



# 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

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# 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*



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 Sjöstad 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 and 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

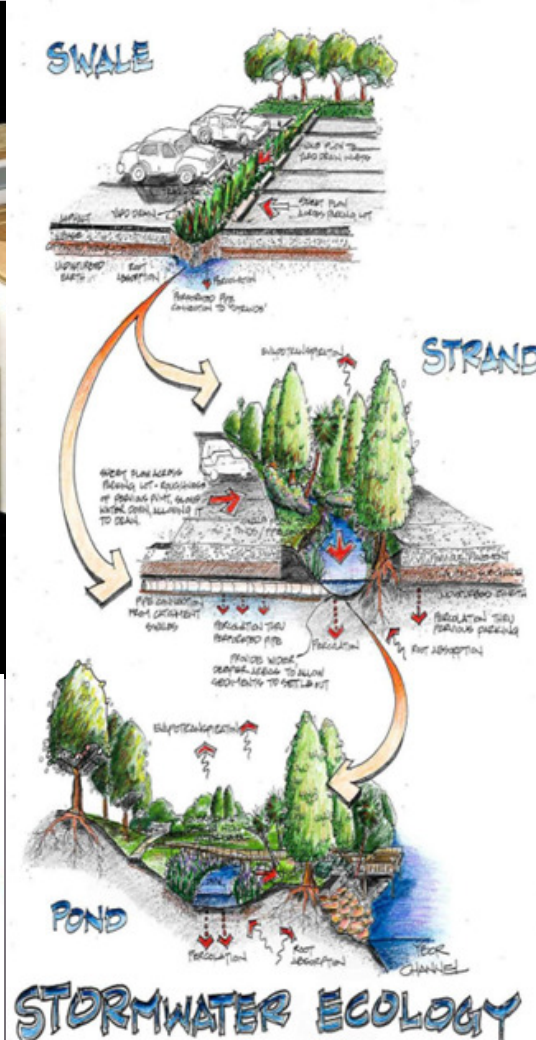
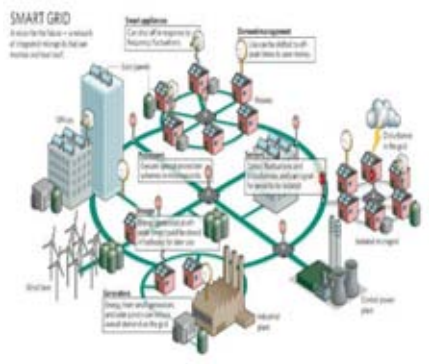
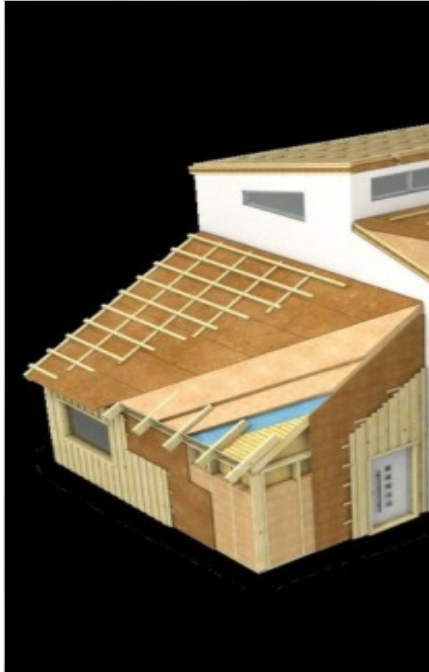
- Land plot for a particular use
- Respect and integrated use of ecological features of the site
- Mitigating ecological impact on environment
- Increasing ecological potential of the site
- Assessing long-term impact on biodiversity



## 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
- Planning for LCA

## Innovations

- Integrated application of innovative solutions in all fields

## Economy

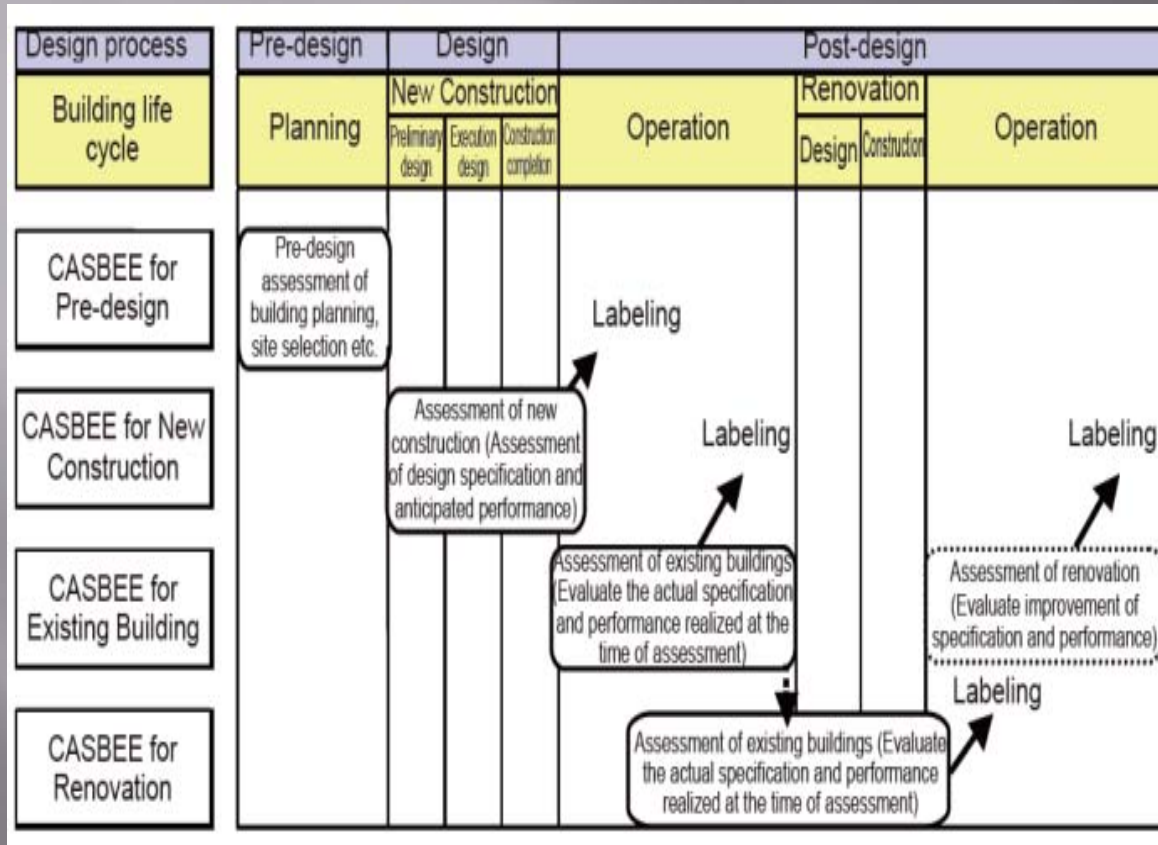
- Life cycle costing
- Value sustainability



