Green Building & Sustainable Urbanism:

From theory to practice

Innovation in Energy Efficiency and Renewable Energy: Ener2i Training Workshop

Prof Gintaras Stauskis

Vilnius Gediminas Technical University Lithuania

Department of Urban Design

Lithuanian Green Building Council

October 15, 2014

Green Building

Contents:

I. Green building features
II. Bioclimatic design
III. Case study analysis

Appendix – GBC for sustainable development

Green Building History

Urban utopia and overall green approach to the city planning and design

Low-cost timber construction.
N. Milyutin.

Industrial city. T. Garnier

Garden city. E. Howard 1902

Green Urbanism Definition

Green urbanism: *the practice of creating communities mutually beneficial to humans and the environment. M. Cote*

- A

Purmeerend City (The Netherlands)

Deira Island (Dubai UAE)

Green Building Policies

- Use **local** and **natural** materials
- Use **RES**
- Conserve **water**
- Build to **last**
- Recycle, **reuse**
- Grow your **food**
- **Share** facilities
- Think small

Green Building Features

Healthy	Aesthetical	Long lasting
Comfortable	Economical in all life cycle	Energy efficient
Minimal environmental impact		Sustainable urban environment

Green Building Principles

Hammarby Sjostadt district Stockholm, SE

- Mind climate and context
- RES for 0 emissions
- Zero-waste city
- Water, water, water
- Landscape, biodiversity
- Sustainable mobility, good public space
- Local and natural resources
- Compact density, retrofitting existing areas
- Green buildings and districts
- Healthy communities amd mixed use
- Local food and short supply chain
- Identity and sense of place
- Improved urban governance
- Education, research, knowledge
- Individual strategies for cities
- Passive design principles
- Circular vs linear urban metabolism

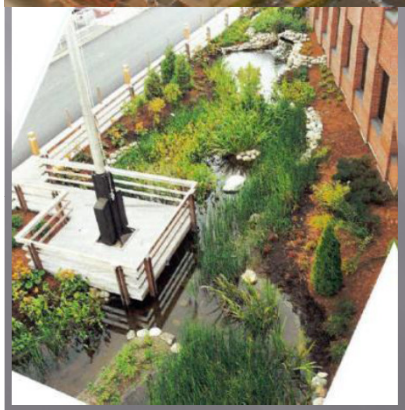
Green Building Practice

Hammarby Sjostadt Stockholm SE

Interdisciplinary approach:

- Urban planning
- Urban design
- Landscape planning
- Landscape design
- Building's design
- Interior's design
- Engineering
- Economy
- Environmental assessment
- Related disciplines

Green Building Cycle



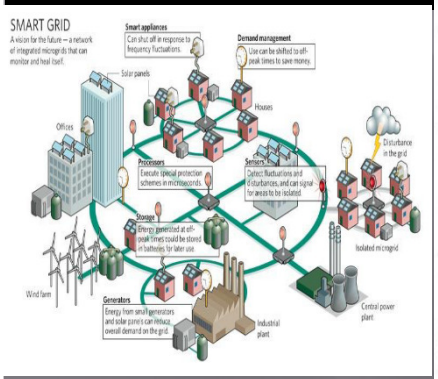
Land use and ecology

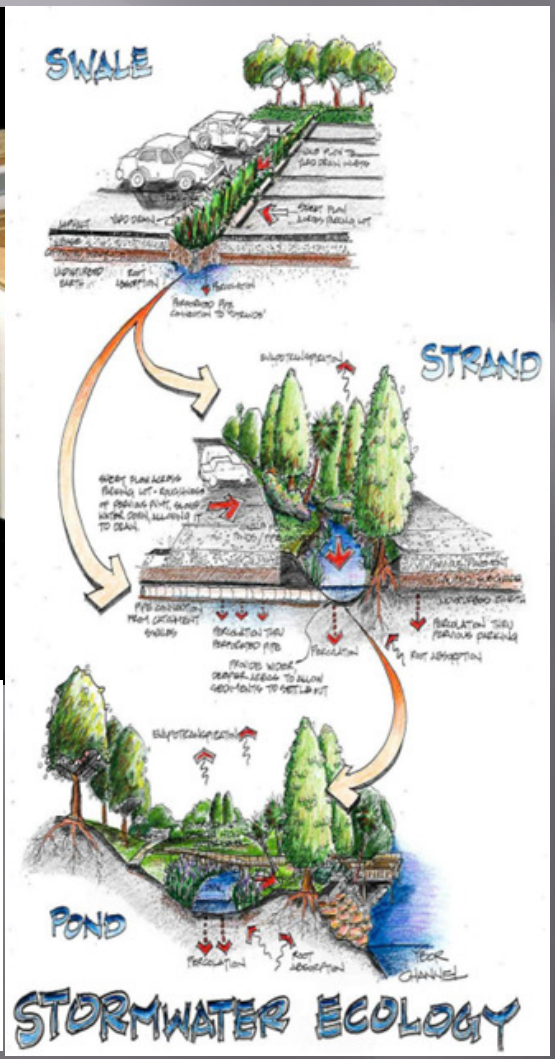
- Land plot for a particular use
- Respect and integrated use of ecological features of the site
- Mitigating ecological impact on environment
- Increasing ecological potential of the site
- Assessing long-term impact on bio-diversity

Mobility systems

- Access to public transport
- Diversity of means of mobility
- Non-motorised mobility infrastructure
- Reduced parking volumes
- Functional mobility routes

Green Building Cycle





Building materials

- Life Cycle Assessment
- Durability of materials
- Hard pavements
- Supply of materials
- Energy conservation

Energy conservation

- Monitoring energy use
- Efficient lighting
- „Zero - Carbon“ technologies
- Energy-efficient mobility system

Sustainable water management

- Efficient model solutions for water management.

Green Building Cycle

Health, wellbeing and life quality

- Visual comfort
- Air quality
- Thermal comfort
- Water quality
- Acoustic comfort
- Safety and security

Pollution

- Protection from external pollution
- Utilisation of rain and storm water
- Reducing night lights
- Prevention of noise pollution

Green Building Cycle

Waste

•Reducing construction waste
•Reducing running waste

Process management

•Participatory planning
•Planing for LCA

Innovations

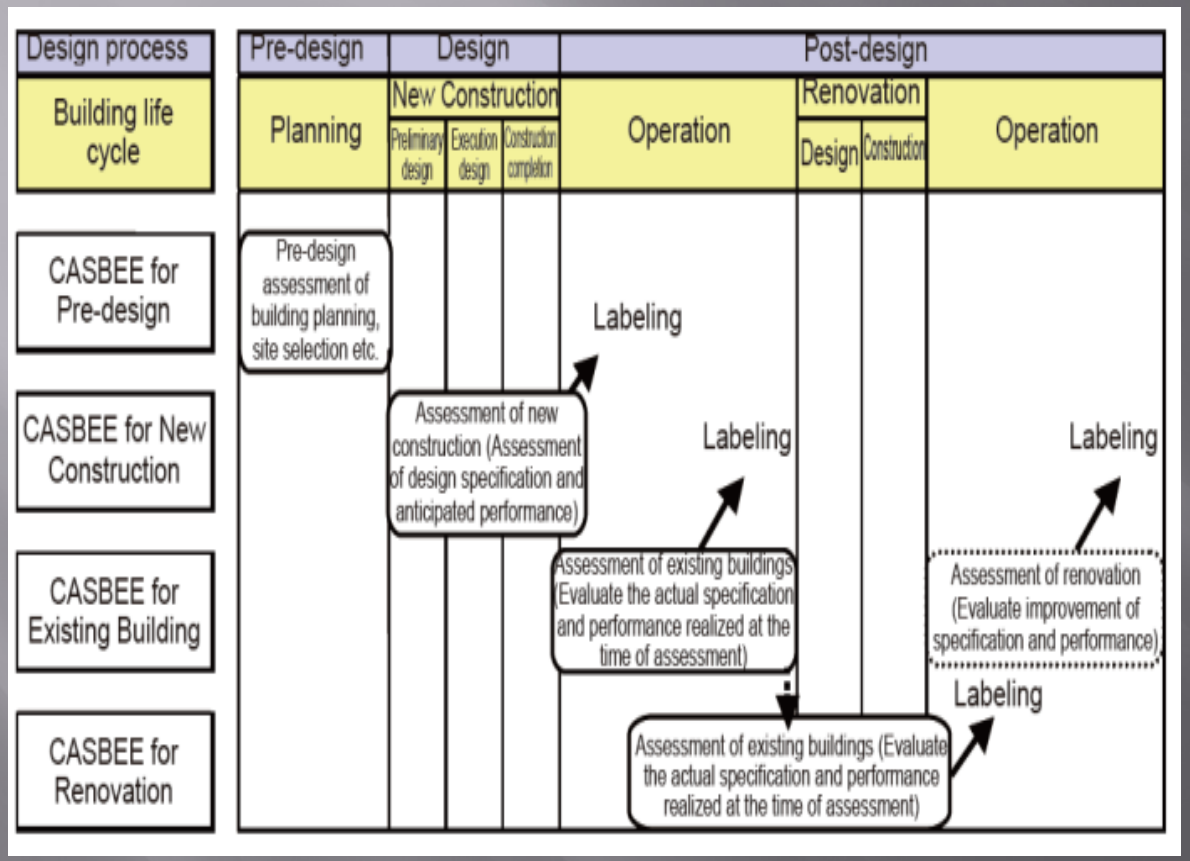
•Integrated application of innovative solutions in all fields

