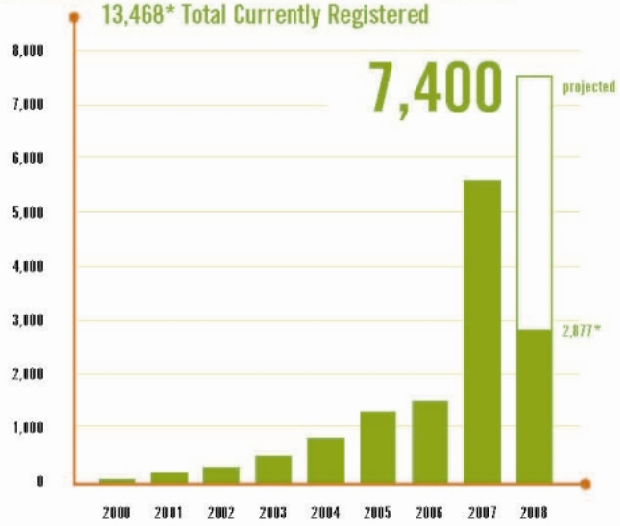


COMMERCIAL LEED CERTIFIED PROJECTS (CUMULATIVE)

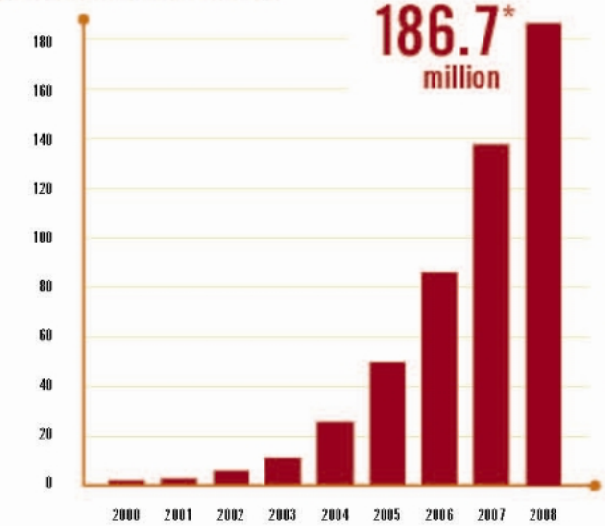


COMMERCIAL LEED REGISTERED PROJECTS (PER YEAR)

13,468* Total Currently Registered

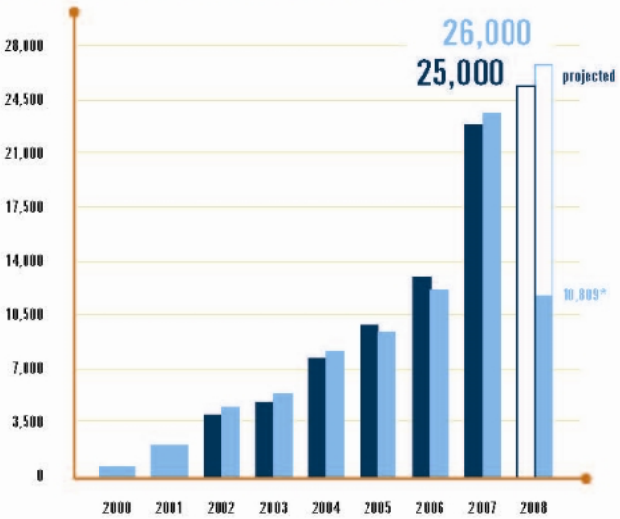


SQUARE FOOTAGE OF COMMERCIAL LEED CERTIFIED PROJECTS (CUMULATIVE, IN MILLIONS)