# Green Building Cycle



# Green Building Management



Phases of quality assessment:

- ▣ Pre-design
- ▣ Project design
- ▣ Post-design

CASBEE Japan 2010



# 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

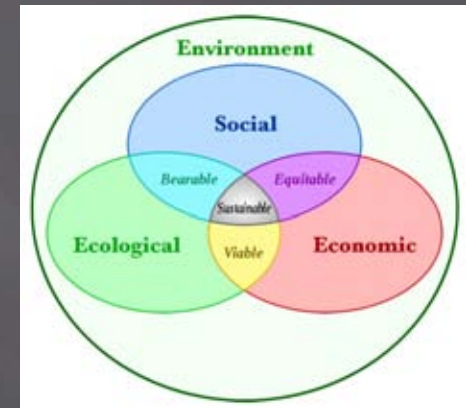
I. Questions are welcome!

## 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

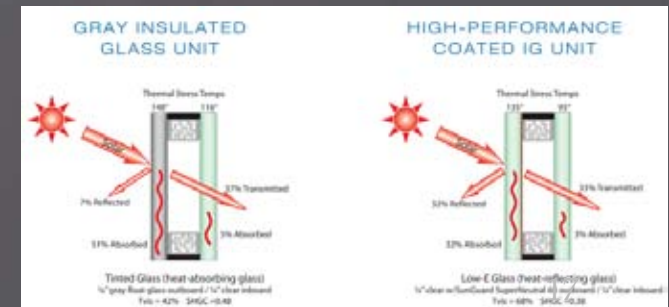
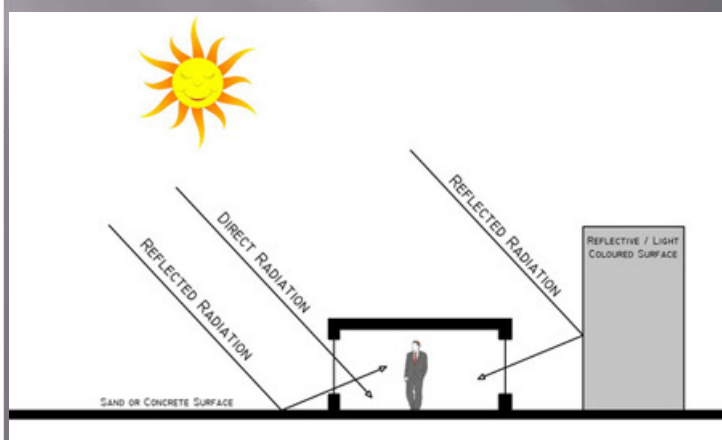
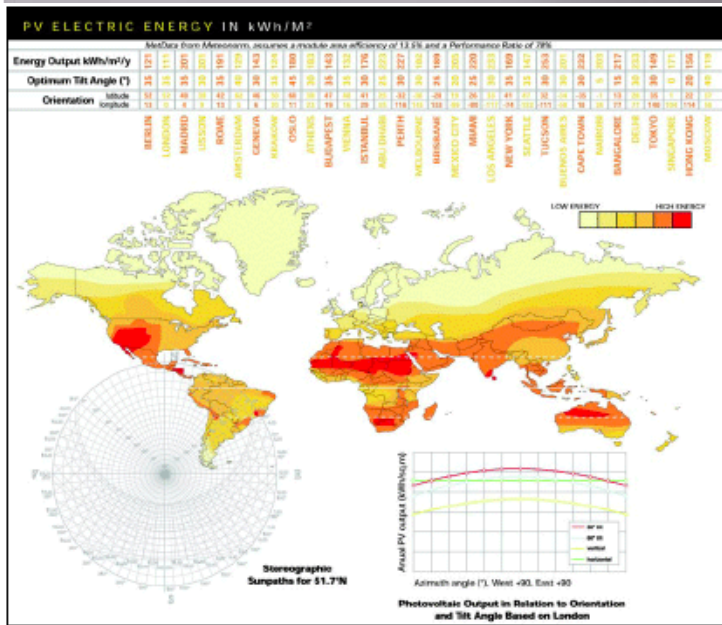
- Use of landscape and vegetation

Window Protection

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

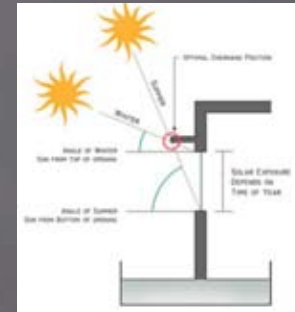
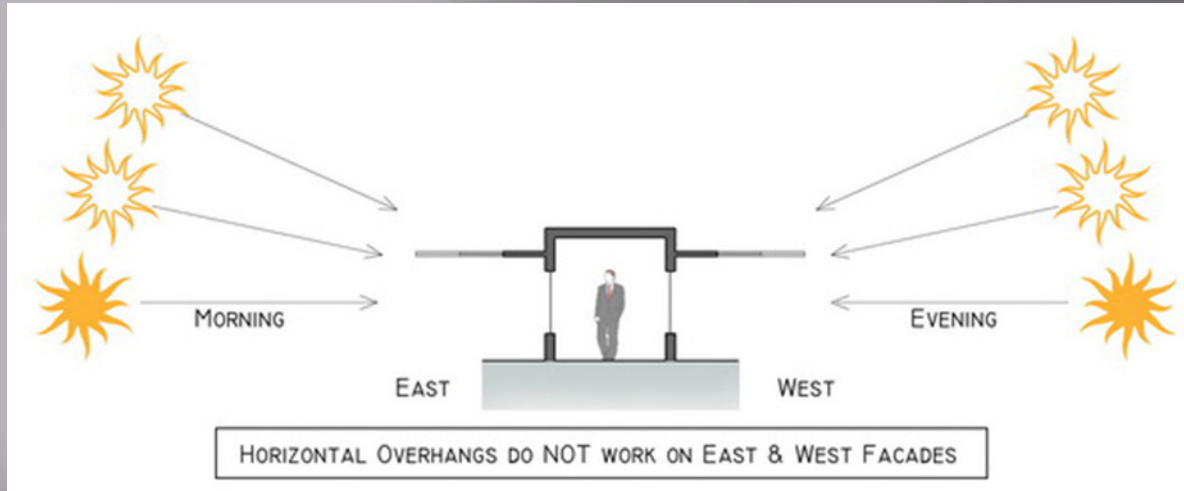
Special glazing types

