# Energy efficiency

for non residential buildings during their whole life time

Seminar

Wintersemester 2010/11

## Green Building

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UNIVERSITY OF TECHNOLOGY, BUSINESS AND DESIGN

**Introduction lecture**

- Introduction of the subject, schedule
- Background
- World Green Building Council
- Green building councils and their evaluating tools:

BREEAM
CASBEE
DGNB
Green Star
LEED

**GREEN BUILDING**
**Elective Course**
**Course Number:**
**Level:** MA (7.-10.Semester)
**Credits:** 5/3
**Main programme:** Master of Arts in Architecture

**Learning time:**
Directed (Supervised) 32
HoursSelf-Directed (Unsupervised) 32
HoursTotal 64 Hours

**Schedule:**

06.10.2010 - Introduction
13.10.2010 - Different strategies and regulations of the governments
27.10.2010 - Excursion week
03.11.2010 - DGNB certification
10.11.2010 - Profesional possibilities for an architect as an auditor
17.11.2010 - Dämmwerk
24.11.2010 - Ecological catalogue of building elements
01.12.2010 - Assessement matrix of DGNB I
08.12.2010 - LEGEP I
15.12.2010 - Assessement matrix of DGNB II
05.01.2010 - Ökobilanz LCA – Life Cycle Assessment, ISO 14040
12.01.2010 - LEGEP II
19.01.2010 - Summary and Documentation

**Background:**

Worldwide expansion of the sustainable movement in the building sector
- due to a continously increasing knowledge of global climate change
- and rising of total energy consumption

High develloped countries have in total the highest energy consumption.
Therefore they have a pioneering role to save energy.

**WGBC**
**World Green Building Council**

is a union (global network) of national Green Building Councils from around the world whose mission is to accelerate the **transformation of the built environment towards sustainability**. It is the largest international organization influencing the green building marketplace.

**1998** the World Green Building Council was founded in **Nagoya Japan**

The GBC is considered to be an **apolitical global forum** for discussions on sustainability in the building sector.

As a **non-profit organisation** it aims to promote the real estate sector of all nations towards sustainability.



Quelle: The introduction of GBC, http://www.worldgbc.org

**WGBC**
World Green Building Council

**The WorldGBC provides an international forum, and champions proven tools that significantly accelerate market transformation from traditional, inefficient building practices to new generation high performance buildings**, provide “branding”, and transform the skills and knowledge of the industry as a whole. This is a critical response strategy for cities and countries worldwide to their national and international commitments **to reduce carbon emissions and redress other Environmental impacts**. Green Building Councils are highly effective at engaging leaders across sectors to transform the built environment. It’s proven, replicable – and it’s building momentum.



Quelle: The introduction of GBC, http://www.worldgbc.org

**Vision**
of World Green Building Council

Through leadership collaboration, the global construction 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**.

**Goal**
of World Green Building Council

Buildings and Communities will enhance the health and vitality of life within a generation.



Quelle: The introduction of GBC, http://www.worldgbc.org

**Mission**
of World Green Building Council

**Ensure Green Building Councils are successful and have the tools necessary to advance.**

**Stand as the premier international voice for green building design & development.**

**Foster effective communications and collaboration between Councils, countries, and industry leaders.**

**Support effective green building rating systems.**

**Share best practices globally.**



Quelle: The introduction of GBC, http://www.worldgbc.org

**Guiding Principles**
of World Green Building Council

**Leadership**
Establish the WorldGBC as the international leader in green building design & development.

**Integrity**
Maintain corporate integrity and exhibit transparency; build trust and credibility with associates.

**Inclusiveness**
Ensure inclusiveness and associate participation in the development of projects and initiatives.




Quelle: The introduction of GBC

**Guiding Principles**
of World Green Building Council

**Climate**
Maximize scale, capacity and speed of GBC growth in response to climate change.

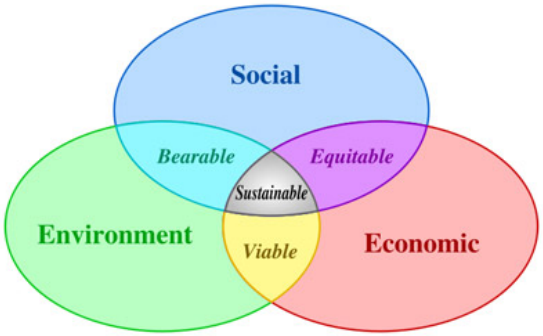
**Respect**
Recognize individual countries have unique needs, opportunities and issues. Responses must be tailored and equal.

**Transparency**
Foster an environment based on trust, support, inspiration and passion.

**Results**
Strive for immediate and measurable results in all initiatives.



Quelle: The introduction of GBC




**Guiding Principles**
of World Green Building Council

**Triple Bottom Line**
The "triple bottom line" must become a primary factor in business and strategic planning across all industry sectors.

**Balance**
Societies must recognize that humanity needs to reconcile with nature to ensure the health of our communities and the planet.

**Effectiveness**
Industries need to develop aggressive emission reduction strategies climate change strategy.

**Diversity**
Sector leaders must support cultural and social diversity in all ventures.



Quelle: The introduction of GBC

**History**
of World Green Building Council

Since **1998**, national Council representatives have met to review global activities and offer support for each other's efforts. This led to the founding meeting of the WorldGBC in November of **1999 in California**, USA with 8 countries in attendance:

1. **Green Building Council of Australia**
2. **Canada**
3. **Japan Green Building Council**
4. **Spain Green Building Council**
5. **Russia**
6. **United Arab Emirates**
7. **United Kingdom Green Building Council**
8. **U.S. Green Building Council**



Quelle: The introduction of GBC, http://www.worldgbc.org

**History**
of World Green Building Council

Formal incorporation of the World Green Building Council (World GBC) followed in **2002** – its primary role being to formalize international communications, help industry leaders access emerging markets, and provide an international voice for green building initiatives.

In early **2007**, national Council leaders identified the urgent need to establish a **Secretariat for the World GBC** that could directly respond to The growing industry interest in green buildings and communities from an international perspective. The Secretariat has now been formally established and is directing its efforts from a LEED Gold building, housed inside The Living City Campus near Toronto, Canada. The Campus is owned and operated by the Toronto and Region Conservation Authority (TRCA), a 350-person, 50-year-old organization with a long history of environmental conservation.



Quelle: The introduction of GBC, http://www.worldgbc.org

**The founding officers**
of World Green Building Council

**Chair**
Ché Wall, Lincolne Scott Pty Ltd., Green Building Council of Australia

**President**
Rick Fedrizzi, Greenthink, LLC., Founding Chair, US GBC

**Treasurer**
Nellie Cheng, Canada Housing Mortgage Corporation, Canada GBC

**Secretary**
Huston Eubank, Principal, Rocky Mountain Institute Green, Development Services

**Legal Counsel**
Daniel K Slone, Mcguire Woods, Partner

**Founder**
David Gottfried, WorldBuild Technologies Inc.



Quelle: The introduction of GBC, http://www.worldgbc.org

**Present**
of World Green Building Council

On the ground in nearly **70 countries**, GBCs create change in their local markets as a way to globalize environmentally and socially responsible building practices.

**Regional networks**
Of World Green Building Council are:

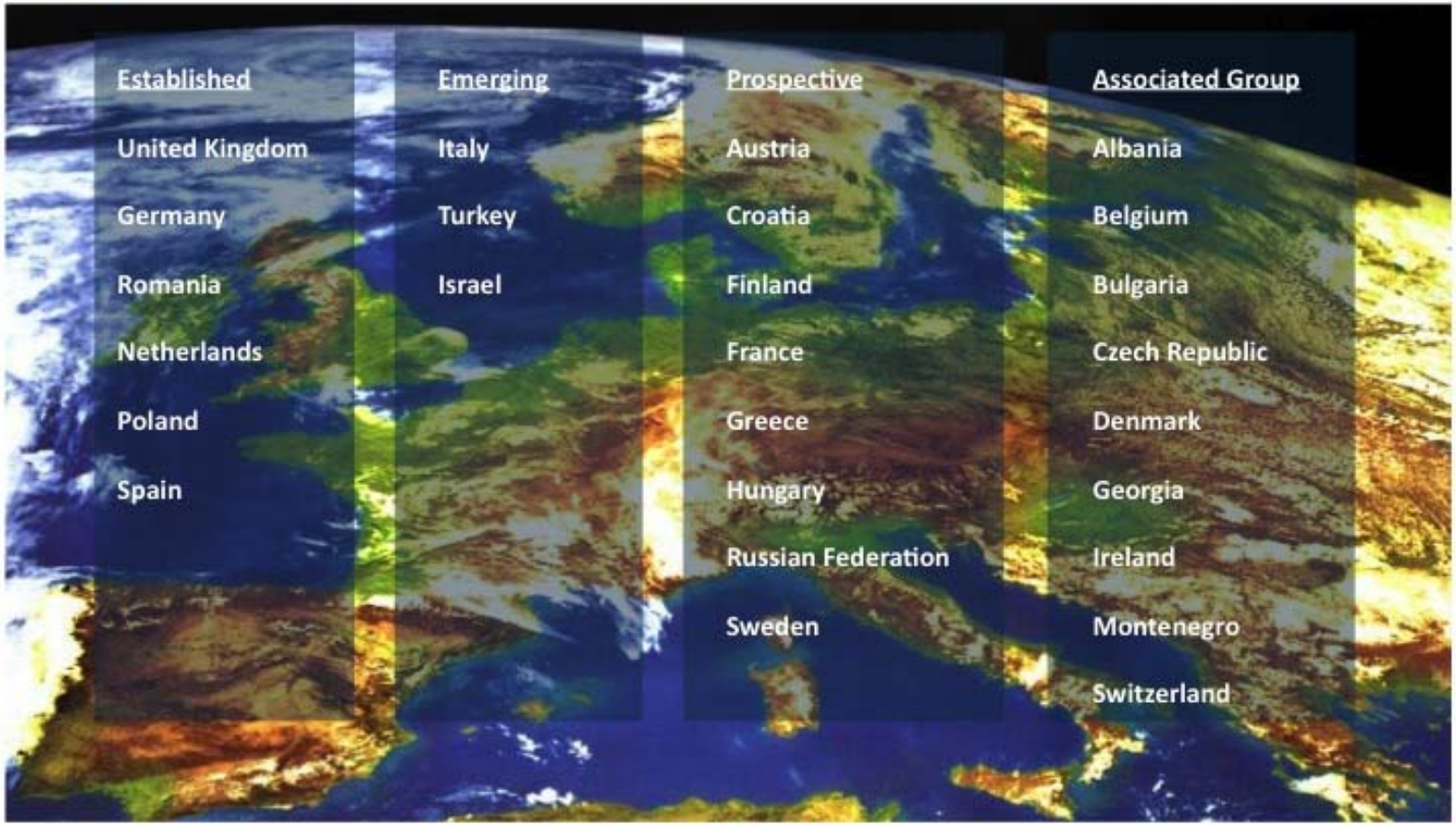
**WorldGBC – Africa**
**WorldGBC – Americas**
**WorldGBC – Asia Pacific**
**WorldGBC – Europe**