Economy

• Life cycle costing
• Value sustainability

Green Building Cycle

Green Building Management



CASBEE Japan 2010

Phases of quality assessment:

- Pre-design
- Project design
- Post-design

Green Building and Sustainability Assessment Schemes

- BREEAM UK
- LEED US
- DGNB DE
- Green Mark SG
- CASBEE JP
- NGBAS LT

Expert evaluation of sustainability criteria for higher than minimal requirements for buildings and urban areas

Voluntary quality assessment system used by business leaders for more competitive practice

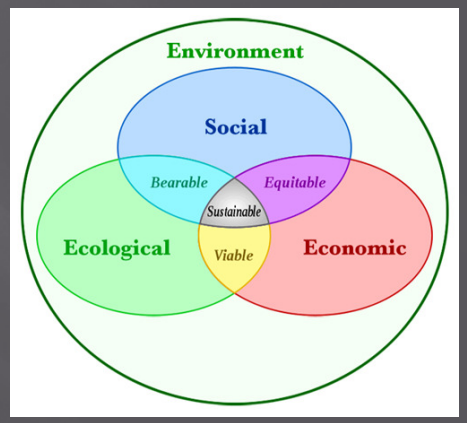
I. Questions are welcome!

II. Bio-Climatic Design

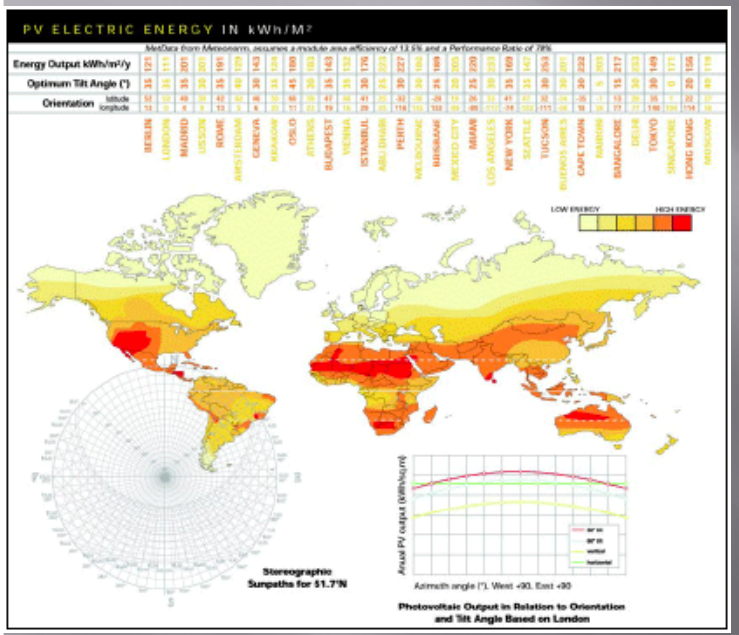
The process of reconnection to the local climate and natural environment, during the planning of a site and design of buildings is called **Bioclimatic Design in Architecture.**

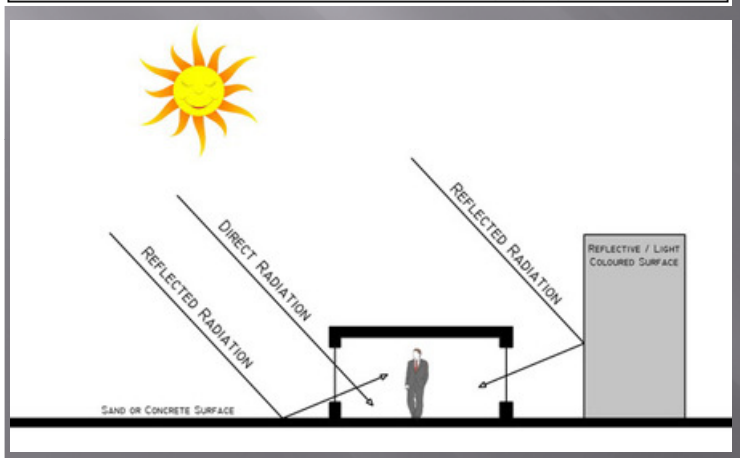
The goal is to design environment and buildings that are:

- Energy efficient
- Create less pollution
- Use sustainable materials
- Have better relation to the environment
- Provide organic architectural composition



❖ Solar radiation control





Goals:

A. **Protection from direct heat radiation**

B. **Avoid both increase in air and mean radiant temperature**

Instruments:

Orientation of buildings N-S-E-W

- Axis of building parallel to east-west direction

Environmental Protection

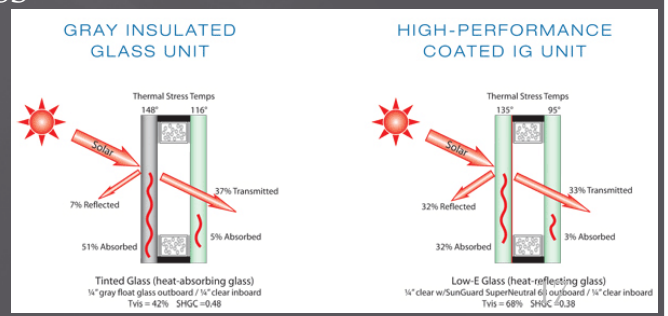
- Use of landscape and vegetation

Window Protection

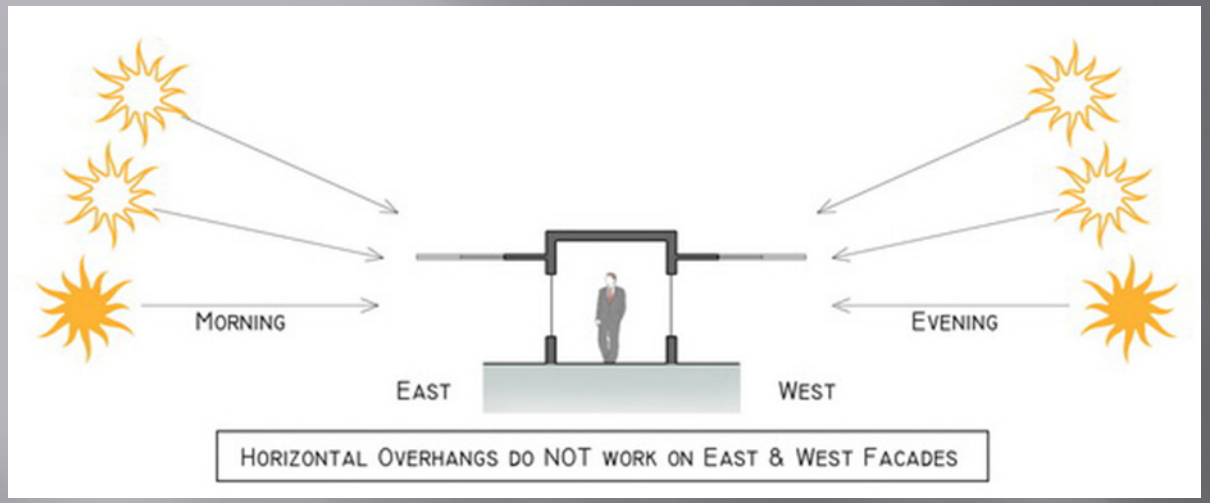
- movable devices (interior or exterior) such as blinds and louvers.
- Permanent ones- overhangs, fins and awnings
- Strategic plantation