- Reflecting glass
- Absorbing glass
- Optical glass

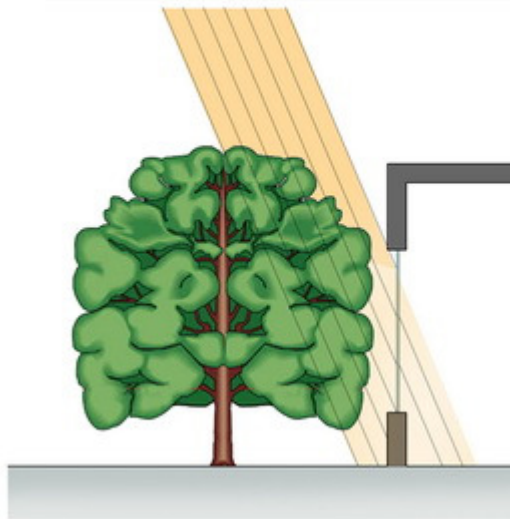




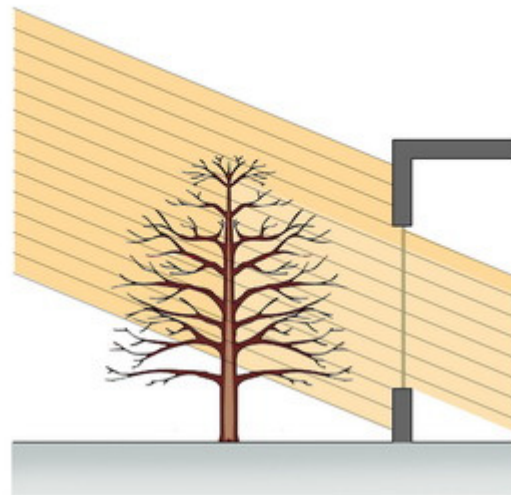
# Solar radiation Cases



SOLAR TRANSMISSION CAN BE AS LOW AS 20% FOR A MATURE TREE IN THE SUMMER



SOLAR TRANSMISSION CAN BE AS HIGH AS 70% FOR A MATURE TREE IN THE WINTER

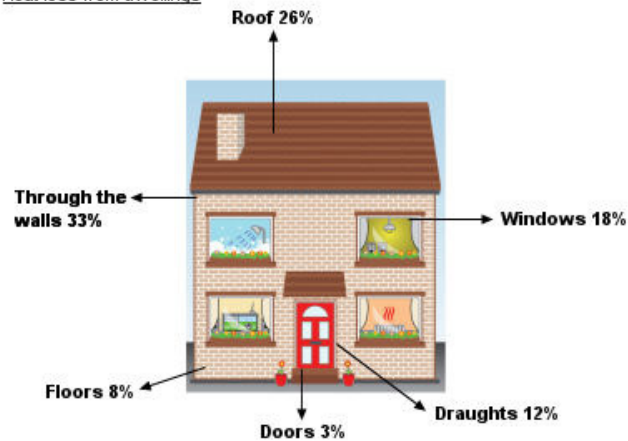


Solar geometry works for us because the sun is naturally HIGH in the summer, making it easy to block the sun with shading devices.

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

Heat loss from dwellings

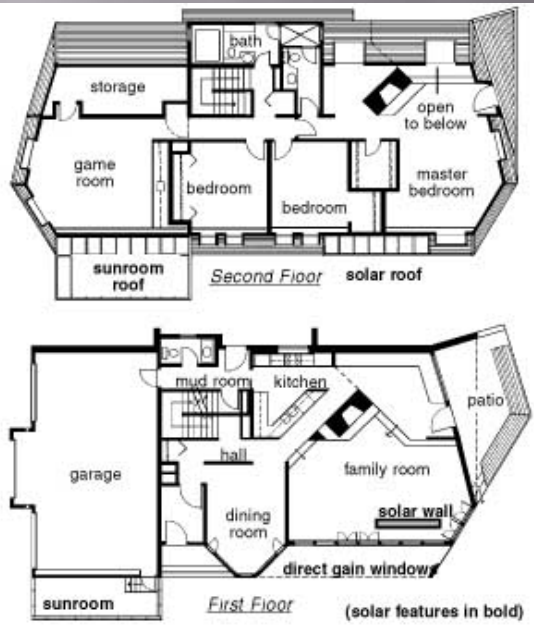


## Reduction of infiltration loss

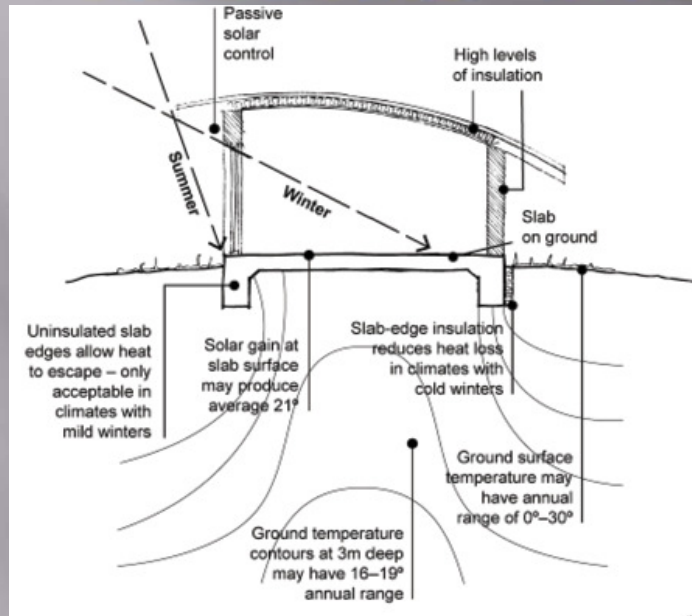
- Avoid heat exchange between exterior and interior.
- Avoid humidity entry in the building