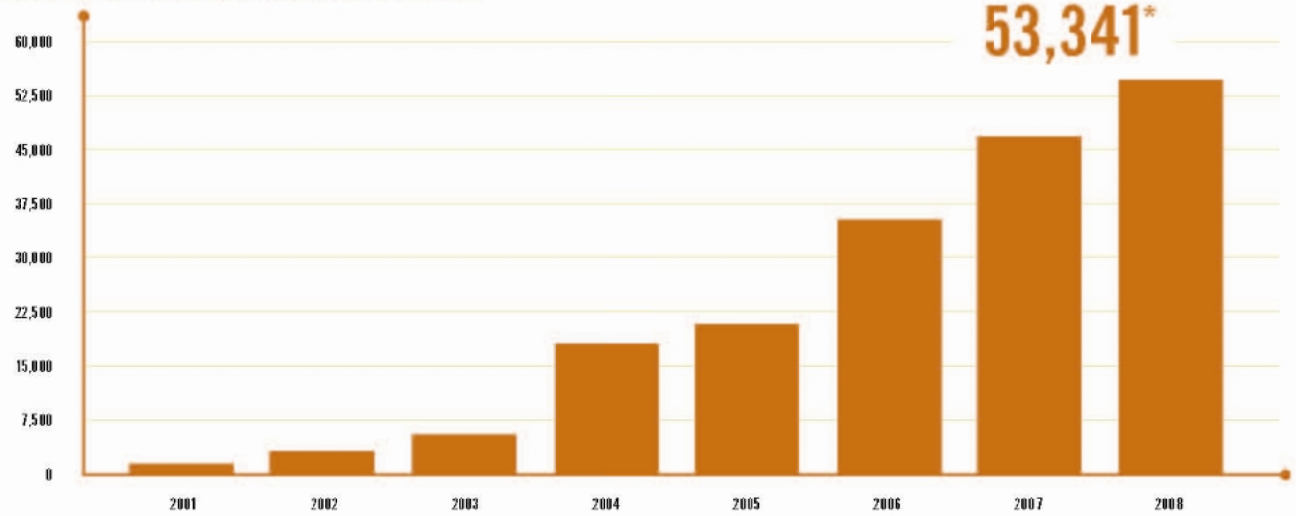


EDUCATION WORKSHOP ATTENDEES (PER YEAR)

GREENBUILD ATTENDEES (NOVEMBER EVENT)



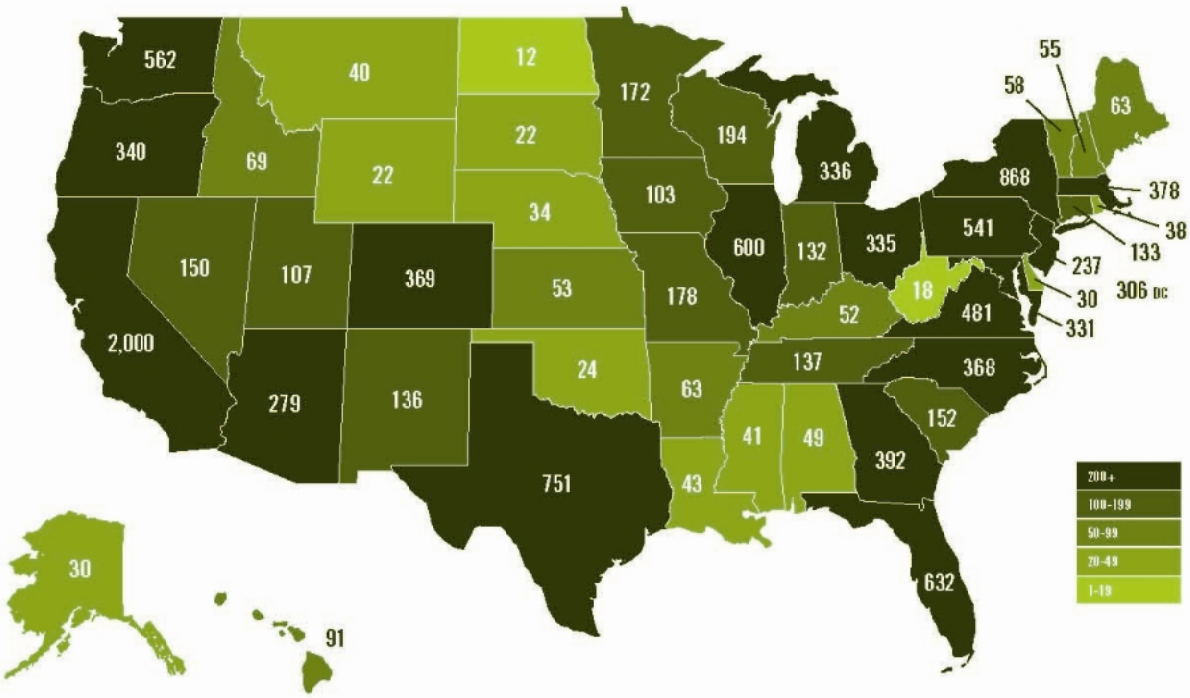
LEED ACCREDITED PROFESSIONALS (CUMULATIVE)