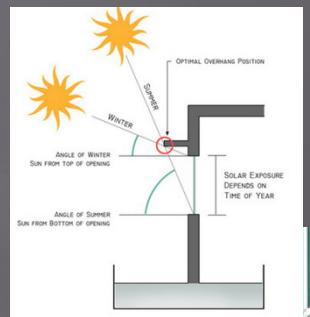
Special glazing types

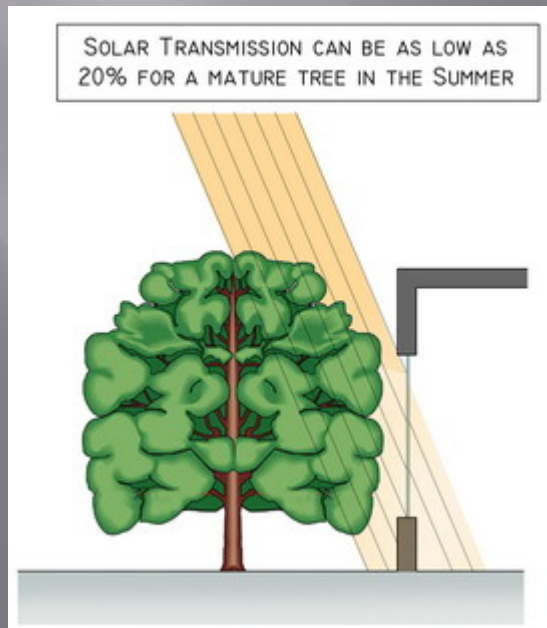
- Reflecting glass
- Absorbing glass
- Optical glass

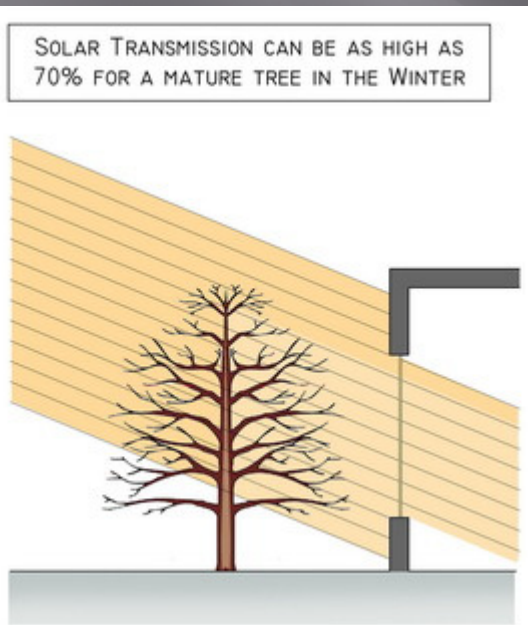


Solar radiation Cases





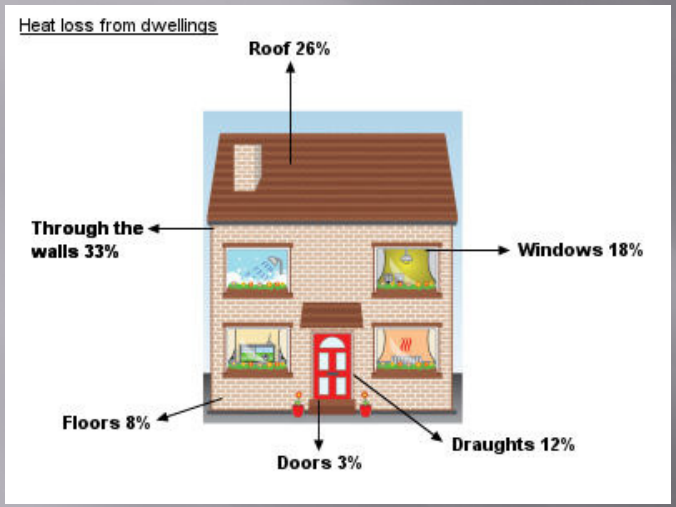




Solar geometry works for us because the sun is naturally HIGH in the summer, making it easy to block the sun with shading devices.

And it is naturally LOW in Winter, allowing the sun to penetrate below our shading devices and enter the building - with FREE heat.

❖ Heating – cooling control

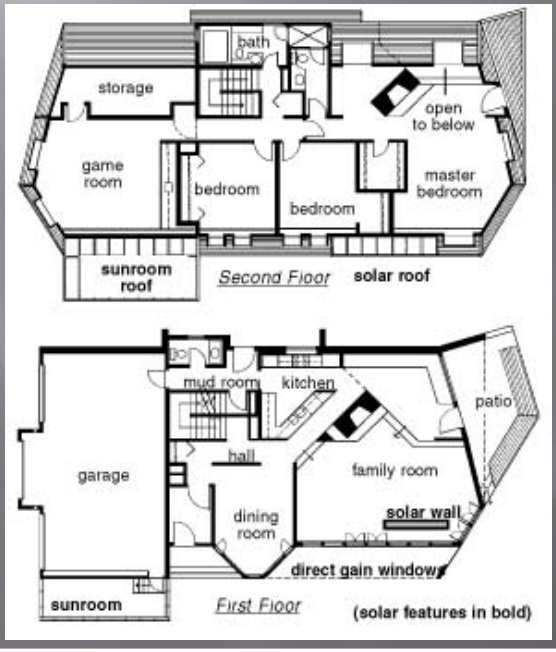


Reduction of infiltration loss

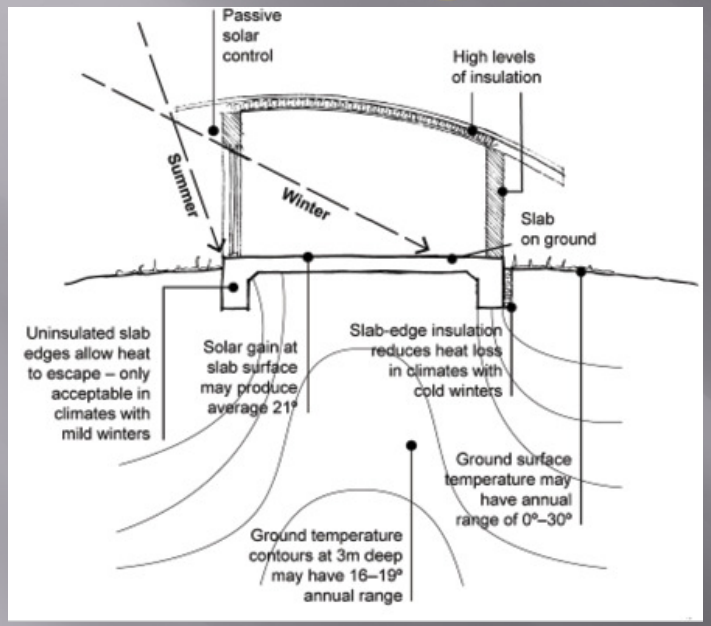
- Avoid heat exchange between exterior and interior.
- Avoid humidity entry in the building

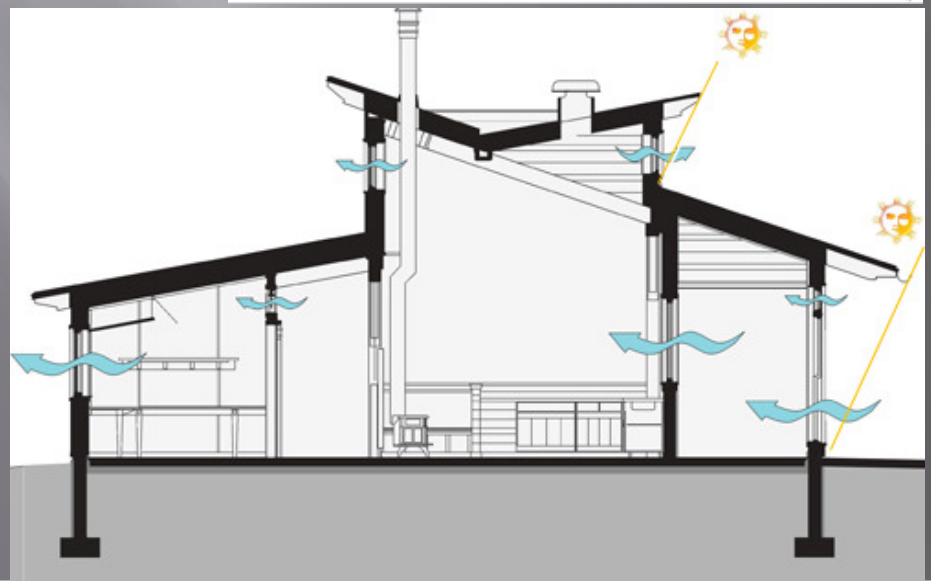
Reduction of transmission loss

- External surfaces - reduce reflection
- Optimal insulation of external shell
- Higher thermal inertia - increase the inward heat flow