## Reduction of transmission loss

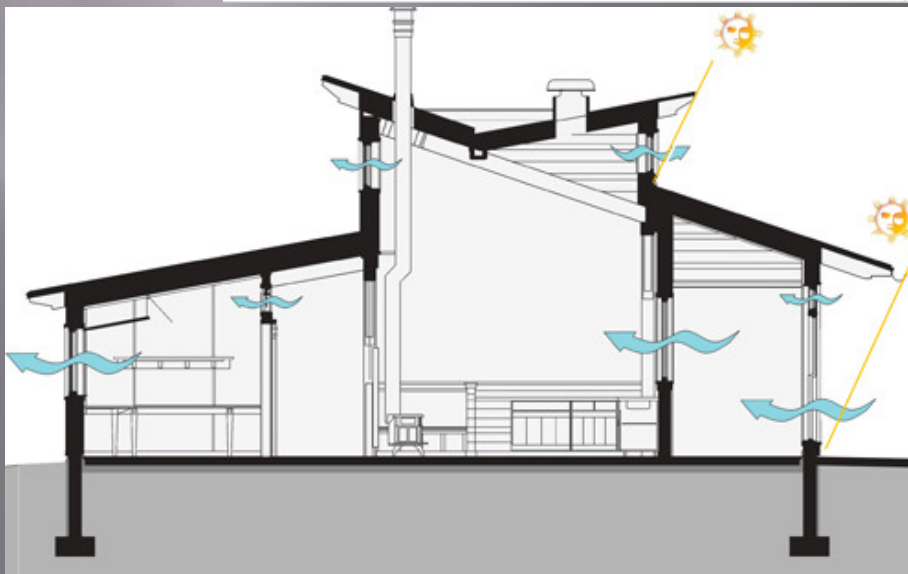
- External surfaces - reduce reflection
- Optimal insulation of external shell
- Higher thermal inertia - increase the inward heat flow



# Heating-cooling control

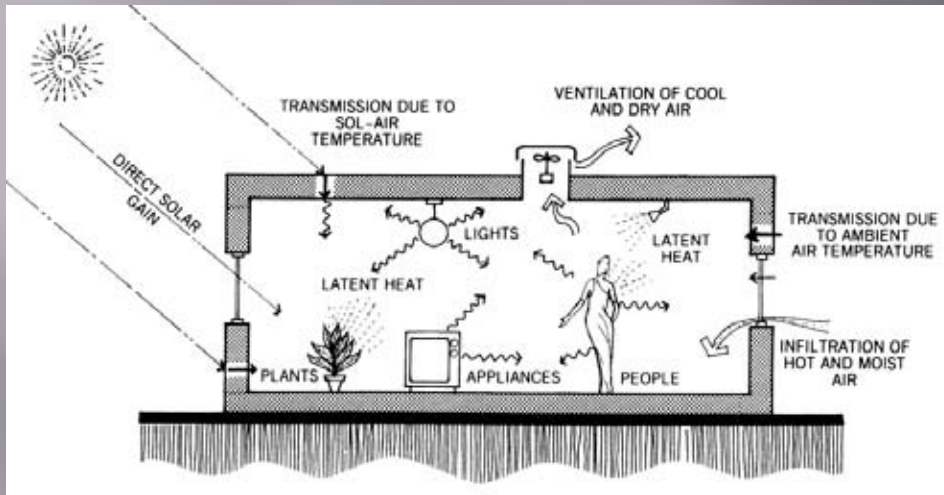


- ▣ Reduced infiltration losses
- ▣ Reduced transmission losses





# ❖ Managing internal gains



## Reducing lighting gains

- ❑ Maximal use of daylight
- ❑ Reduce energy consumption for lighting

## Manage casual gains

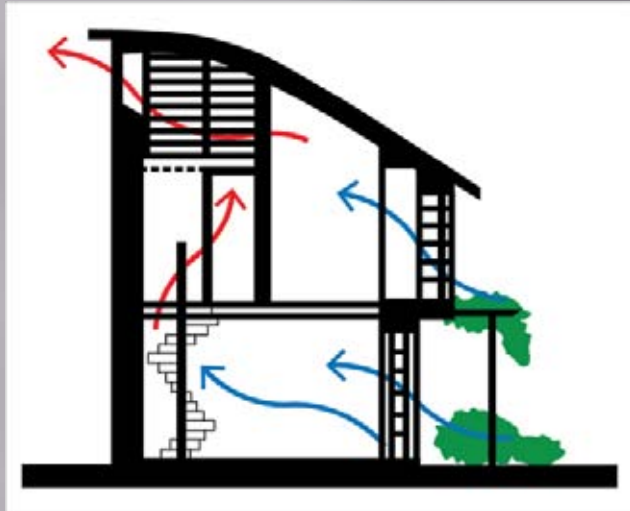
- ❑ Maximise occupancy level
- ❑ Minimise the gains from appliances – use energy efficient equipment.

## ❖ 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)

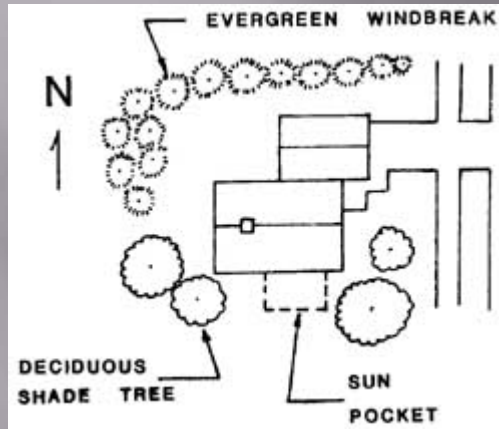
## Envelop cooling

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

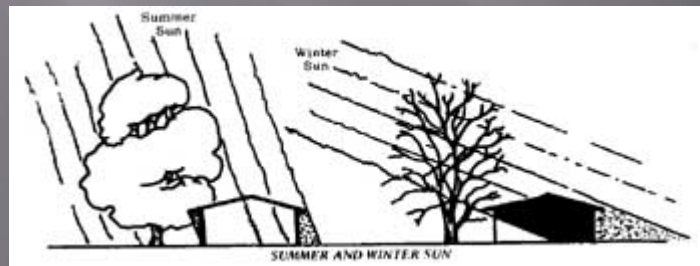
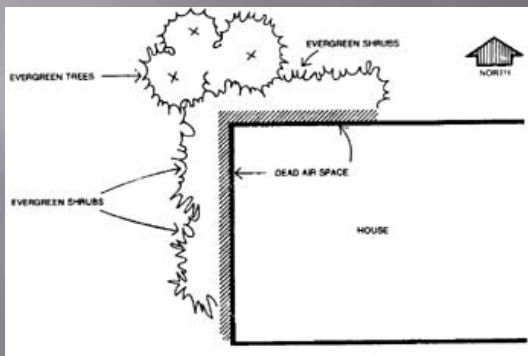




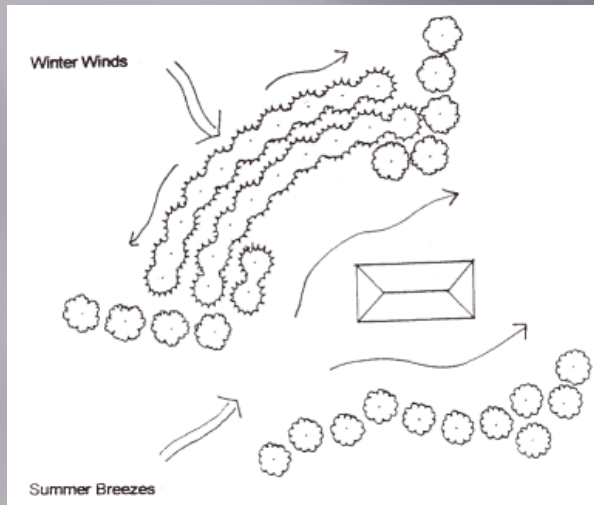
# Landscape Planning for Bioclimatic Design



- 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.