WORLD GREEN BUILDING COUNCIL



Quelle: http://www.worldgbc.org

## Councils & Groups in Europe




# Green Building

Quelle: http://www.worldgbc.org

**Present**
of World Green Building Council

WorldGBC supports the adoption and ongoing development of market based green building transformation systems that meet local needs for each country.
The WorldGBC does not promote any particular system or methodology as a global standard. The following is a sample of some of the rating tools that have been developed around the world:

**BREEAM** - United Kingdom, Netherlands
**CASBEE** - Japan
**DGNB** Certification System - Germany
**GreenStar** - Australia, New Zealand, South Africa
**IGBC** Rating System - India
**LEED** - United States, Canada, India

There are many other local rating tools used by different GBCs.



Quelle: http://www.worldgbc.org

**BREEAM**
United Kingdom, Netherlands


It is world's longest standing and most widely used environmental assessment method for buildings. It sets the standard for best practice in sustainable development and demonstrates a level of achievement

**BRE** - Building Research Establishment
**EAM** - Environmental Assessment Method

- BREEAM market leader
- Winner of the 'Best Program' Award at the influential 2005 Tokyo World Sustainable Building Conference
- BREEAM was acknowledged 'the most successfully executed program for promoting sustainable practices, and influencing other initiatives, worldwide'
- in UK there are almost 100,000 buildings certified (25% of buildings) and over half a millionregistered for assessment



Quelle: Presentation of Caterina Link

**BREEAM**
Versions

BREEAM Bespoke
BREEAM Courts
BREEAM EcoHomes
BREEAM EcoHomes XB
BREEAM Healthcare
BREEAM Industrial
BREEAM International
BREEAM Multi Residential
BREEAM Offices
BREEAM Prisons
BREEAM Retail
BREEAM Schools



Quelle: Presentation of Caterina Link

**BREEAM**
Evaluating system

- **evaluates buildings according to set criteria** and then concludes by providing an overall assessment score
- **anything that could have an impact on the environment** at all levels of its construction and lifecycle is featured in the criteria

- final assessment score will fall within one of the four rating bands:
  **- ‚PASS‘ - ‚GOOD‘ - ‚VERY GOOD‘ - ‚EXCELLENT‘**

BREEAM

**Environmental Assessment Award**

*This is to certify that*

**Historic Van de Kamp Bakery Building, Northeast Center, Los Angeles City College, Los Angeles, California**

*has achieved the rating of*

**GOOD**

*Under*

**Bespoke BREEAM**

*This assessment was carried out at the*
**DESIGN STAGE**

*Signed on behalf of Building Research Establishment Ltd.* Claire Lowe

*Date:* 22 November 2005

| | | | |
|---|---|---|---|
| *Licensed Assessor:* | Amy Garrod | *On behalf of:* | Faber Maunsell / DMJM |
| *Client:* | Los Angeles Community College District | *Local Expert:* | DMJM / JGM Program Management |
| *Architect:* | Roschen Van Cleve Architects | *Master Plan Architect:* | Steven Ehrlich Architects |
| *Construction Manager:* | Bovis Lend Lease | *Building Occupiers:* | Los Angeles City College |

This environmental assessment has been carried out at the design stage. No assumptions should be made about performance of aspects not covered by the assessment report. BREEAM is a registered trademark of the Building Research Establishment Ltd.

BRE



Quelle: Presentation of Caterina Link

**BREEAM**
Evaluating system

8 environment categories:

- **Management**
- **Health and Well-being**
- **Energy**
- **Transport**
- **Water**
- **Land Use and Site Ecology**
- **Materials**
- **Waste and Pollution**

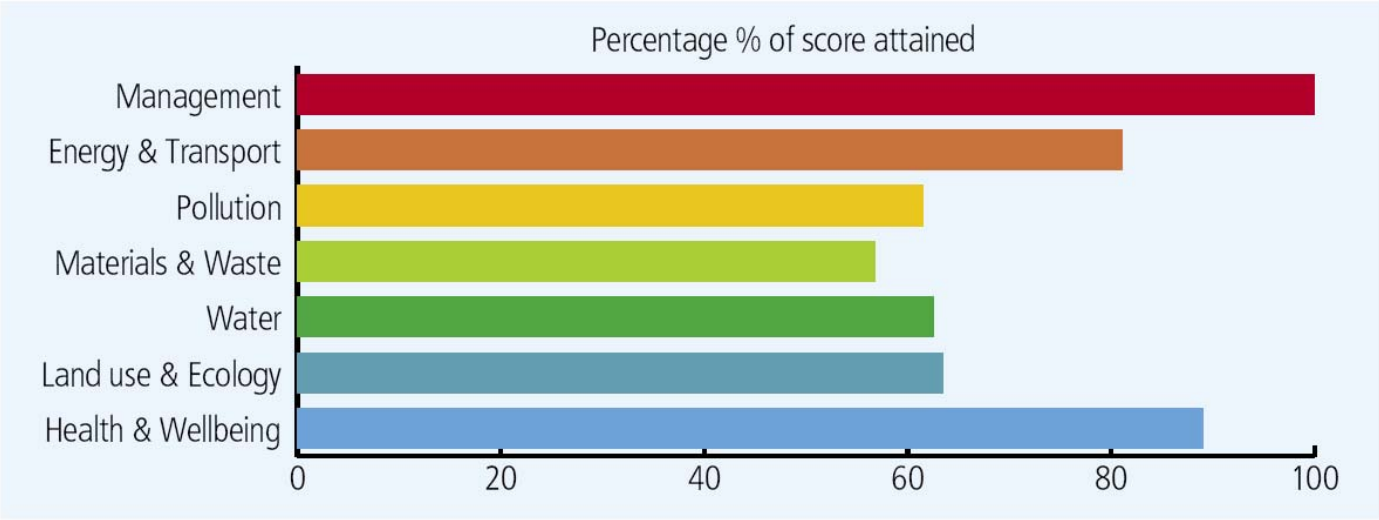


Quelle: Presentation of Caterina Link

**BREEAM**

Bespoke Award Winner - **Matthew Hay Building, University of Aberdeen**

BREEAM Rating: **Excellent**
Score: 76.19%
Size: Net lettable area – 3,310m²




# Green Building

Quelle: Presentation of Caterina Link

**BREEAM**

Bespoke Award Winner - **Matthew Hay Building, University of Aberdeen**

- a highly efficient facade system
- U-values and air permeability beyond the minimum requirements
- Natural daylighting
- Local controls for heating and lighting
- Building Management System (BMS)
- Day and night lighting modes
- Monitoring of all plant items and energy consumption
- mixed mode ventilation strategy, majority of spaces being naturally ventilated
- Low carbon technologies and passive renewables
- Heating source with low NOx emissions
- Green Guide-rated materials
- all insulants were specified with low Ozone Depleting Potential (ODP) and Global Warming Potential (GWP)
- encourage use of public transport
- all BREEAM construction site impacts considered and achieved
- Low water consumption fittings
- Rainwater harvesting system



Quelle: Presentation of Caterina Link

**CASBEE**
GBC Japan

The Japan Sustainable Building Consortium (JSBC) was established in April 2001 as a joint framework between industry, government and academia, under the auspice of the Japanese Ministry of Land, Infrastructure and Transport. (Secretariat: The institute for Building Environment and Energy Conservation (IBEC).
The vital research activities of JSBC have already provided numerous outcomes, the most important being the Comprehensive Assessment System for Building Environmental Efficiency (CASBEE). Overall management of CASBEE development is carried out by JSBC and its affiliated sub-committees.



Quelle: http://www.ukgbc.org/site/worldgbc

**CASBEE**
Japan, Asia

**Comprehensive Assessment System for Building Environmental Efficiency**

CASBEE is developed according to the following policies:

1) The system should be structured to award high assessments to superior buildings, thereby enhancing incentives to designers and others.
2) The assessment system should be as simple as possible.
3) The system should be applicable to buildings in a wide range of applications.
4) The system should take into consideration issues and problems peculiar to Japan and Asia.