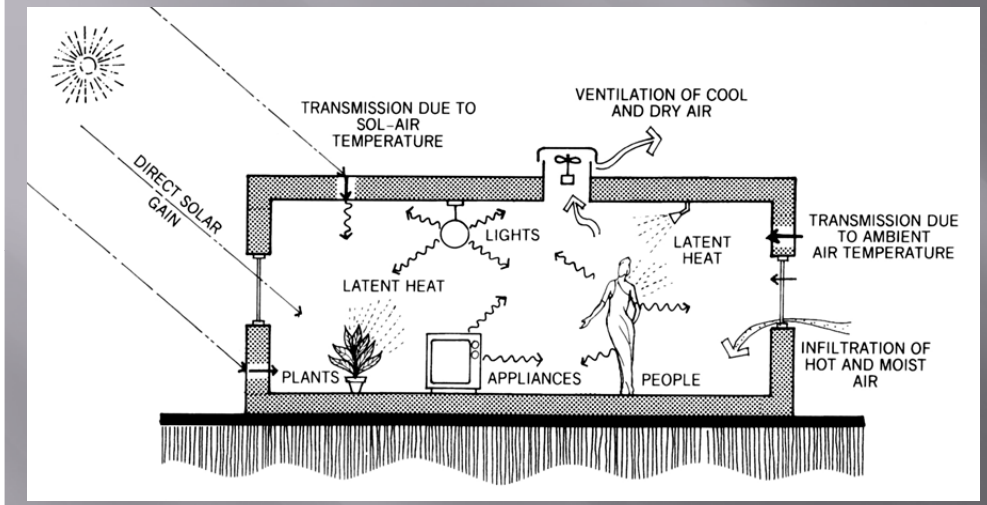
Heating–cooling control





- Reduced infiltration losses
- Reduced transmission losses

Managing internal gains



Reducing lighting gains

- Maximal use of daylight
- Reduce energy consumption for lighting

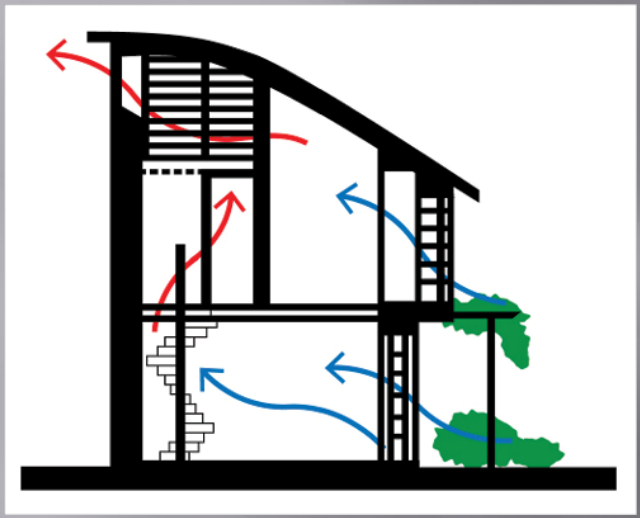
Manage casual gains

- Maximise occupancy level
- Minimise the gains from appliances – use energy efficient equipment.

Providing natural ventilation

- **Physiological features of cooling**
  - Control air movement velocity
  - Avoid draughts
- **Apply natural ventilation**
- **Air cooling**
- **Envelop cooling**

Providing natural ventilation



Apply natural ventilation

- Improve indoor air quality (eliminate stale air)
- Achieve body comfort - balance of convection and perspiration

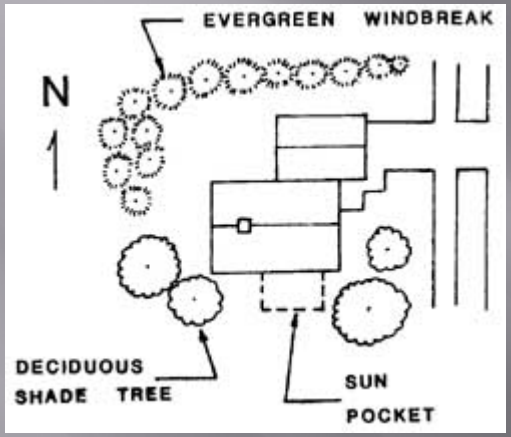
Air cooling

- Use of evaporating cooling (water basins)
- Circulating air through underground ducts (raised floor system)

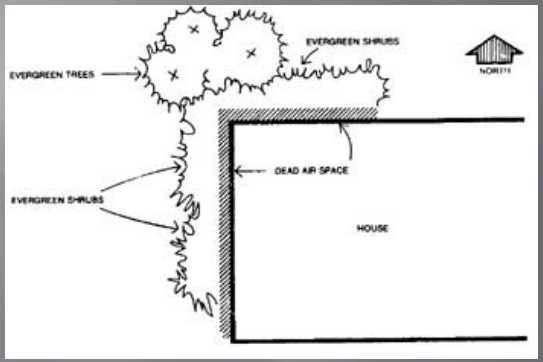
Envelop cooling

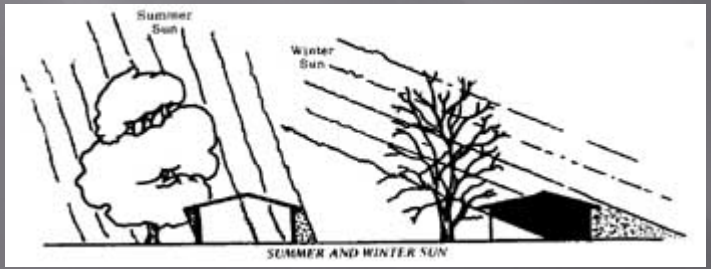
- Discharging heat accumulated inside the building
- Night ventilation: cooling through radiation heat transfer
- Cross ventilation

Landscape Planning for Bioclimatic Design

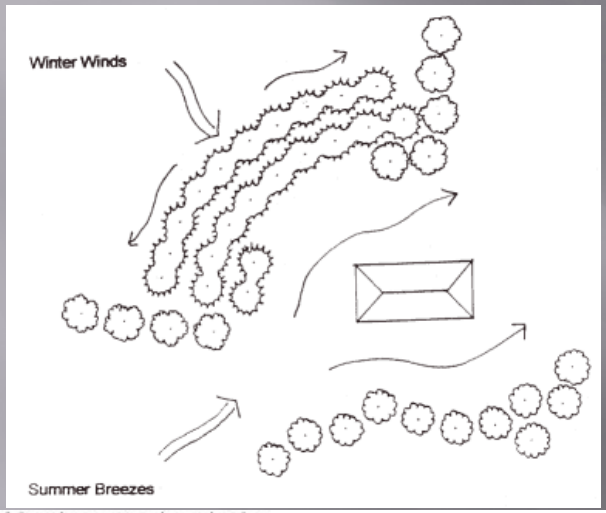


- Proper landscaping can modify the climate around your home and reduce both heat gain in summer and heat loss in winter.
- Properly placed plants reduce wind velocity near the home.



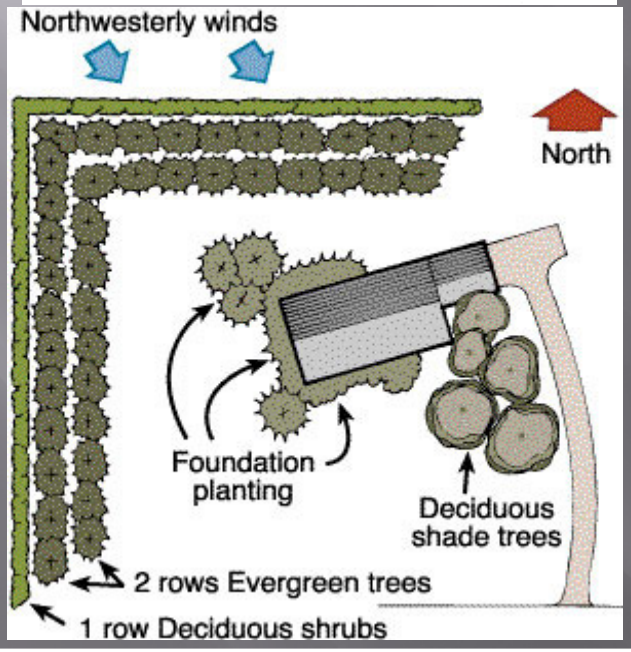


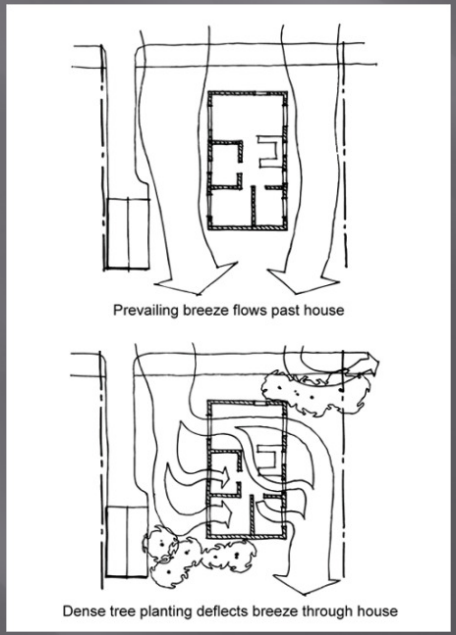
Landscape Architecture for Bioclimatic Design