*AS OF 5-31-08

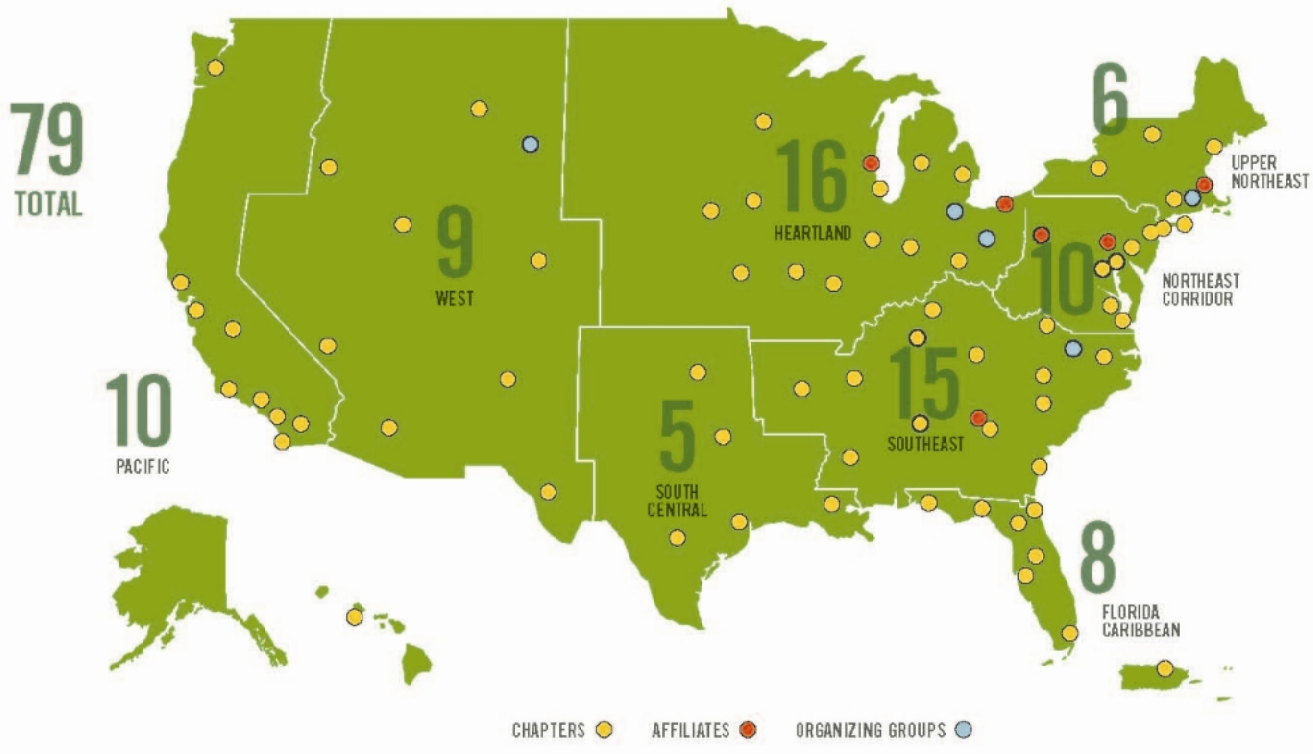
COMMERCIAL LEED PROJECTS BY STATE (REGISTERED AND CERTIFIED)

AS OF 5-31-08



USGBC CHAPTER NETWORK BY REGION

AS OF 5-31-08



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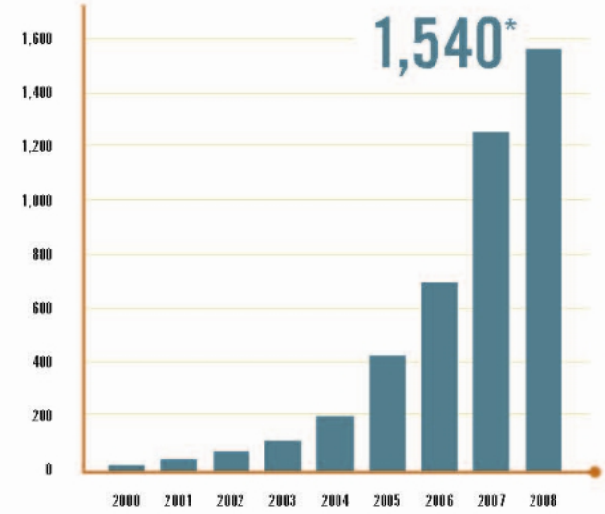