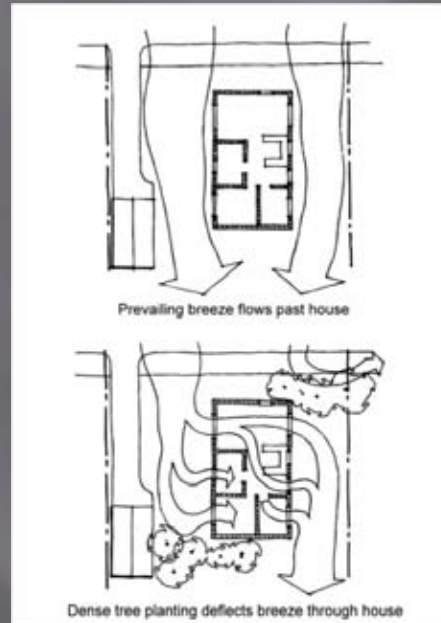
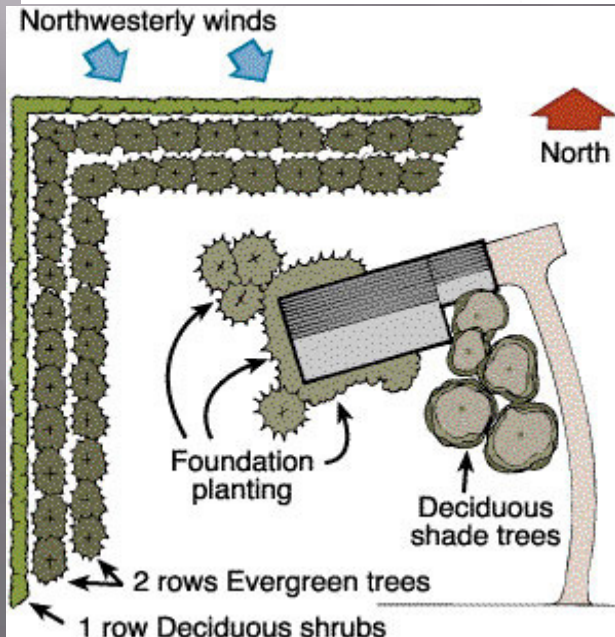


# Landscape Architecture for Bioclimatic Design



- 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!

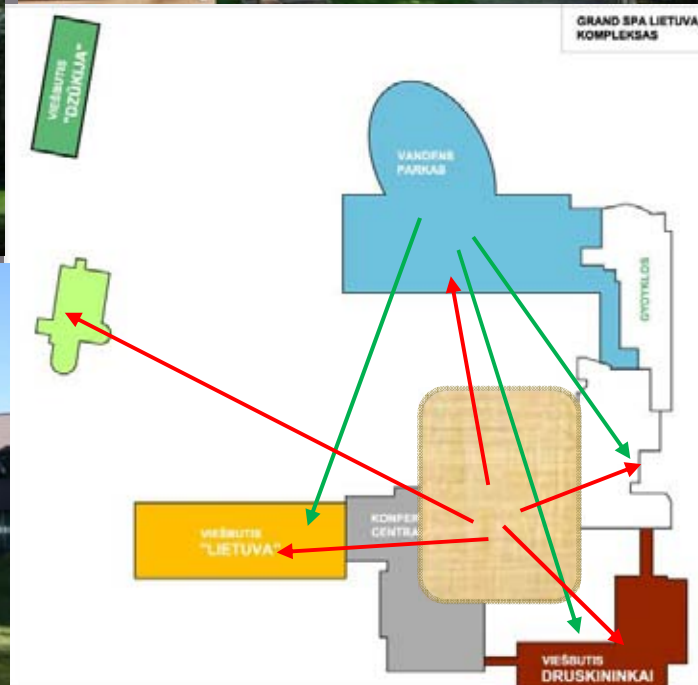




# III. Case Studies: Grand Spa Lietuva Hotel Conference LT

Druskininkai City  
Lithuania, 2009

- Geothermal heating
- Dual-flow heat exchanger
- PE 74 kWh/m<sup>2</sup>/pa
- ROI 7 years.

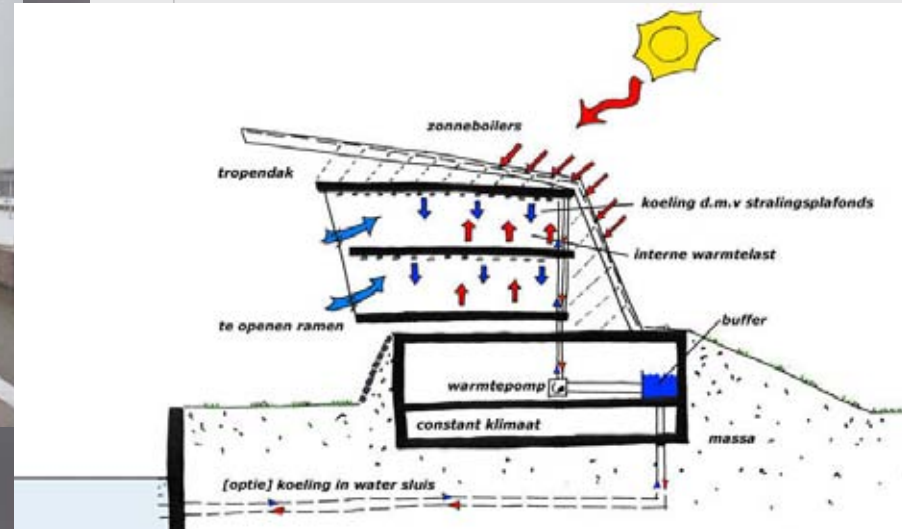
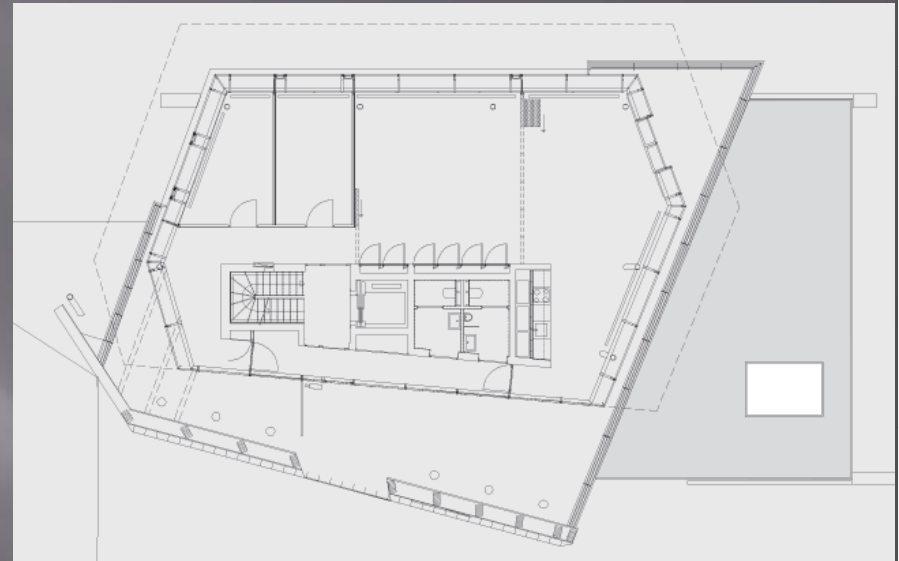