Quelle: Presentation of Deng Weiqiang and Yuan Li

**CASBEE**
Japan, Asia

Research and development of CASBEE have been carried out as a cooperative project between industry, government and academia. At the same time, the members of the council are the **Ministry of Land, Infrastructure, Transport And Tourism (MLIT), the Japan GreenBuild Council (JaGBC), the Japan Sustainable Building Consortium (JSBC) and Institute for Building Environment and Energy Conservation (IBEC)**, they keep cooperating ogether for the development of CASBEE until now.
JaGBC/JSBC **is continuously developing and updating** the CASBEE system. By now, CASBEE has developed more and it can be used for almost all kinds of building including buildings of **public assembly, health services, commerce, industry/production, museums, exhibitions and even urban area and urban development**.
**CASBEE is planned and designed for not only Japan but the whole Asia.**



Quelle: Presentation of Deng Weiqiang and Yuan Li

**CASBEE**
Japan, Asia

CASBEE is composed of four assessment tools corresponding to the building lifecycle. The "CASBEE Family" **consists of 4 types of tools** and the expanded tools for specific purposes. The assessment tools are for:

- **Pre-design**
- **New Construction**
- **Existing Building**
- **Renovation**

Each tool is intended for a separate purpose and target user, and is designed to accommodate a **wide range of uses** (offices, schools, apartments, etc.) in the evaluated buildings.



Quelle: Presentation of Deng Weiqiang and Yuan Li

**CASBEE**
Japan, Asia

The assessment categories (energy efficiency, resource efficiency, local environment, indoor environment) were classified into BEE numerator Q (Building environmental quality and performance) and BEE denominator L (Reduction of building environmental loadings).

$$\text{Building Environmental Efficiency (BEE)} = \frac{\text{Q (Building Environmental Quality \& Performance)}}{\text{L (Building Environmental Loadings)}}$$

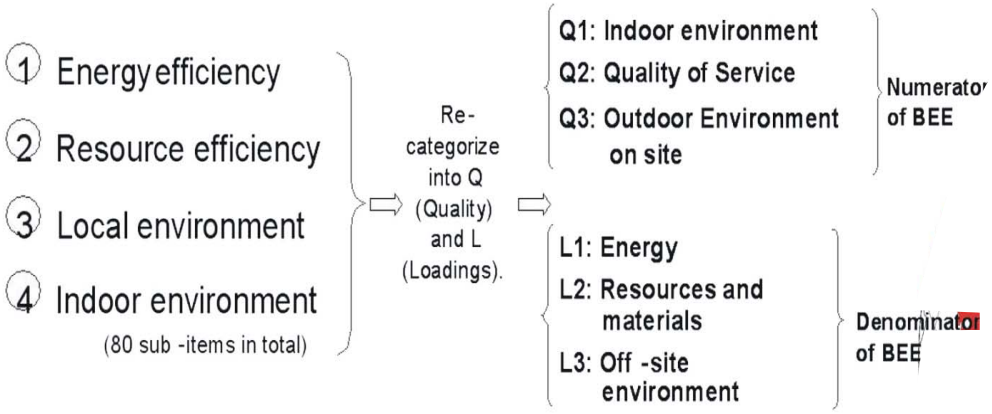
The calculated score is BEE, which is the final result we can use to decide whether the building is sustainable. Look at the formula, we can find that the Quality score is more the result is better and the Loading score is less the result is better, in a similar way, it goes the opposite when Q and L go under an opposite trend.



Quelle: Presentation of Deng Weiqiang and Yuan Li

**CASBEE**
Japan, Asia

There are six main certified projects, and there are
**Q1**-Indoor Environment,
**Q2**-Quality of service and
**Q3**-Outdoor environment on site
as the components of Q(Quality).
Meanwhile, there are
**LR1**-Energy,
**LR2**-Resources and Materials and
**LR3**-Off-site Environment
as the components of L(Loadings).

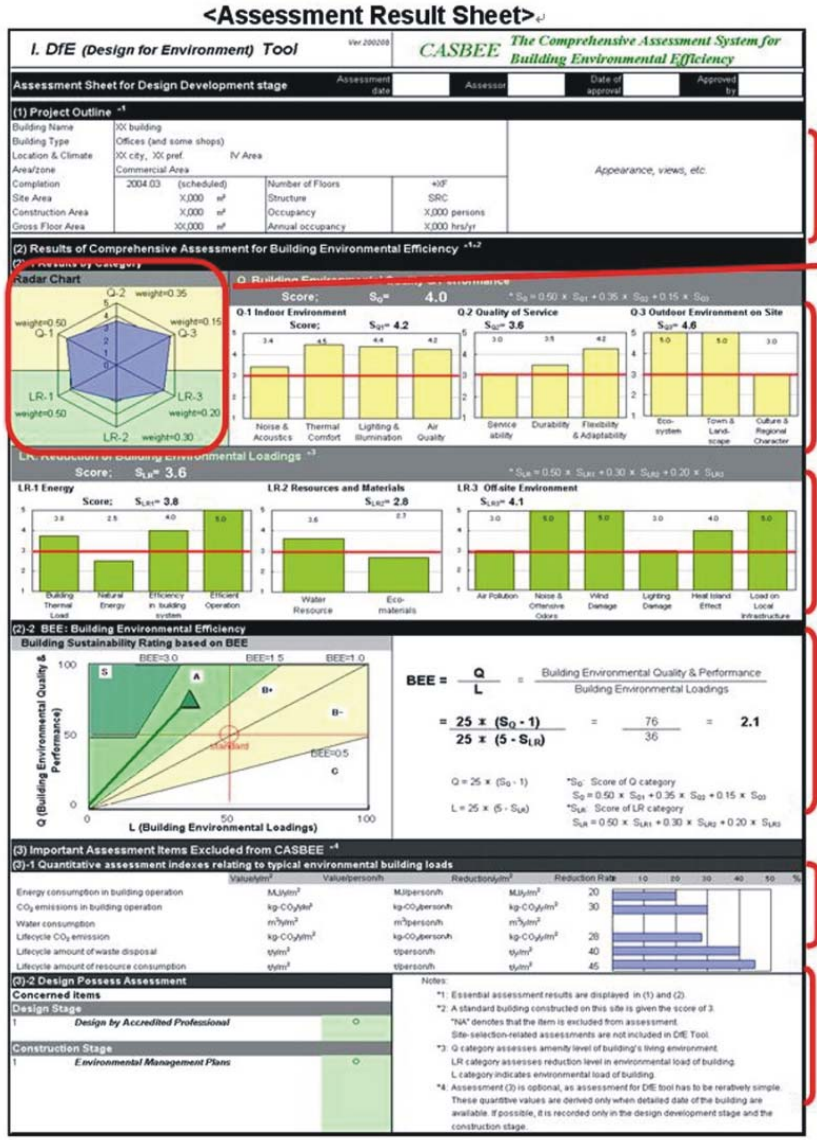



Of course there are twenty-two sub-grade certified projects to constitute the main six Q and L, still, there are forty-eight detail certified projects to constitute the sub-grade projects. It is so complex but logical and reasonable.



Quelle: Presentation of Deng Weiqiang and Yuan Li

**CASBEE**
Japan, Asia




# Green Building

Quelle: Presentation of Deng Weiqiang and Yuan Li

**CASBEE**

Japan, Asia

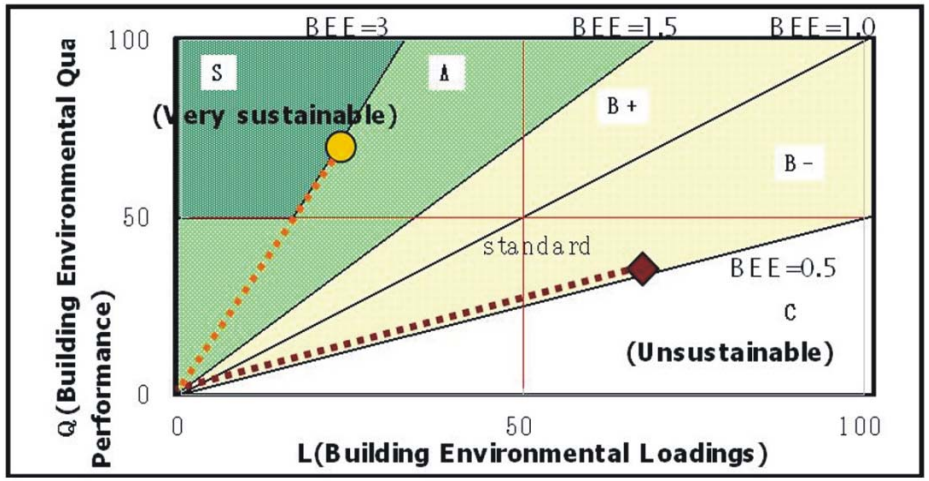
## CONCEPT OF BEE (BUILDING ENVIRONMENTAL EFFICIENCY):

In CASBEE, the assessment scale for Q and LR goes from 1 to 5. As SQ represents the score for the Q category, the numerator Q in Equation 1 is derived from SQ. Similarly, the denominator L is calculated from SLR. Here Q is defined as Q = 25(SQ-1) and L as L = 25(5-SLR); thus Equation 1 can be expressed in the following form:

$$BEE = Q / L = 25(SQ-1) / 25(5-SLR)$$

$S_Q$ = Score for Q category

$S_{LR}$ =Score for LR category







Quelle: Presentation of Deng Weiqiang and Yuan Li

**CASBEE**

Example – **Takenaka Corporation Tokyo main office, Japan**

Takenaka Corporation (Head Office: Osaka; President: Toichi Takenaka) has received (on September 7) certification for the "New Takenaka Corporation Tokyo Main Office Building," completed in November 2004, under the "Comprehensive Assessment System for Building Environmental Efficiency" ("CASBEE"), being promoted by the Institution for Building Environment and Energy Conservation (IBEC) **in the highest "S" rank, "Building Environmental Efficiency (BEE) = 4.9."**



Quelle: Presentation of Deng Weiqiang and Yuan Li

**CASBEE**

Example – **Takenaka Corporation Tokyo main office, Japan**

The company's proposal was to "plan architecture where the company, with the customers, could aim for the creation of space in harmony with the environment." Realize the goal of improvement of the total environmental quality and reduction in the load on the environment.