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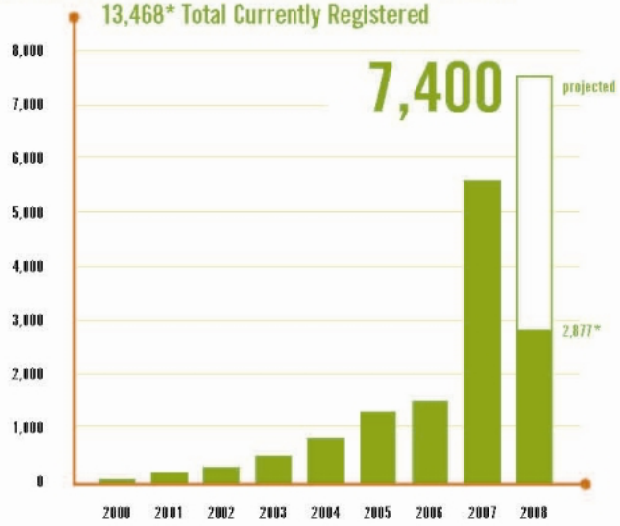
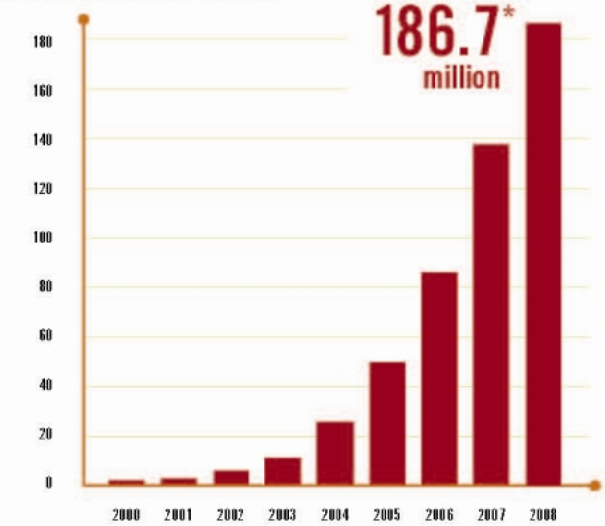


SQUARE FOOTAGE OF COMMERCIAL LEED CERTIFIED PROJECTS (CUMULATIVE, IN MILLIONS)



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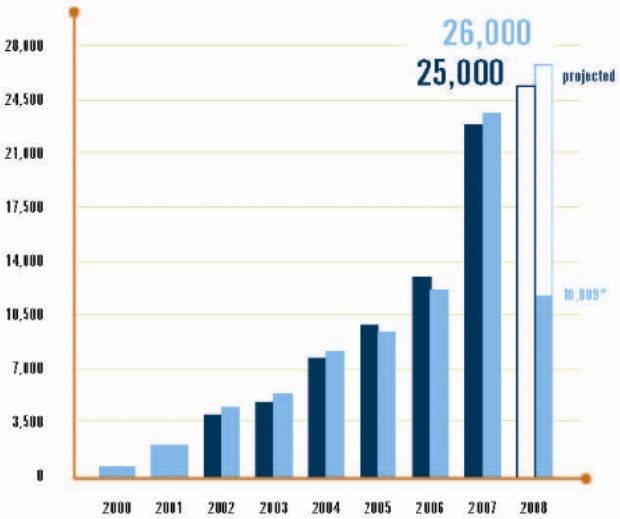