- The goal of energy-conserving landscaping is to regulate energy flows from the sun and wind.
- Windbreaks can save up to 25 percent on heating costs

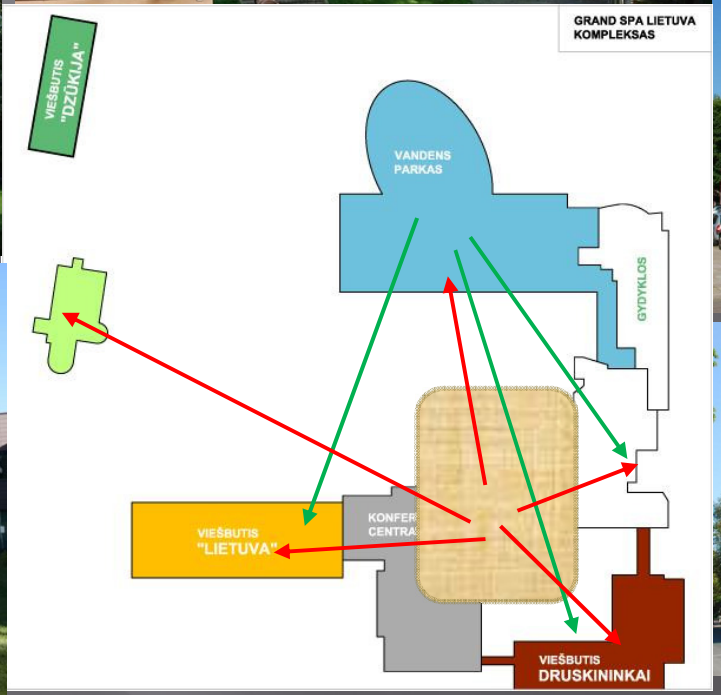
II. Questions are welcome!



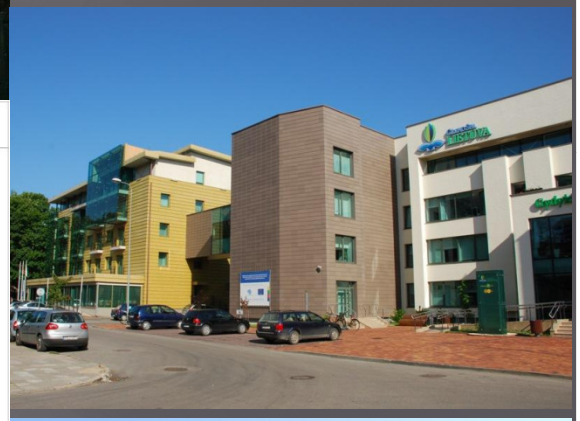


III. Case Studies: Grand Spa Lietuva Hotel Conference LT

Druskininkai City
Lithuania, 2009



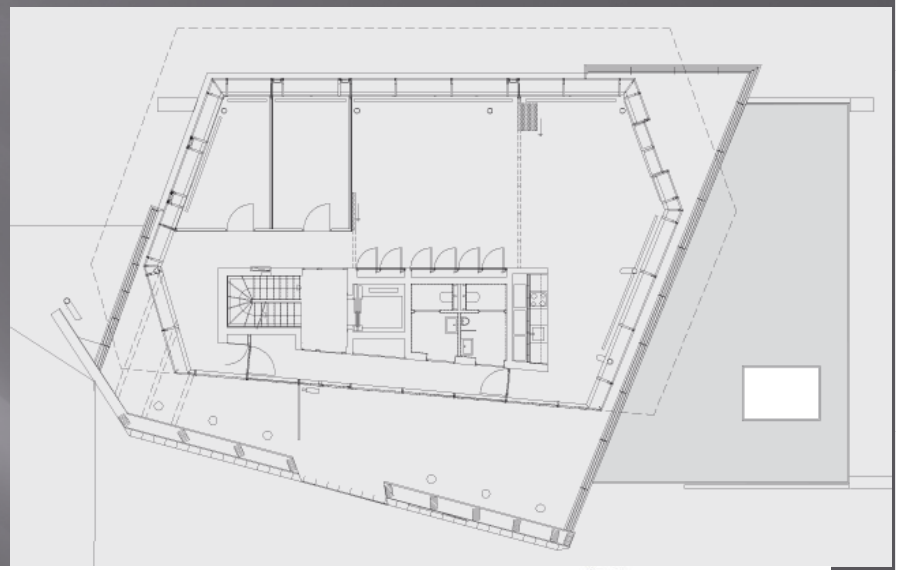
- Geothermal heating
- Dual-flow heat exchanger
- PE 74 kWh/m2/pa
- ROI 7 years.