Atrium in the Center: Bringing Natural Light and Wind into the Building

Views through the stairwell

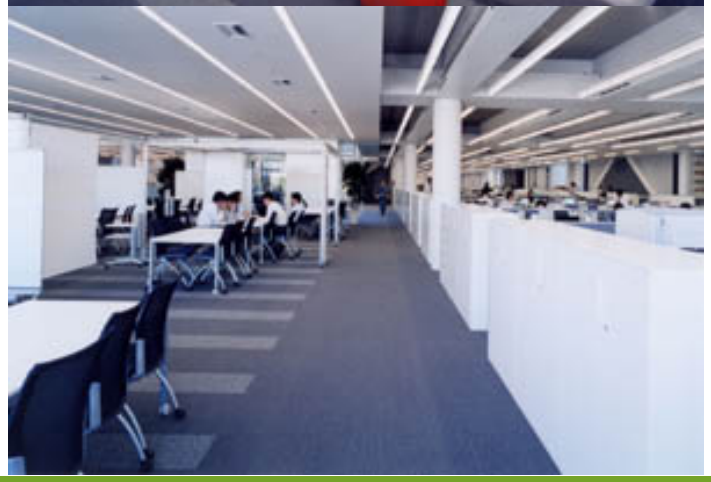


Quelle: Presentation of Deng Weiqiang and Yuan Li

## CASBEE

Example – **Takenaka Corporation Tokyo main office, Japan**

Open space enhances collaboration



Massive space enhances internal communication

Flexible, efficient office layout

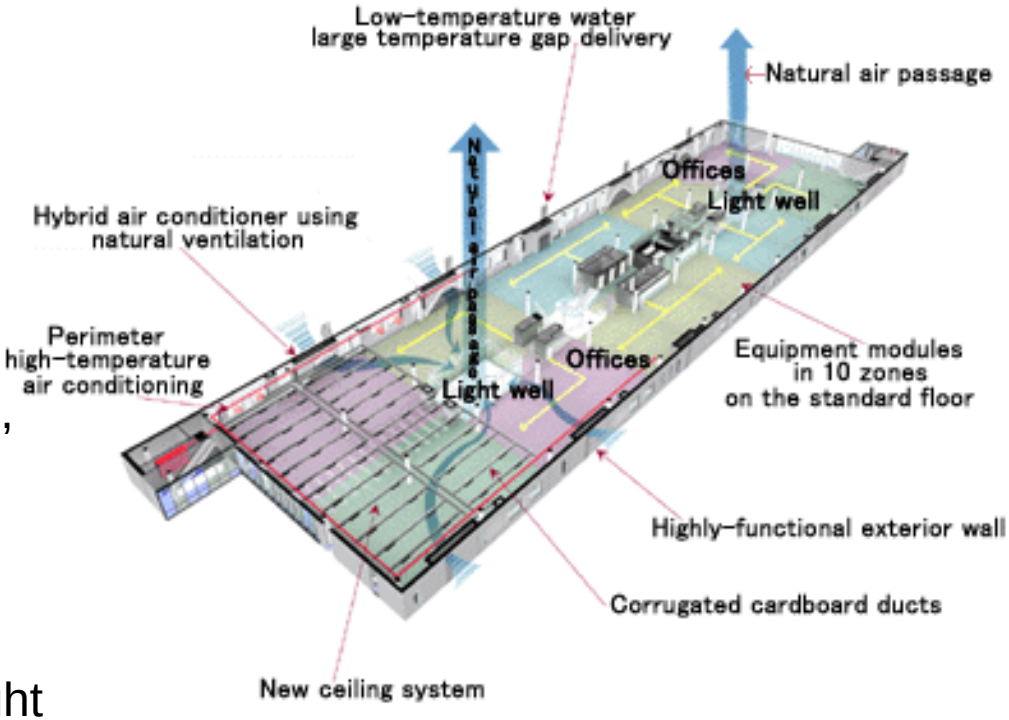


Quelle: Presentation of Deng Weiqiang and Yuan Li

**CASBEE**

Example – **Takenaka Corporation Tokyo main office, Japan**

Various methods have been used in the aim of a reduction in the load on the environment, including using corrugated cardboard ducts, using recycled materials such as the specially-developed exterior PCa boards using the waste glass from optical fiber and recycled aggregate, using solar power such as with rooftop heat-collection ducts on the cafeteria-wing rooftop (used for cafeteria heating and ventilation), daylight collectors installed in the light wells, and automatic light controls, and using intermediate rainwater.



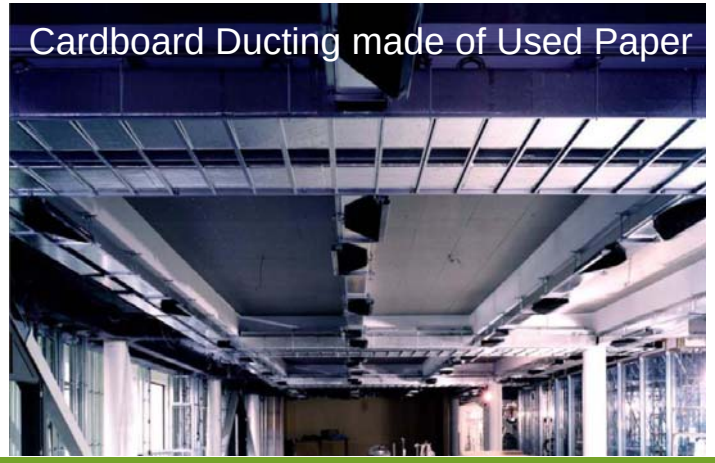

Dispersed hybrid air-conditioners on exterior wall braces maintain a comfortable office environment



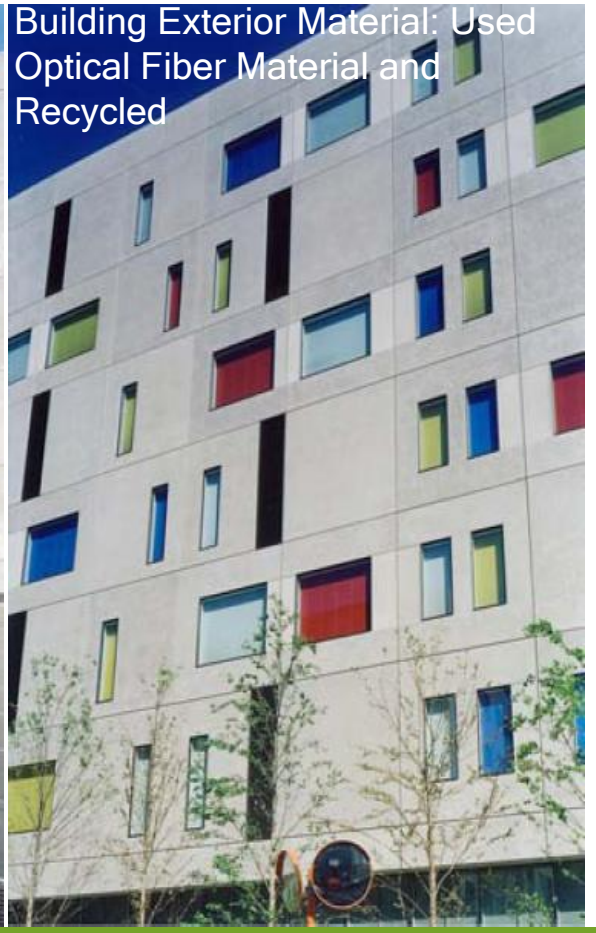
Quelle: Presentation of Deng Weiqiang and Yuan Li

## CASBEE

Example – **Takenaka Corporation Tokyo main office, Japan**






# Green Building

Quelle: Presentation of Deng Weiqiang and Yuan Li

**DGNB**
Certification System, Germany

DGNB
Deutsche Gesellschaft für nachhaltiges Bauen e.V.

**DGNB** - Deutsche Gesellschaft für Nachhaltiges Bauen
**GeSBC** - German Sustainable Building council

For planning and evaluation of buildings, there is a new and clearly structured tool: The German Sustainable Building Certification. As meritocratic rating system, it covers all relevant topics of sustainable construction.

The German Sustainable Building Certification was developed by the **German Sustainable Building Council (DGNB) together with the Federal Ministry of Transport, Building, and Urban Affairs (BMVBS)** to be used as a tool for the planning and evaluation of buildings in this comprehensive perspective on quality.



Quelle: Presentation of Meng Hangxu

**DGNB**
Certification System, Germany

The certificate is based on the concept of integral planning that defines, at an early stage, the aims of sustainable construction.

DGNB included green building economic, social and cultural building features and other factors, cover the construction industry chain. Represents the highest level of the **second generation of green building assessment system**.