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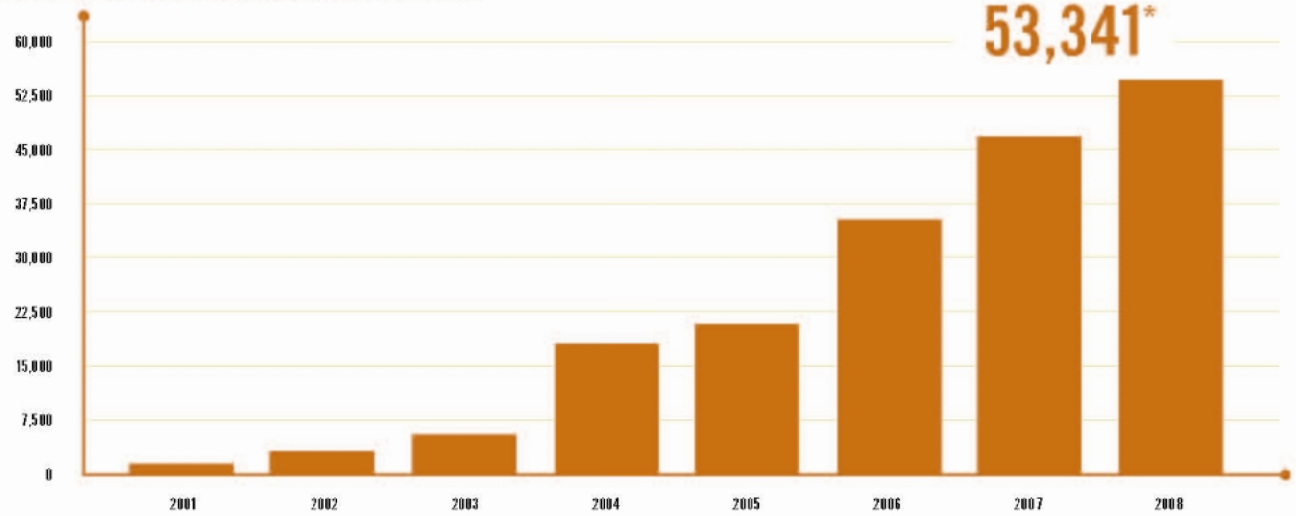

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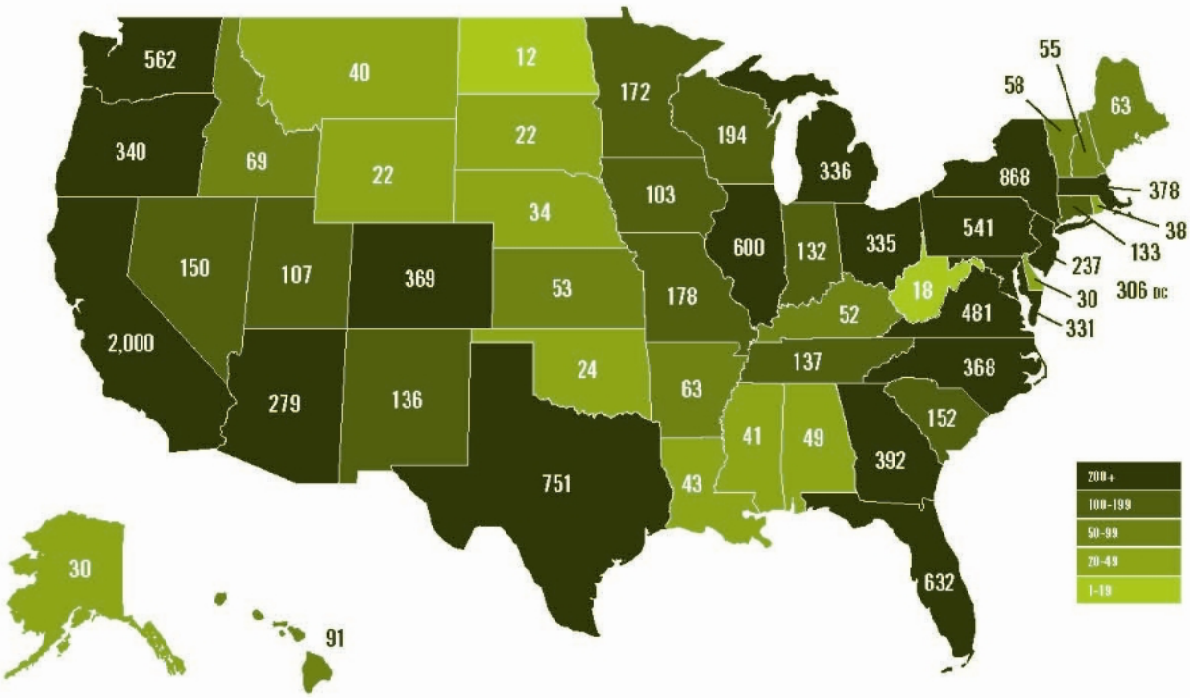