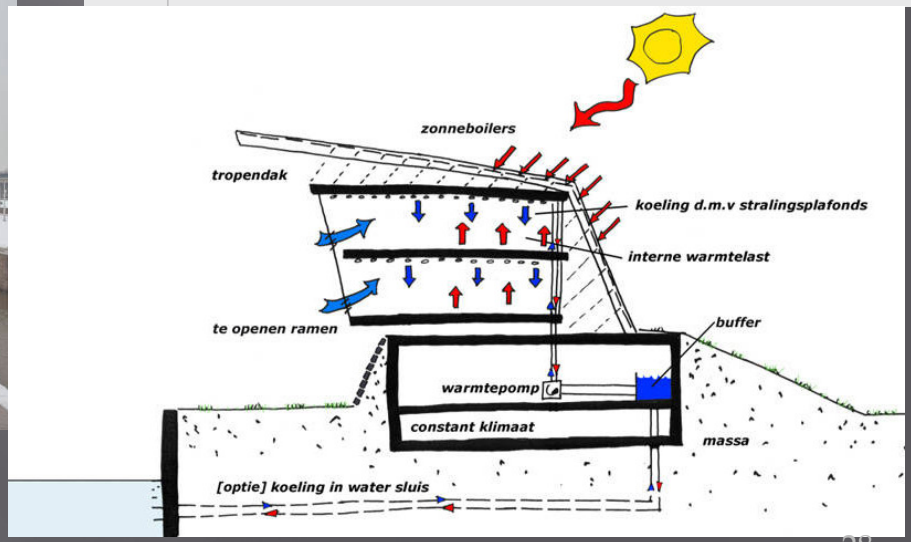


www.construction21.lt Engineering: Tenko Baltic JSC http://www.tenko.lt

Water Management Office NL

Water Management Office NL



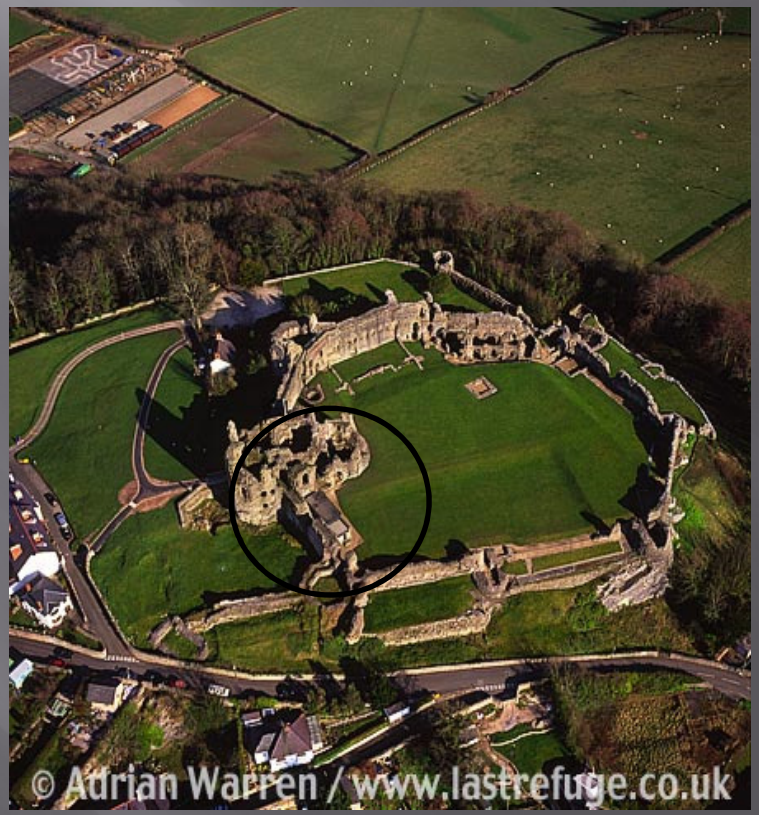


www.dp6.nl

Denbigh Castle Visitor Reception Building

http://www.grosvenorconstruction.co.uk/2012/04/26/denbigh-castle-visitor-centre/

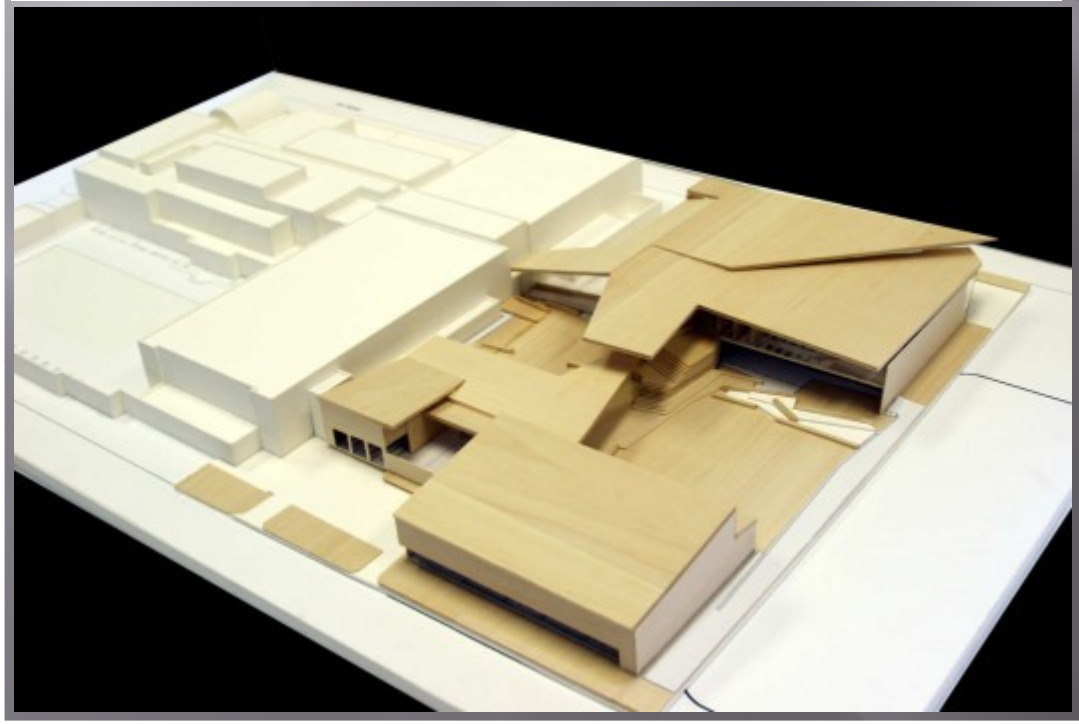
Gross Floor Area – 79.5m²
Total Area of the Site – 0.033 hectares
% Area of Building to be used by Community – Approximately 67% for small out ofhours meetings
% Area of Grounds to be used by Community – 100% when required
Location: Wales UK



The University of Arizona student recreation centre - LEED platinum

http://uanews.org/node/33766
http://www.archdaily.com/94852/university-of-arizona-student-recreation-center-expansion-sasaki/

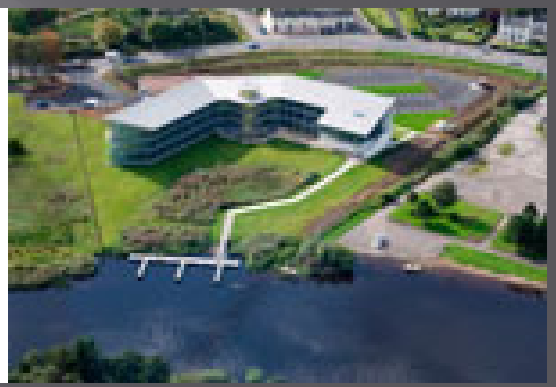
Architects: **Sasaki**
Location: **Tucson, Arizona, USA**
Cost: **$22.7 million**
Project area: **54,000 sq. ft.**
Project year: **2010**

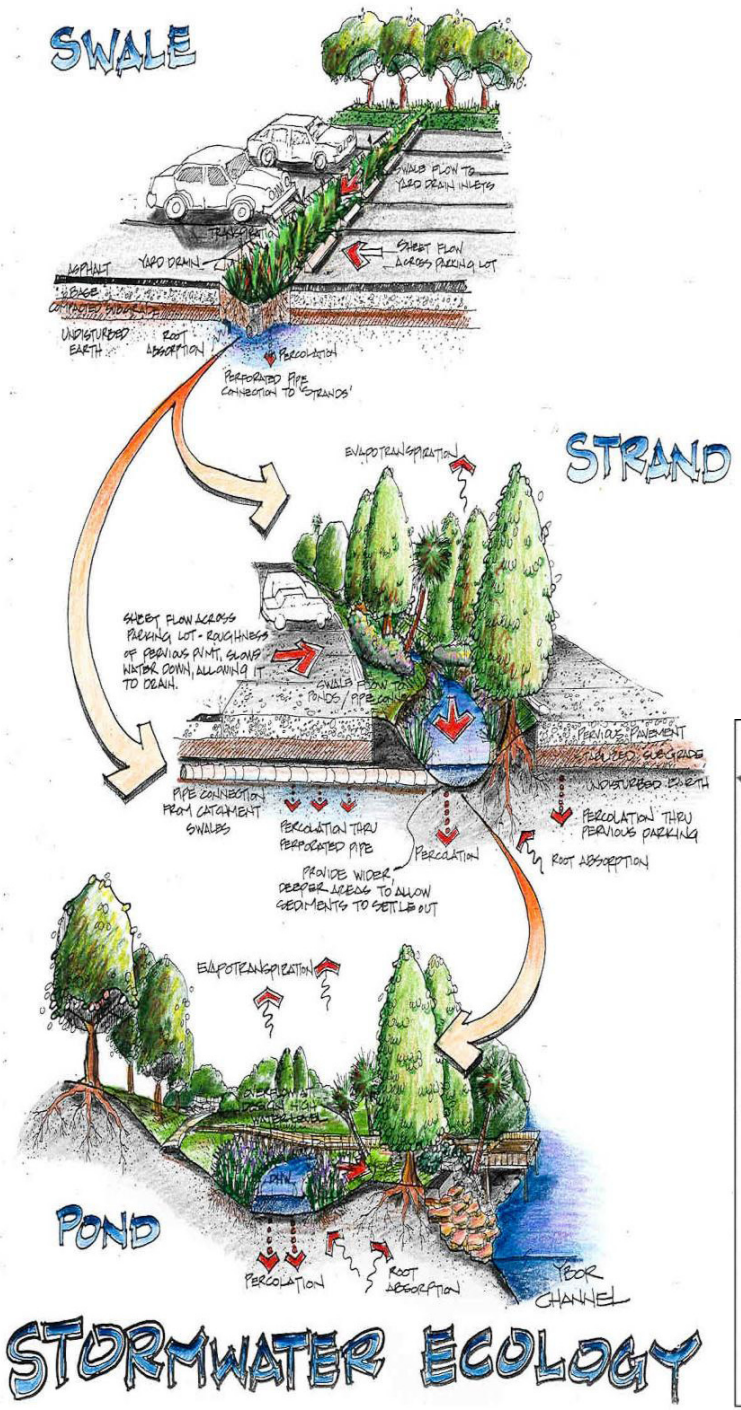


Deep roof overhangs shield the courtyard and windows from direct sunlight.