Quelle: Presentation of Meng Hangxu

**DGNB**
Goals of the Certification System

The certification system suits to:
- **New buildings, old buildings, reconstructions**
- **Buildings and infrastructures in general**

It is continuosly developing and reacts on:
- **Changed economical situation**
- **Changed political conditions**
- **Changed society goals**

**And it is possible to use it for other climate regions.**



Quelle: DGNB Darstellung

**DGNB**
Goals of the Certification System

The certification system in which can take part everybody:

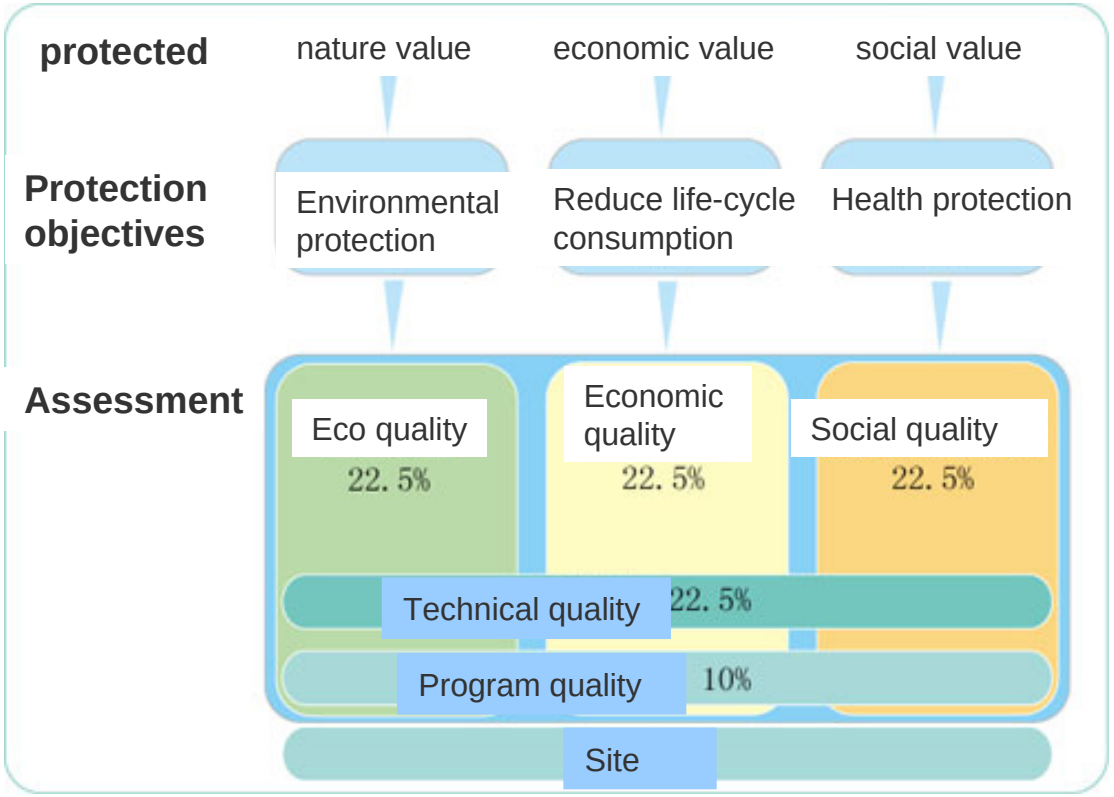
- **Investors**
- **Planners** (architects, engineers, environmental engineers, experts for health,...)
- **Producers of building materials and elements**
- **Companies in charge**
- **Political responsers**
- **Legislature**




Quelle: DGNB Darstellung

## DGNB

Develop ideas of certification system




1, The global environment **protected** are classified :

Natural environment and resources,

Economic value,

Health and socio-cultural.

2, For each type of protection system develop the corresponding **protection objectives**:

Environmental Protection,

Reduce life-cycle consumption,

Health protection.

3, **Assessment**



Quelle: Presentation of Meng Hangxu

**DGNB**

Technical composition and evaluation system

During the evaluation, **6 topics with around 60 criterias** are considered by the certification:

- **Ecological Quality** 22,5%
- **Economical Quality** 22,5%
- **Socio-cultural and Functional Quality** 22,5%
- **Technical Quality** 22,5%
- **Quality of the Process** 10%
- **Quality of the Location** 0%




Quelle: Presentation of Meng Hangxu

**DGNB**

Certification system

Occupancy profiles:




Quelle: http://www.dgnb.de

**DGNB**

Assessment and classification

The score shows the extent to which the requirements are fulfilled. If the score is **50 percent**, for instance, the building will receive a **bronze** certificate. The score can also be based on grades, with 3.0 being required for bronze. If the score is **65 percent**, a **silver** certificate is granted. A **gold** certificate requires a score of **80 percent**. The performance in each of the Topical categories relevant for the score therefore has to be of a certain minimum level for a certificate to be issued. For instance, gold requires a score of at least 65 percent in the first five topical categories. Silver requires a score of at least 50 percent; bronze, 35 percent.

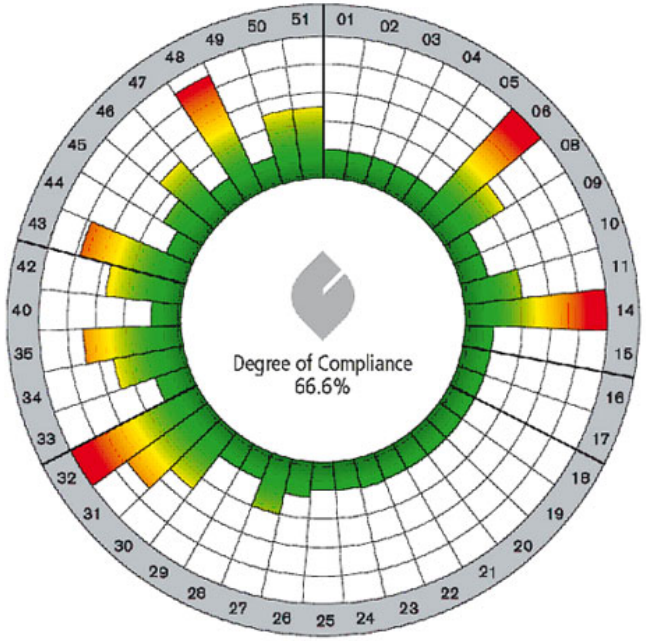



Quelle: http://www.dgnb.de

**DGNB**

Assessment and classification

- Software-supported evaluation enables precise optimization of the building in the planning stage
- Evaluation results are summarized descriptively by topic and criteria






Quelle: Presentation of Meng Hangxu

**DGNB**

Example - **Local Authorities Barnim, Eberswalde**

| | |
|---|---|
| **Property Evaluation** | **1,18 (Certificate in Gold)** |
| Ecological Quality | 1,13 |
| Economical Quality | 0,83 |
| Sociocultural and Functional Quality | 1,25 |
| Technical Quality | 1,35 |
| Process Quality | 1,57 |
| **Site Evaluation** | **1,55** |



Quelle: http://www.dgnb.de

**Green Star**

GBC Australia

green building council australia

Launched in 2002, the GBCA is a national, not-for-profit organisation that is committed to developing a sustainable property industry for Australia by encouraging the adoption of green building practices. It is uniquely supported by currently 698 members consisting of the government, the industry, private individuals as well as educational and financial institutions across the country. The GBCA is a comprehensive, national, voluntary environmental rating scheme that evaluates the environmental design and achievements of buildings.



Quelle: *www*.gbca.*org.au,* Presentation of Claudia Ninas, Conny Nitsche

**Green Star**

Australia, New Zealand, South Africa

Each Green Star rating tool was created to assess the environmental performance of buildings in a specific sector (office, retail, healthcare, education) at a distinct phase in the development cycle (design or construction and maintenance).
**It is built on existing systems and tools British BREEAM, North American LEED, VicUrban – Melbourne Docklands‘ ESD Guide (Ecologically Sustainable Design Guide)**
There are established individual environmental measurement criteria with Particular Relevance to the Australian marketplace and environmental context.