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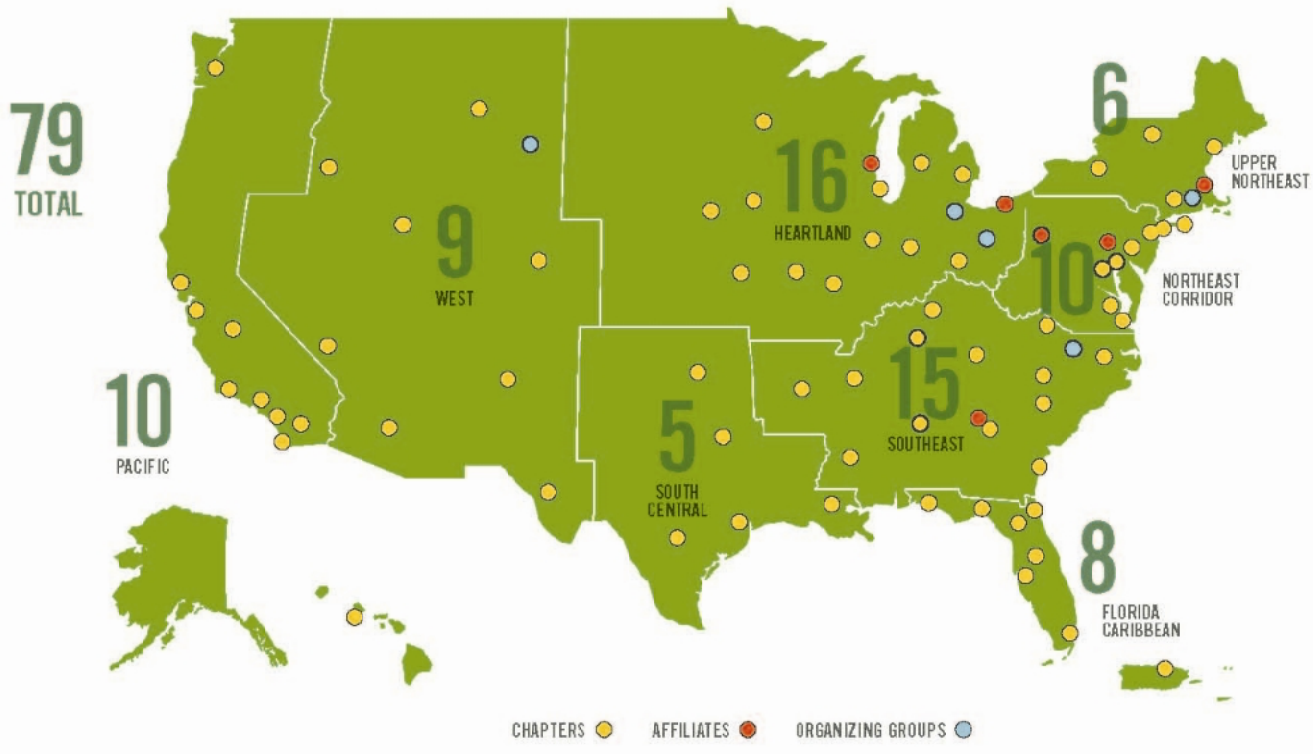

CONTACT US

PHONE

Customer Service 1-800-795-1747
Outside the U.S. 1-202-742-3792

E-MAIL

General USGBC inquiries ..... info@usgbc.org
Chapters inquiries ..... chapters@usgbc.org
Education inquiries not related to LEED workshops..... education@usgbc.org
Education Provider Program inquiries ..... EPProgram@usgbc.org
LEED inquiries ..... leedinfo@usgbc.org
LEED workshop inquiries ..... workshop@usgbc.org
Membership inquiries ..... membership@usgbc.org
Press inquiries ..... media@usgbc.org
Professional Accreditation inquiries ..... exam@usgbc.org
Speaker inquiries..... speakerinquiry@usgbc.org
Web site forms & orders ..... webmaster@usgbc.org
Web site performance ..... leedinfo@usgbc.org

FAX

1-202-828-5110

BUSINESS ADDRESS

U.S. Green Building Council
1800 Massachusetts Avenue NW
Suite 300
Washington, DC 20036

PAYMENT ADDRESS

U.S. Green Building Council
P.O. Box 404296
Atlanta, GA 30384-4296