Waterways Ireland, Enniskillen, Northern Ireland

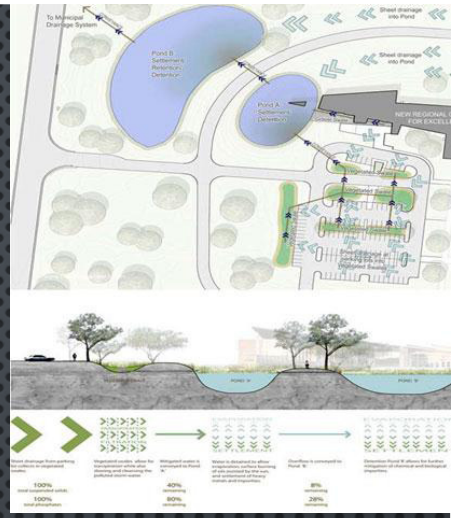
http://www.breeam.org/page.jsp?id=330

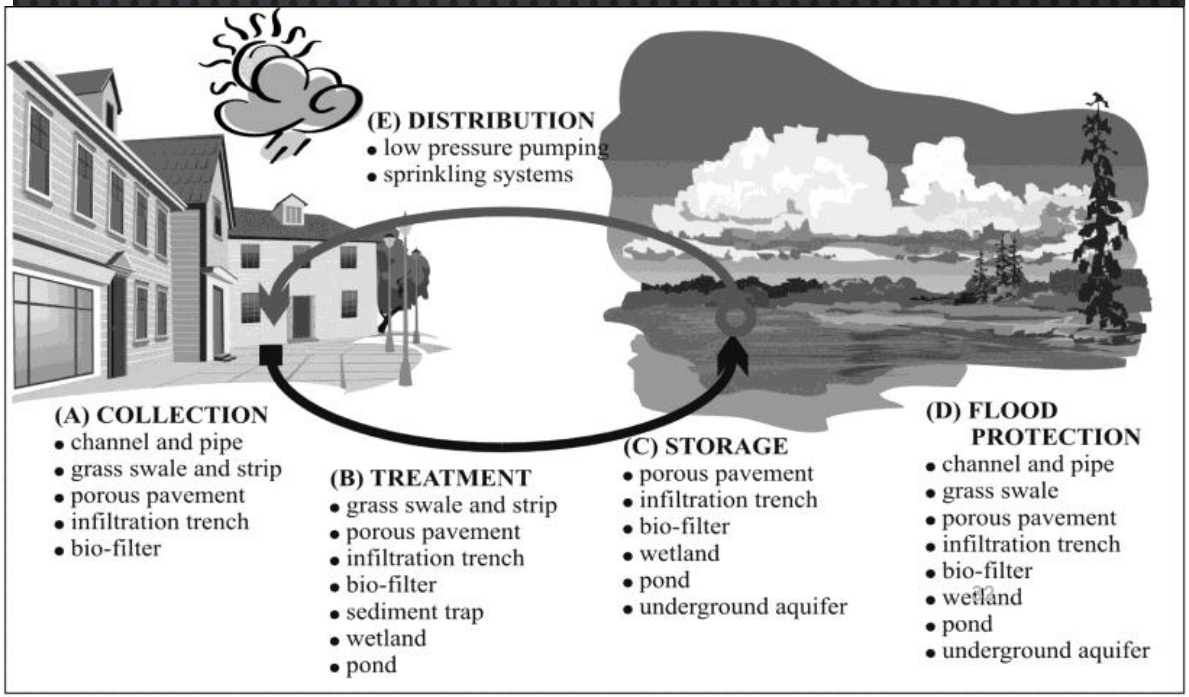




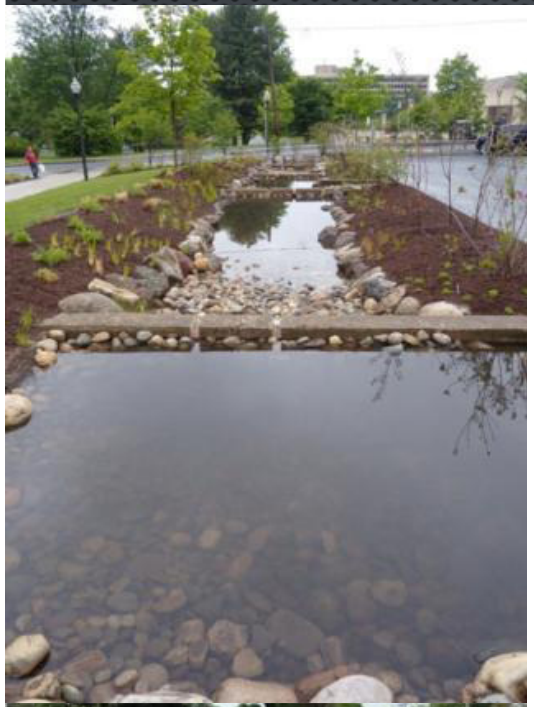
BLUE ELEMENTS ON SITE

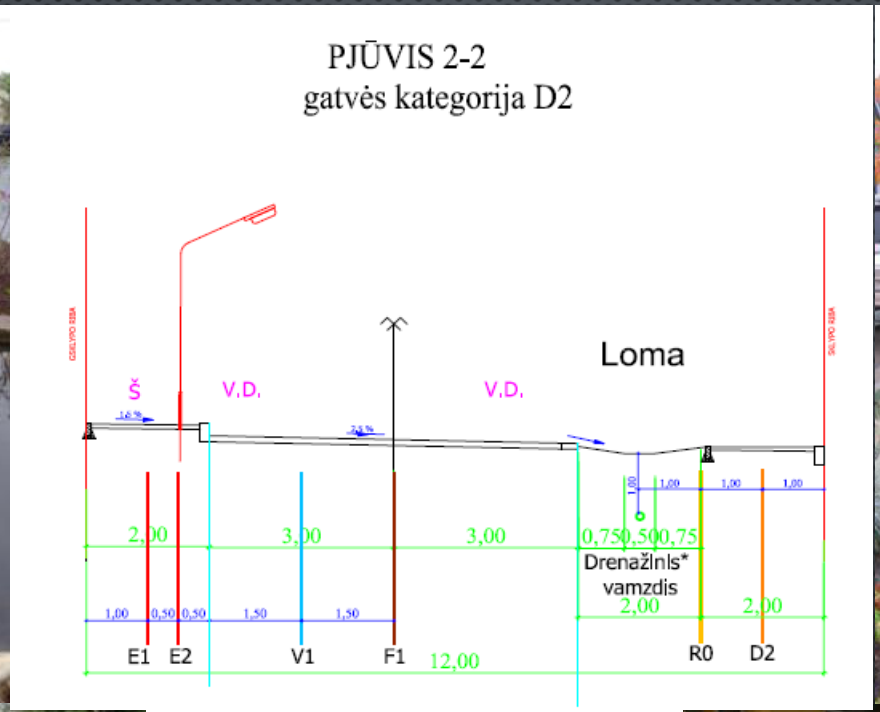
- Valleys, Corridors
- Buffers, Strips
- Wetlands
- Swale, strand, pond
- Wet ponds
- Dry ponds with continuous flow
- Catching and cleaning installations





GREEN – BLUE URBANISM: GREEN VALLEYS

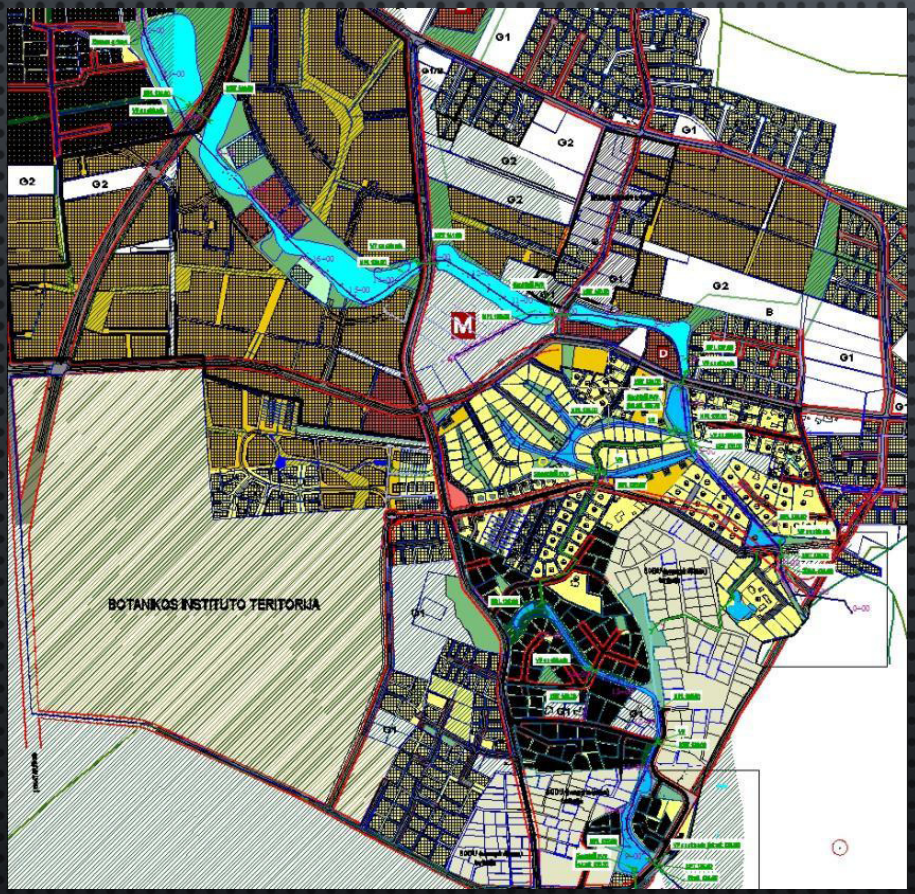




WET PONDS TO ACCUMMULATE RAIN WATER

Wetlands: better water management, cleaning, microclimate and aesthetics of residential landscape