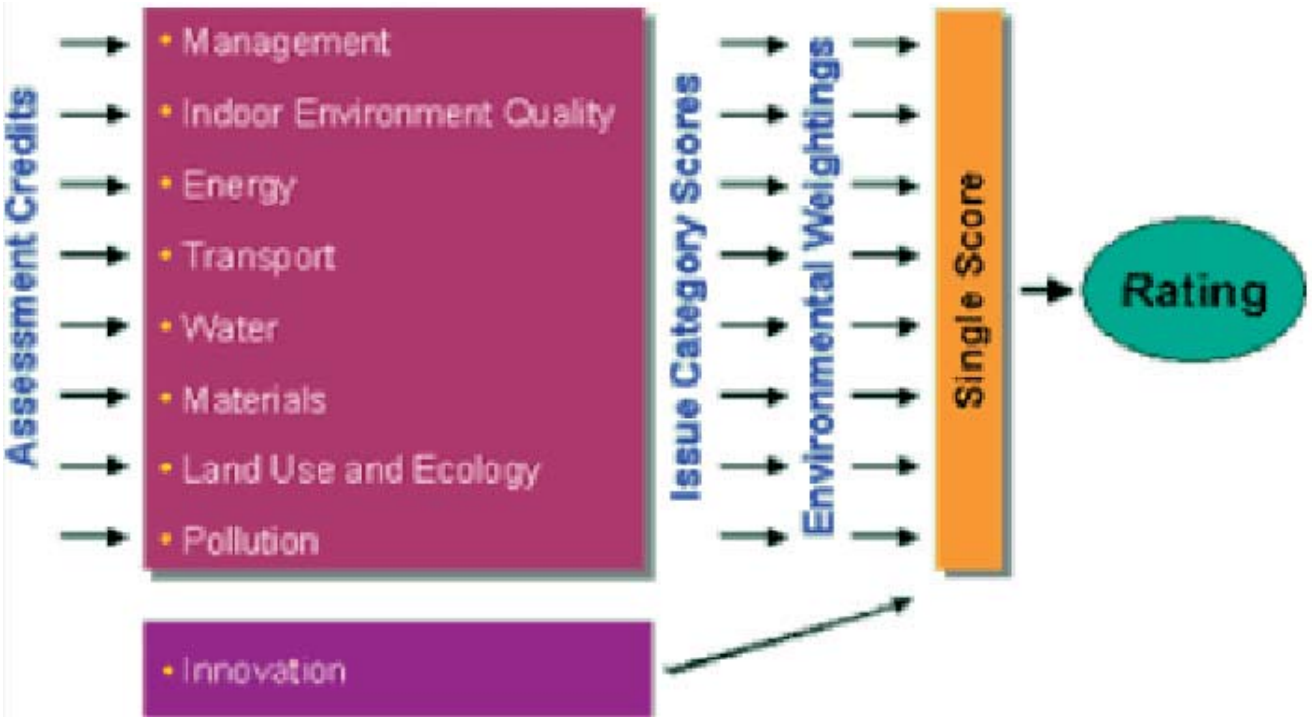


Quelle: *www*.gbca.*org.au,* Presentation of Claudia Ninas, Conny Nitsche

**Green Star**

Australia, New Zealand, South Africa

The nine categories, which are considered:






Quelle: *www.gbca.org.au,* Presentation of Claudia Ninas, Conny Nitsche

**Green Star**

Australia, New Zealand, South Africa

These categories are divided into credits, each of which addresses an initiative that improves or has the potential to improve environmental performance. Points are given for actions that demonstrate that the project has met the overall Objectives. The percentage score is calculated and then the Green Star environmental weighting factors are applied.

**Green Star Certified Ratings:**

4 Star Green Star (score 45-59) ‚**Best Practice‘**
5 Star Green Star (score 60-74) **‚Australian Excellence‘**
6 Star Green Star (score 75-100) **‚World Leadership‘**

**Only buildings that achieve a rating of Four, Five or Six Stars will be certified.**



Quelle: *www*.gbca.*org.au,* Presentation of Claudia Ninas, Conny Nitsche

**Green Star**
Example **8 Brindabella Circuit, Brindabella Business Park**
**Canberra International Airport, ACT**

First building in Australia to achieve a 5 star“Australian Excellence” Green Star-Offi ce Designrating



# Green Building

Quelle: Presentation of Claudia Ninas, Conny Nitsche

**Green Star**
Example **8 Brindabella Circuit, Brindabella Business Park**
**Canberra International Airport, ACT**

**Management**
- 80% of waste to be recycled
- All key decision makers undertaken Green Building Council training and 2 Green Star Professionals supervised design
- Independent commissioning agent will ensure optimum building performance

**Indoor Environmental Quality**
- 100% outside air, exceeding Australian Standard by 185%
- High frequency digital fluorescent lighting, reducing flicker
- Thermal modeling to ensure minimal temperature fluctuations
- External shading
- 75% of office space within 8m of external windows



Quelle: Presentation of Claudia Ninas, Conny Nitsche

**Green Star**
Example **8 Brindabella Circuit, Brindabella Business Park**
**Canberra International Airport, ACT**

**Energy**
- Energy savings exceeding 4.5 Star ABGR model requirements
- CO2 savings equivalent to removing 130 cars permanently off the road
- Shared plant with 40,000m² of other offi ce buildings, giving economies of scale, better shoulder loadings and greater redundancy
- T5 light fi ttings with automatic perimeter light sensing
- Solar hot water, using solar for 70% of energy
- Double glazed green tinted windows

**Transport**
- Secure bicycle facilities, showers and gym
- Provision of small car parking spaces



Quelle: Presentation of Claudia Ninas, Conny Nitsche

**Green Star**
Example **8 Brindabella Circuit, Brindabella Business Park**
**Canberra International Airport, ACT**

**Water**
- 43% reduction in water consumption
- Waterless urinals
- 3/6 Dual flush toilets
- Subsoil irrigation and electronic moisture detection
- Water efficient cooling towers

**Materials**
- 100% recycled steel, including ‘rejuvenated’ steel
- 100% recycled or sustainable timber
- 30% recycled cement
- 62% less PVC, replaced with HDPE
- 100% recycled glass used for fill



Quelle: Presentation of Claudia Ninas, Conny Nitsche

**Green Star**
Example **8 Brindabella Circuit, Brindabella Business Park**
**Canberra International Airport, ACT**

**Emissions**
- All refrigerants will have Ozone Depleting Potential (ODP) of zero
- Efficient fittings will reduce water to sewer flows
- All thermal insulants will contain substances with zero ODP
- No upward light dispersement Energy
- Energy savings exceeding 4.5 Star ABGR model requirements
- CO2 savings equivalent to removing 130 cars perma-nently off the road
- Shared plant with 40,000m² of other office buildings, giving economies of scale, better shoulder loadings and greater redundancy
- T5 light fittings with automatic perimeter light sensing
- Solar hot water, using solar for 70% of energy
- Double glazed green tinted windows

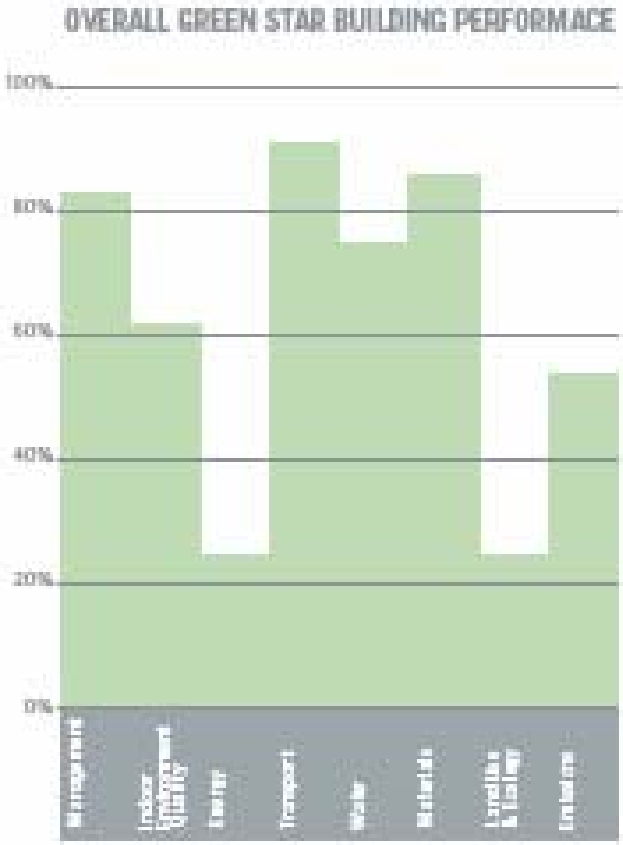


Quelle: Presentation of Claudia Ninas, Conny Nitsche

**Green Star**
Example **8 Brindabella Circuit, Brindabella Business Park**
**Canberra International Airport, ACT**

**Land Use and Ecology**
- Topsoil and fill contained entirely within the site

**Innovation**
- Small air-conditioning zones
- In slab hydronic cooling
- Tenant lighting connections to BMS
- Perimeter light dimming
- Re-usable carpet






Quelle: Presentation of Claudia Ninas, Conny Nitsche

**Green Star**
Example **Telecom Tower, Albert street, Auckland, New Zeland**

Green Star NZ was launched in July 2005 and became a member of the World Green Building Council in 2006. Green Star NZ was created fromthe Australian system for New Zealand



Quelle: Presentation of Sasha Hendry, Abbey Bower

**Green Star**
Example **Telecom Tower, Albert street, Auckland, New Zeland**

**MANAGMENT**

• Commissioning agent: an independent commissioning agent was appointed to oversee the critical commissioning phase of the installation to ensure maximum efficiencies were realized and control systems function as designed.
• Building tuning at 3 month intervals
• Construction and demolition waste was recycled


**INDOOR ENVIRONMENT**

• P rovision of fresh air at rates at 50% above those required by the building code
• A tenant exhaust riser has been provided serving all floors



Quelle: Presentation of Sasha Hendry, Abbey Bower

**Green Star**
Example **Telecom Tower, Albert street, Auckland, New Zeland**

**ENERGY**
- Efficient light sources such as T5 tri-phosphor fluorescent lamps
- Lighting for lift lobbies are controlled via a combination of programmable time clocks and occupancy sensors

**TRANSPORT**
- The location of the building has ensured that maximum public transport points were gained

**WATER**
- Heat recovery hot water generation for base building amenities
- Low flow water fixtures and fi ttings to reduce overall water consumption
- Local instantaneous hot water generation for tenancy requirements ….
- Rain water harvesting for toilet flushing



Quelle: Presentation of Sasha Hendry, Abbey Bower

**Green Star**

Example **Telecom Tower, Albert street, Auckland, New Zeland**

## MATERIALS

- Re-use of an existing building façade and structure which has breathed new life into an existing building
- Use of high performance glass in the new level