# Water Management Office NL



# Water Management Office NL





# Denbigh Castle Visitor Reception Building

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



Gross Floor Area – 79.5m<sup>2</sup>

Total Area of the Site – 0.033 hectares

% Area of Building to be used by Community –

Approximately 67% for small out of hours meetings

% Area of Grounds to be used by Community – 100%  
when required

Location: Wales UK



© Adrian Warren / [www.lastrefuge.co.uk](http://www.lastrefuge.co.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/>

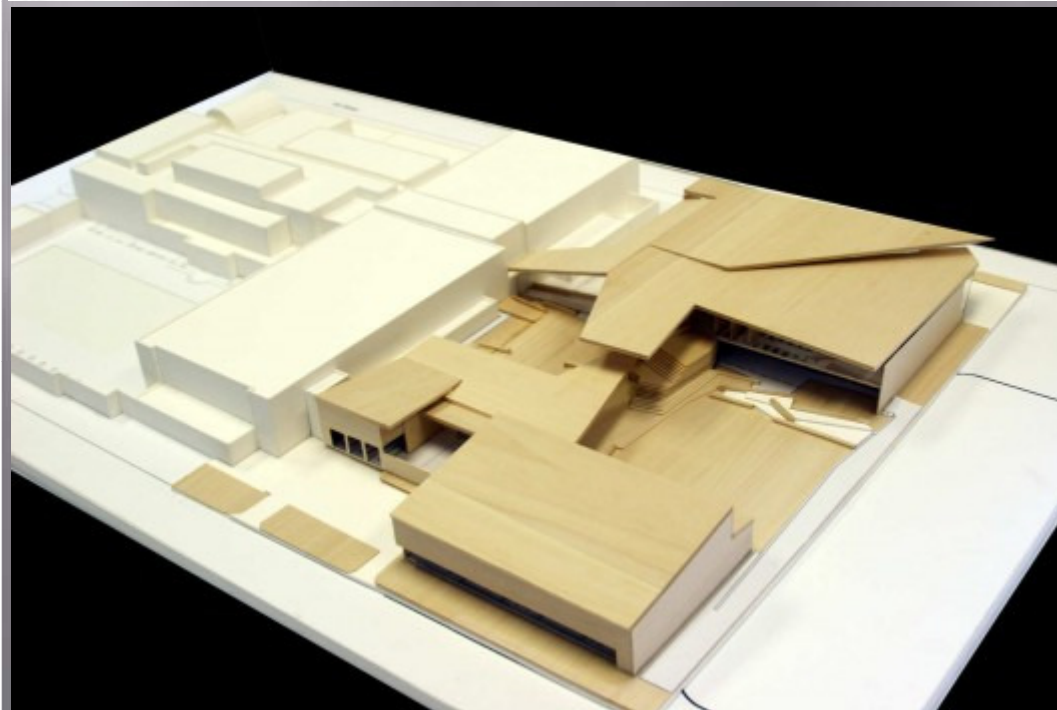
Architects: **Sasaki**

Location: **Tucson, Arizona, USA**