PILOT AREA "GULBINAI" VILNIUS LITHUANIA



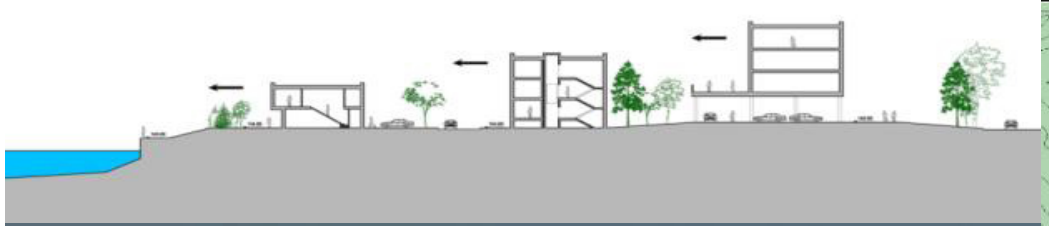
THE MAIN PRIORITIES OF DEVELOPMENT:

1. COMPLEX SUSTAINABLE PLANNING OF THE TERRITORY, IMPLEMENTATION OF DEVELOPMENT PLANS;

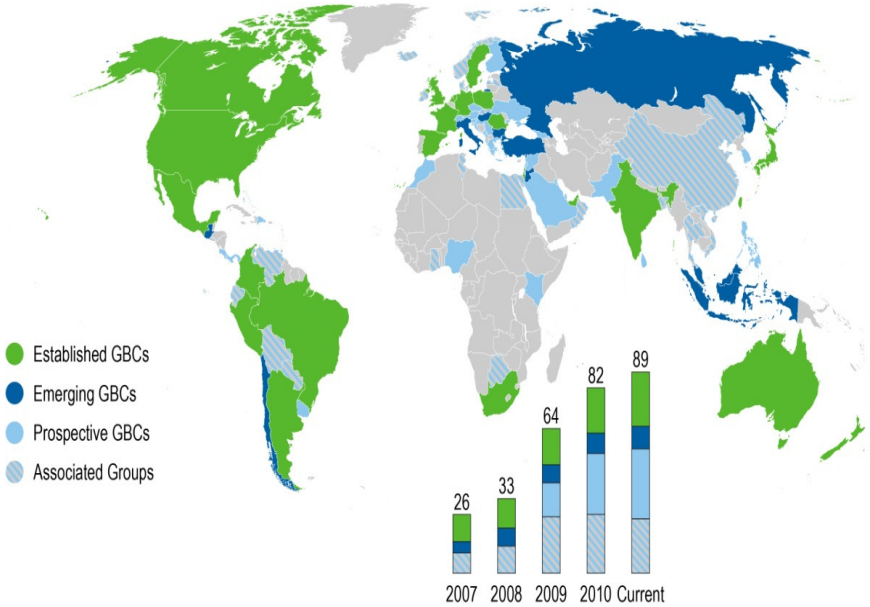
2. INTEGRITY WITH THE ENGINEERING, TRANSPORT AND SOCIAL INFRASTRUCTURE OF VILNIUS CITY;

3. PROTECTION AND RATIONAL USE OF NATURAL RESOURCES OF VERKIAI MUNICIPAL PARK, ELIMINATING ALL KINDS OF POLLUTION BASED ON "GREEN - BLUE" PLANNING PRINCIPLES;

“GULBINAI” RESIDENTIAL AREA



Global Green Building (GBC) network



World Green Building Council (World GBC) – coalition of national associations that has a common mission to make a breakthrough in construction using market instruments for more sustainable development.

GBC's are active in >100 countries making the biggest international organisation that makes an impact on green building market.

More information - www.worldgbc.org.

Lithuanian Green Building Council

LIETUVOS ŽALIŲJŲ PASTATŲ TARYBA

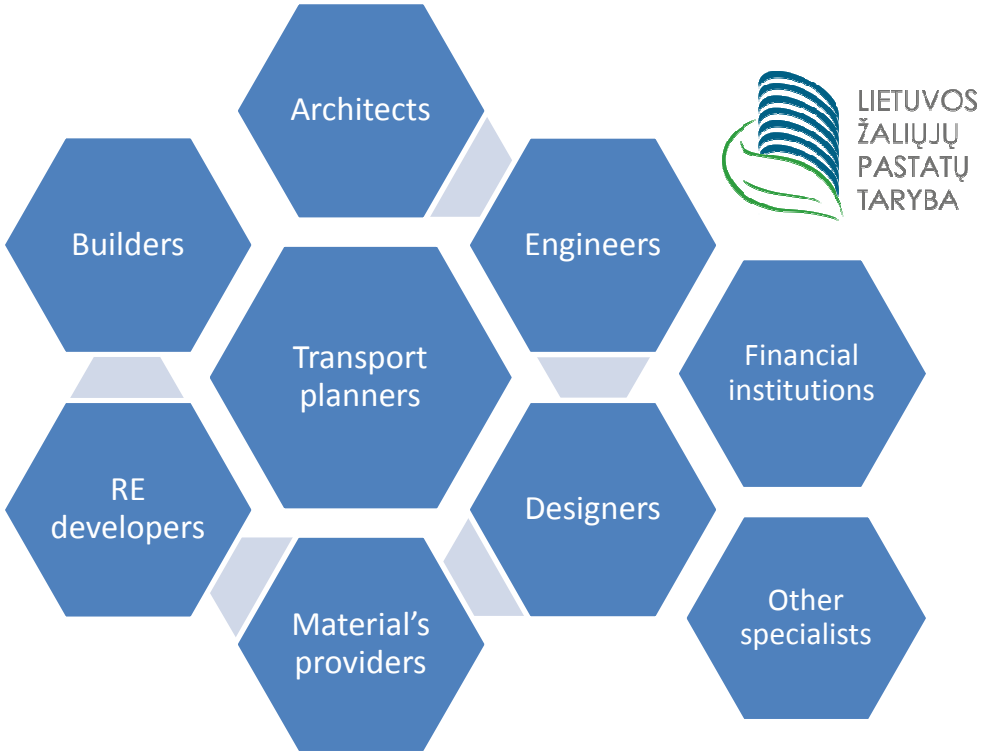
Established: June 20, 2013

Members: 16 business and education companies from development, design, construction, materials supply, building management sectors.

Activities:

- Green Building Professional training programme 2013 - 2015;
- Upgrade of national building and environmental legislation;
- National Green Building Assessment System;
- Rising public awareness www.lzpt.lt

Green Building Professional training



GREEN BUILDING PROFESSIONAL

GB Pro courses

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Required courses:

- Legal requirements and certification
- Green design principles
- Lighting design and smart buildings
- Sustainable materials and resources
- Financial considerations of green buildings
- Managing green building projects
- Sustainable site selection and management
- Creating and managing green working places

Elective courses:

- Green building envelope design
- Creating and managing greener schools
- Landscape and exterior design
- Integrating RES into green buildings
- Sustainable water drainage for green building
- Zero energy buildings
- Life cycle „Cradle 2 Cradle“

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Training methods

- Working groups
- Interactive seminars
- Case study analysis
- Theory update
- Test

GB Pro lecturers

www.lzpt.lt

Lecturers:

- Sue Clark, Sweden GBC
- Devyn Olson-Sawyer, Irland GBC
- Luca Volpi, Spain GBC
- Hadley Barret, UK GBC
- Steven Borncamp, Romania GBC

Impact:

- Higher professional competence
- Better understanding of sustainable development
- Upgrading legal system and regulations
- Sustainable business development
- Advanced academic education

GREEN BUILDING PROFESSIONAL

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Q & A

Дзякуй за Вашу ўвагу!
Thank you for your attention!
Ačiū už jūsų kantrybę!

Gintaras.Stauskis@vgtu.lt

VILNIAUS GEDIMINO TECHNIKOS UNIVERSITETAS

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