4 lobby atrium

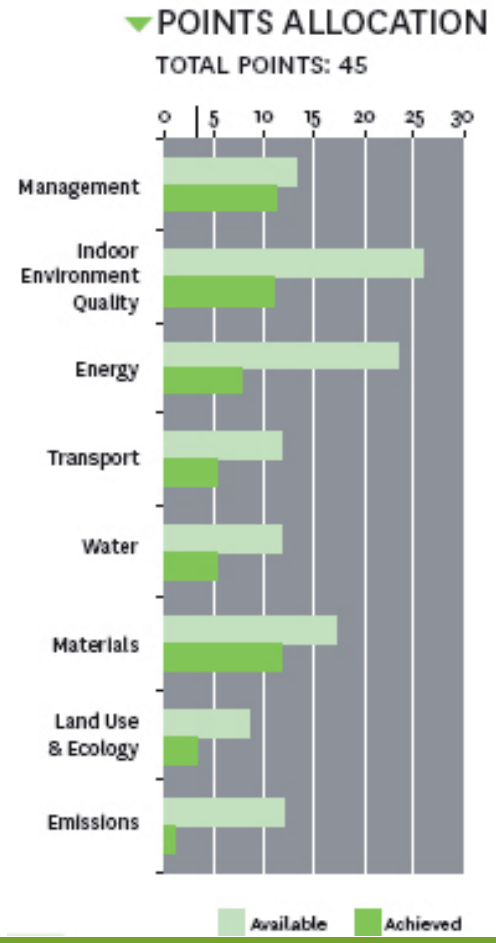
- Use of low formaldehyde materials in joinery

## LAND USE & ECOLOGY

- 92 Albert Street re-used existing land
- There was zero cut and fill on site

## EMISSIONS

- Light pollution was reduced to zero from the previous lighting installation.






Quelle: Presentation of Sasha Hendry, Abbey Bower

**LEED**
GBC United States

The U.S. Green Building Council (USGBC) is the nation's foremost coalition of leaders from every sector of the building industry working to promote buildings that are environmentally responsible, profitable and healthy places to live and work. Its core purpose is 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 quality of life.
**The USGBC are responsible for The Leadership in Energy and Environmental Design (LEED) Green Building Rating System**. LEED is The nationally accepted benchmark for the design, construction and operation of high performance green buildings. LEED gives building owners and operators the tools they need to have an immediate and measurable Impact on their buildings' performance.

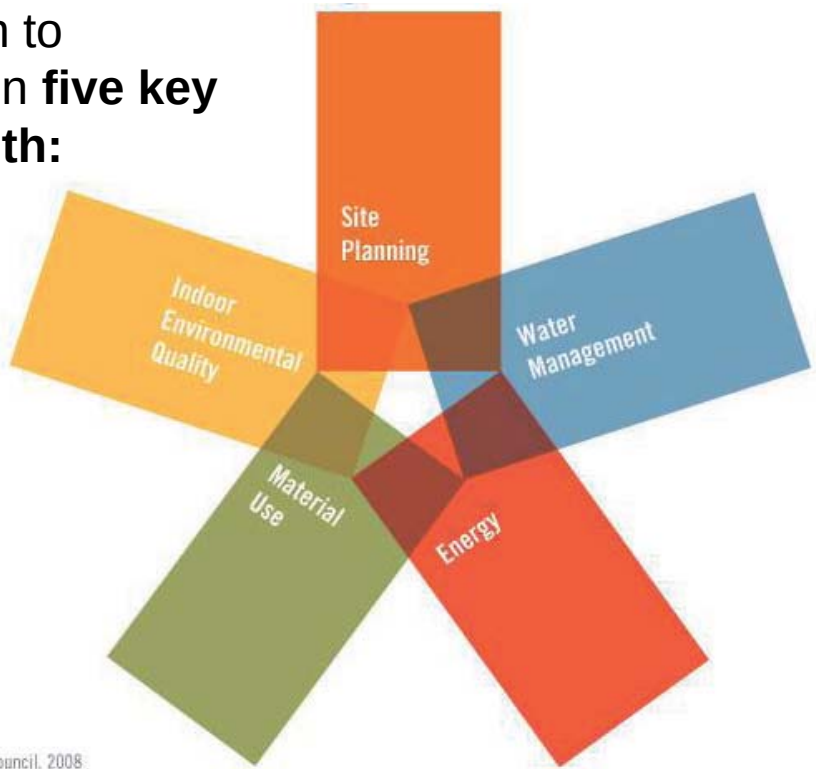


Quelle: http://www.ukgbc.org/site/worldgbc

**LEED**
United States, Canada, India

LEED – Leadership in Energy and Environmental Design

LEED promotes a whole-building approach to sustainability by recognizing performance in **five key areas of human and environmental health:**



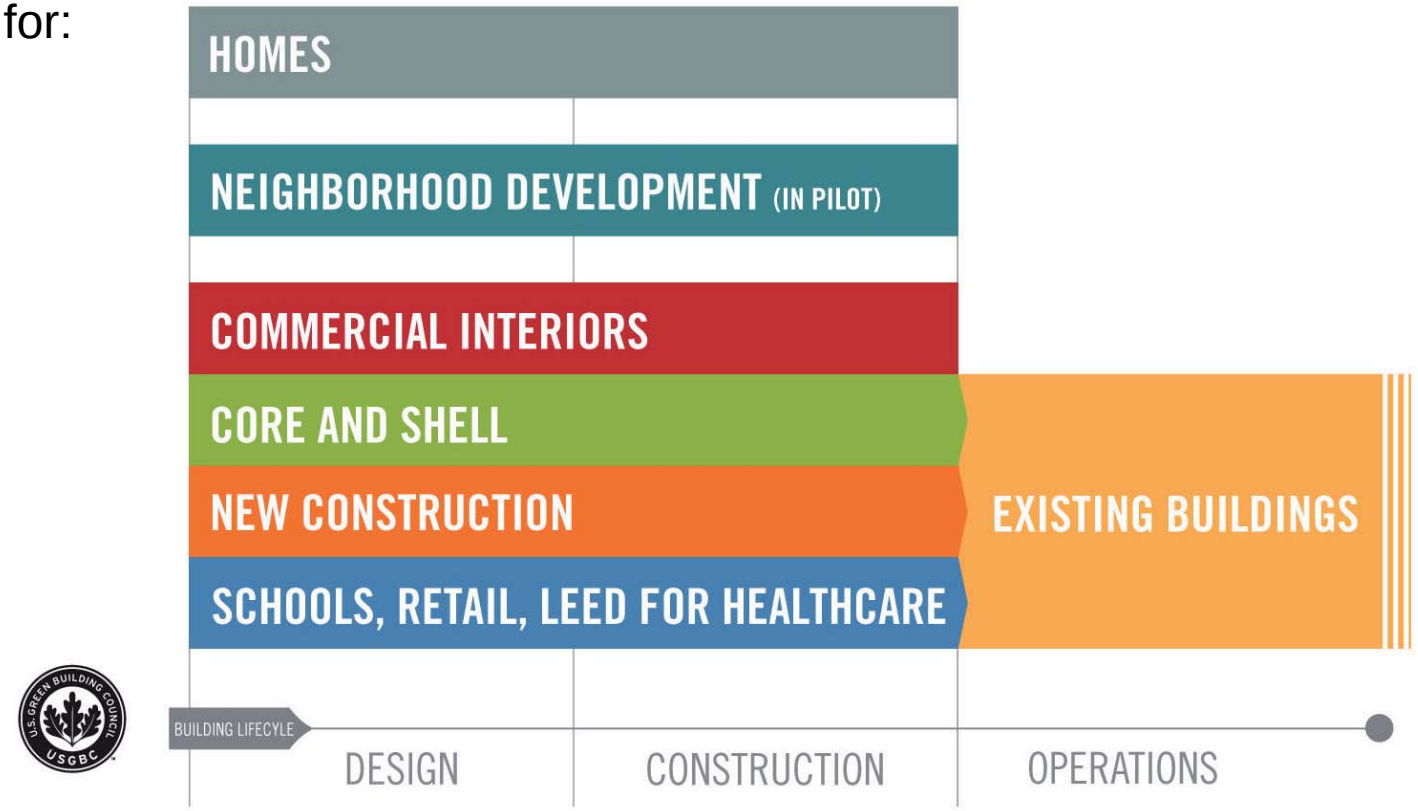

**sustainable site development,**
**water savings,**
**energy efficiency,**
**Materials selection and**
**indoor environmental quality.**



Quelle: Presentation of Sabrina Lampe, Sabrina Penning

**LEED**
United States, Canada, India

Developed for:






Quelle: Presentation of Sabrina Lampe, Sabrina Penning

**LEED**
United States, Canada, India

**LEED rating system**

LEED-points could be award to the following criteria:

| | |
|---|---|
| 14 points | Sustainable site development |
| 5 points | Water efficiency |
| 17 points | Energy and atmosphere |
| 13 points | Material and resources |
| 15 points | Indoor Environmental Quality |
| 5 points | Innovation in Design Process |

| | |
|---|---|
| **Platinum** | 52 – 69 |
| **Gold** | 39 – 51 |
| **Silver** | 33 – 38 |
| **Bronze** | 26 – 33 |

All certified projects receive a LEED plaque




Quelle: Presentation of Sabrina Lampe, Sabrina Penning

**LEED**
United States, Canada, India

LEED rating system use:




Quelle: Presentation of Sabrina Lampe, Sabrina Penning

**LEED**
Example **Sidwell Friends Middle School, Washington, D.C., United States**

Level: **Platinum** (57* points)
(first school in the U.S.)