Cost: **\$22.7 million**

Project area: **54,000 sq. ft.**

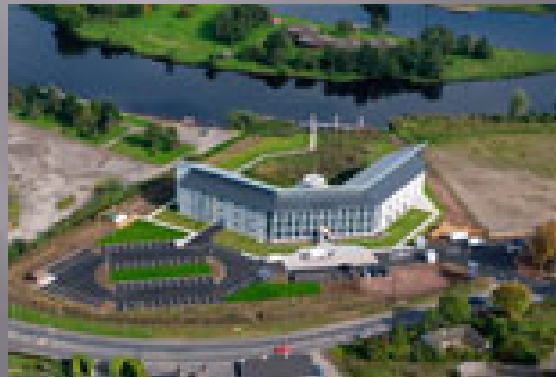
Project year: **2010**



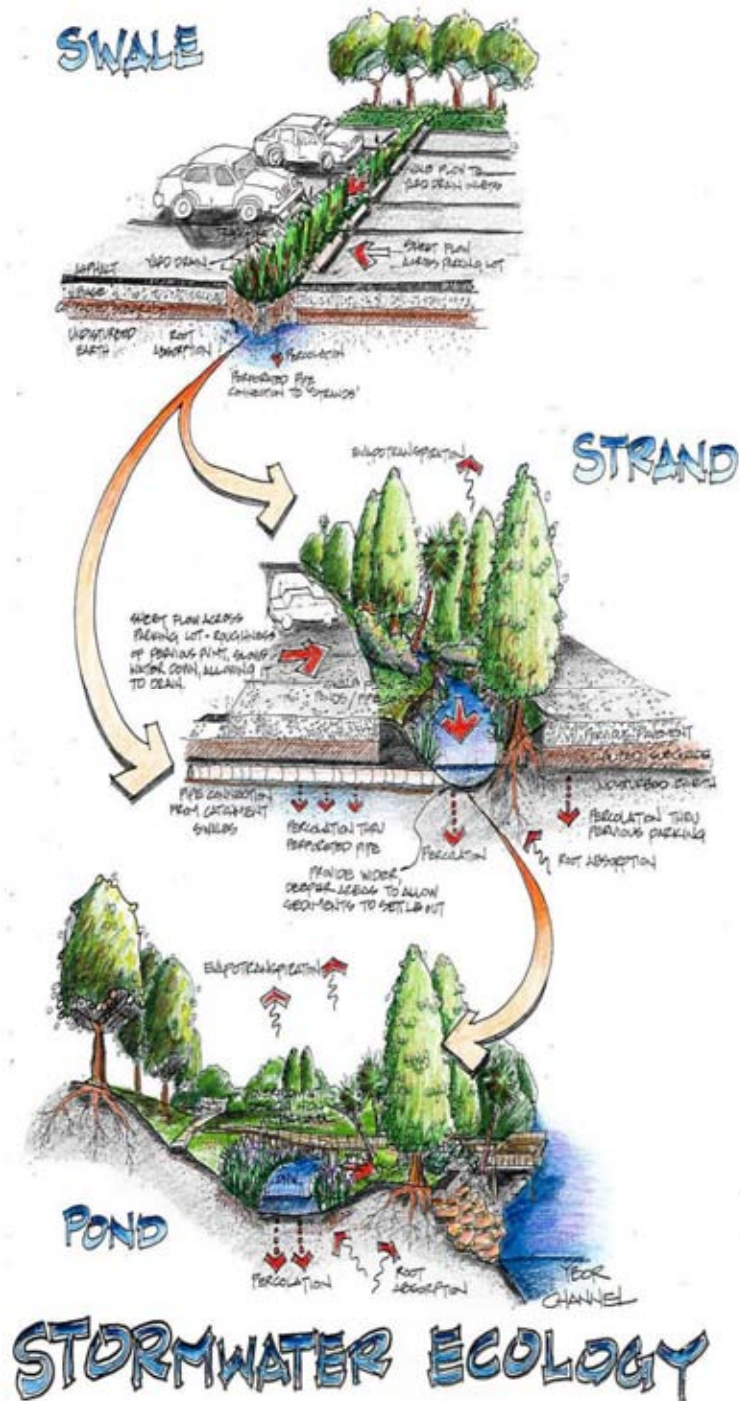
Deep roof overhangs shield the courtyard and windows from direct sunlight.

# Waterways Ireland, Enniskillen, Northern Ireland

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

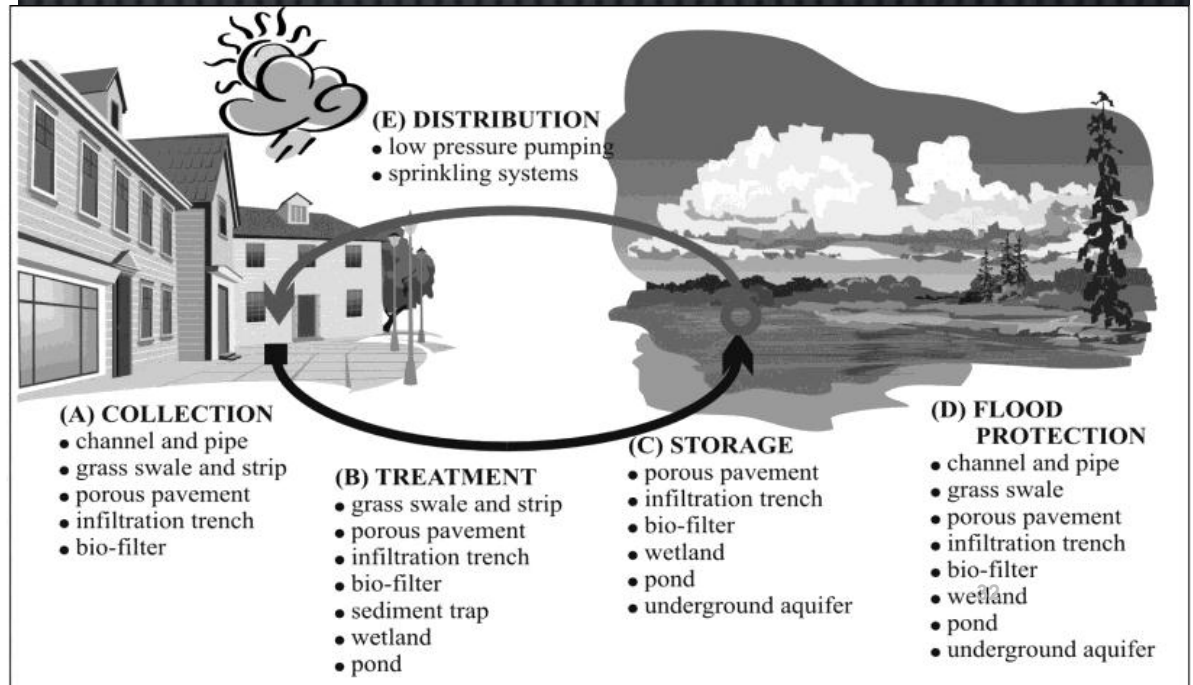
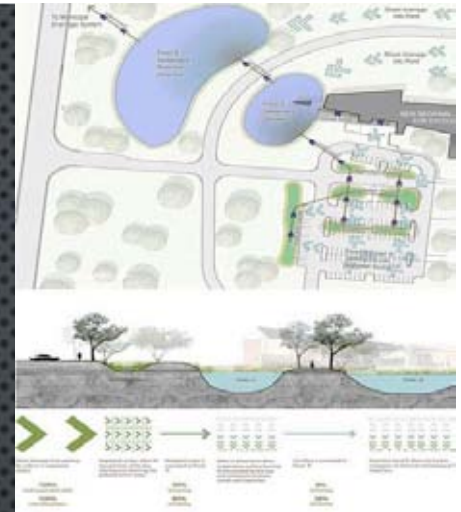






## BLUE ELEMENTS ON SITE

- VALLEYS, CORRIDORS
- BUFFERS, STRIPS
- WETLANDS
- SWALE, STRAND, POND
- WET PONDS
- DRY PONDS WITH CONTINUOUS FLOW
- CATCHING AND CLEANING INSTALLATIONS