Sustainable Sites 11/14
Water Efficiency **5/5**
Energy & Atmosphere 13/17
Materials & Resources 8/13
Indoor Environmental Quality **15/15**
Innovation & Design **5/5**

54% _ new construction (39.000 sq.f.)
46% _ existing building (33.500 sq.f.)
(renovation of a 1950 building, last renovated in 1971)



Quelle: Presentation of Sabrina Lampe, Sabrina Penning

**LEED**

Example **Sidwell Friends Middle School, Washington, D.C., United States**

Green Features:

- Green roof
- Constructed wetland to treat wastewater
- Site takes advantage of passive solar design
- Daylighting strategies
- High-efficiency electric lighting, photosen-sors and occupancy sensors
- Solar-ventilation chimneys, operable win dows and ceiling fans
- Photovoltaic array
- Reclaimed materials, including exterior cladding (western red cedar, reclaimed from wine casks), the stone used for landscaping
- Recycled, rapidly renewable and locally produced materials, including cork, gypsum, bamboo and wheatherboard substrate
- Low -VOC materials

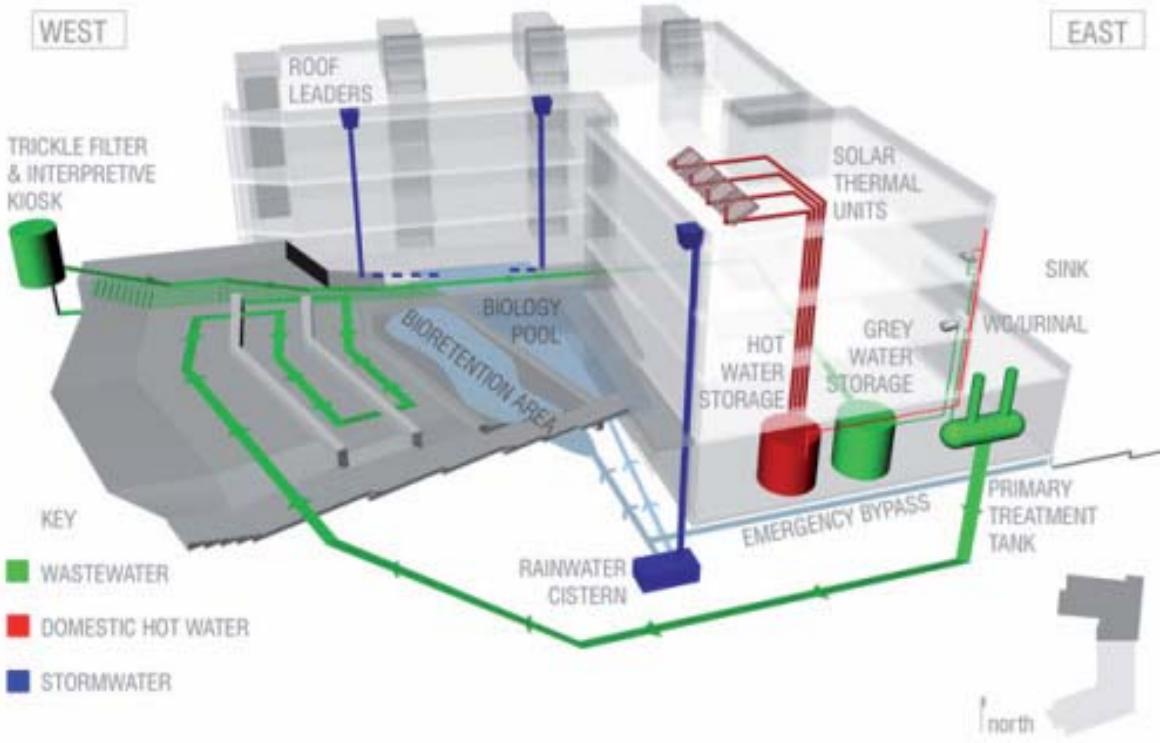


Quelle: Presentation of Sabrina Lampe, Sabrina Penning

**LEED**

Example **Sidwell Friends Middle School, Washington, D.C., United States**

This schematic describes the building‘s wastewater, stormwater, and domestic hot water systems.





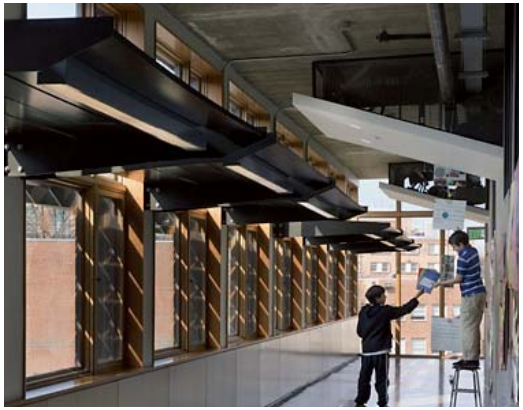

Quelle: Presentation of Sabrina Lampe, Sabrina Penning

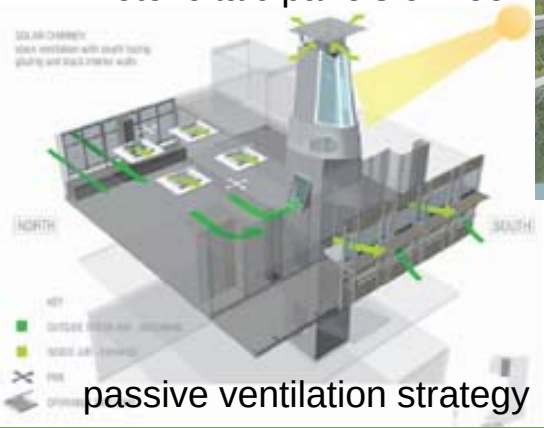
**LEED**

Example **Sidwell Friends Middle School, Washington, D.C., United States**

Science wing corridor and light shelves

Photovoltaic panels on roof



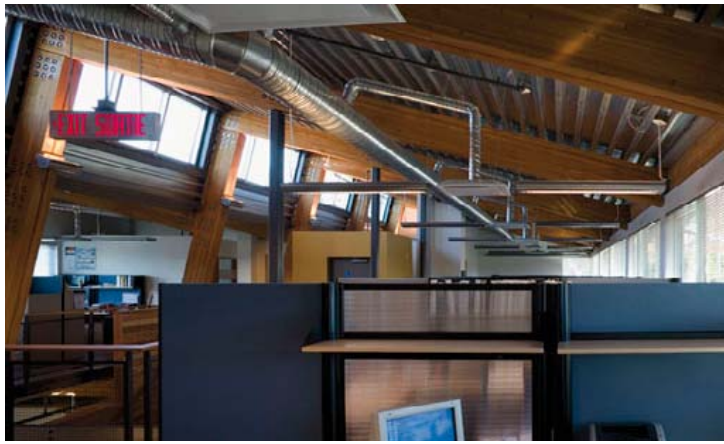
passive ventilation strategy

## Green Building

Quelle: Presentation of Sabrina Lampe, Sabrina Penning

**LEED**
Example **Gulf Islands, National Park Reserve, Canada**

The Gulf Islands Operations Centre is the first LEED® **Platinum** certified building (56 points) in Canada and received a **2007 Award of Excellence in Green Building Design from the Royal Architectural Institute of Canada**.



# Green Building

Quelle: Presentation of Stefan Juerß, Fabian Ußler

**LEED**
Example **Gulf Islands, National Park Reserve, Canada**

**Structure:**
Hybrid construction (concrete, steel, wood), Basement is reinforced concrete, Exterior walls are a combination of steel, columns and woodframed walls, Walls serve as retaining walls on three sides.

**Sustainable Sites:**
Strict erosion and sedimentation control measures during the construction, Facility is located near public transit, Bicycle racks and showers were provided for staff use, Use alternative fuel technologies for their fl eet vehicles, Original house on the property has been preserved, Lawn and ornamental gardens were retained, Rainwater is collected from the roof and, stored Contaminated material was removed in accordance with Federal standards, Exterior lighting was designed to limit the amount of light crossing property lines



Quelle: Presentation of Stefan Juerß, Fabian Ußler

**LEED**
Example **Gulf Islands, National Park Reserve, Canada**

**Water Effi ciency:**
New planting is drought-resistant, Rainwater used for for ushing toilets and as equipment wash water, 30,000 litre underground storage tank, 108,000 litres of water will be collected and used annually, Potable Water was reduced by over 60%

**Energy & Atmosphere:**
Energy consumption was reduced by 75%, Heat exchanger: Ocean water is used for the heating system, Energy- effi cient fl uorescent lamps were used, Photo-sensors to adjust artifi cial lighting levels, Sensors turn off lights when user are not present, Exterior sunshades were installed over south facing windows, Photovoltaic system was installed



Quelle: Presentation of Stefan Juerß, Fabian Ußler

**LEED**
Example **Gulf Islands, National Park Reserve, Canada**

**Materials & Resources:**
85% of construction waste was diverted from land, including wood waste,
More than 20% of the building materials came from local and regional manufacturing:
Concrete walls,
Glulam columns and beams,
Wood framing for walls and partitions,
Western red cedar siding,
Douglas fibr decking

**Recycled Content of Building Materials:**
More than 27% (based on cost) of the building materials were manufactured from recycled materials including:
Fly ash, Steel, Thermal insulation, Millwork panel products, Carpet tile, Aluminum frames, Gypsum wallboard



Quelle: Presentation of Stefan Juerß, Fabian Ußler

**LEED**
Example **Gulf Islands, National Park Reserve, Canada**

**Indoor Environmental Quality:**
Natural Ventilation are controlled by the building control system, Sensors were linked to the ventilation system to reduse the $CO^2$ level, Operable Windows and Daylight, ...



Quelle: Presentation of Stefan Juerß, Fabian Ußler