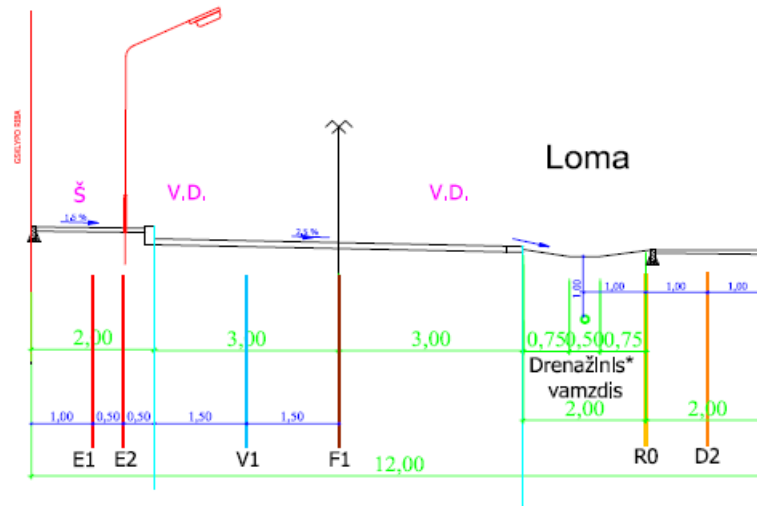




# GREEN – BLUE URBANISM: GREEN VALLEYS



PJŪVIS 2-2  
gatvės kategorija D2





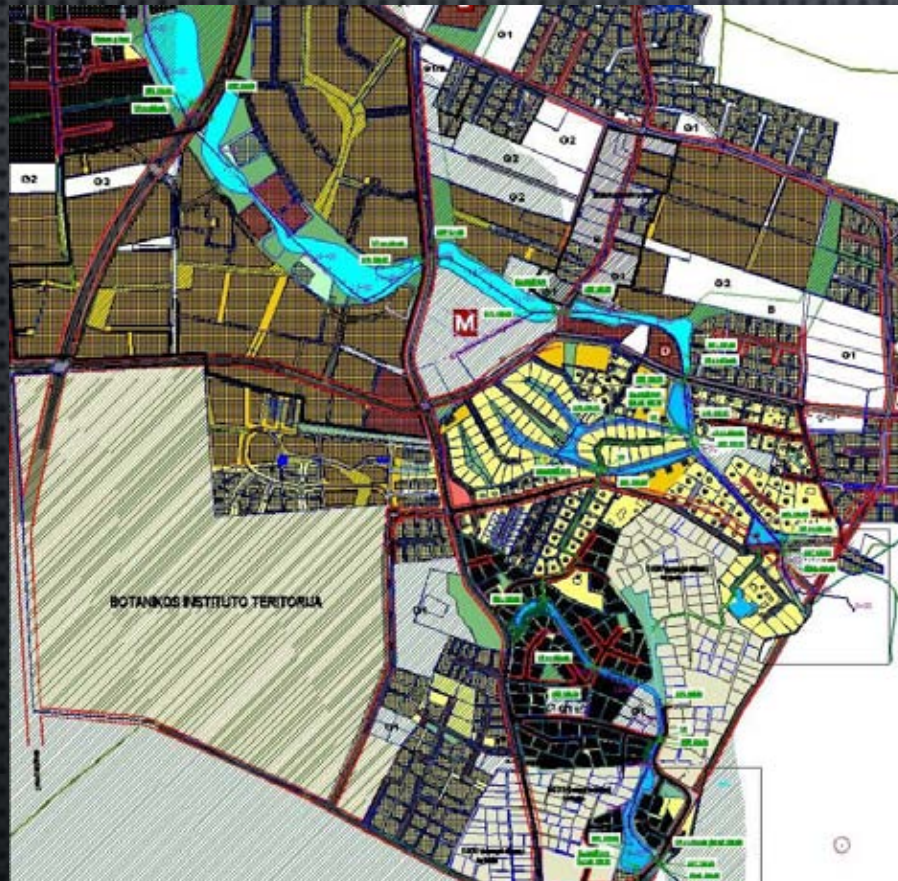
# WET PONDS TO ACCUMMULATE RAIN WATER



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



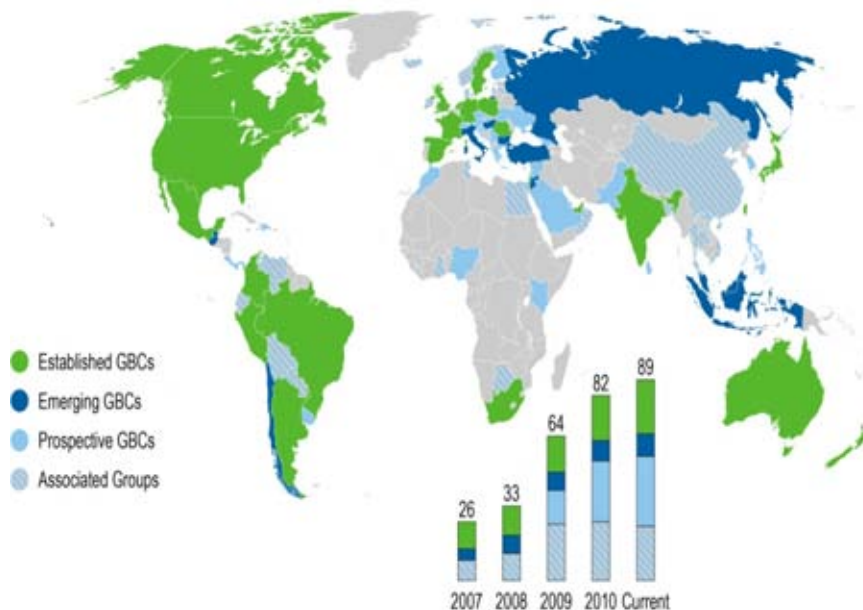
# Global Green Building (GBC) network



**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](http://www.worldgbc.org).





# Lithuanian Green Building Council



**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](http://www.lzpt.lt)

TRAINING COURSES, CERTIFICATION OF SUSTAINABLE BUILDINGS, LOBBYING

WORLD GREEN BUILDING COUNCIL  
Lithuanian Green Building Council  
PARTNER

TRAINING COURSES FOR GREEN BUILDING PROFESSIONALS

- Zero Energy Homes
- Financial Considerations of Green Buildings
- Legal Requirements and Voluntary Certifications for Green Buildings
- Green Design Principles
- Managing Green Building Projects
- Counting and Managing Greenhouse Gases
- Sustainable Materials and Resources

CERTIFICATION OF SUSTAINABLE BUILDINGS

- Building Research Establishment Environmental Assessment Method (BREEAM)
- Leadership in Energy and Environmental Design (LEED)
- Passive House (Passivhaus)
- German Society for Sustainable Building (DGNB)
- Label for Low-Energy Consumption Buildings (Silver)
- Label for High Environmental Quality (HQE)

LOBBYING FOR LEGISLATION

- Coordination with European Union Green Building Policies
- Implementation of European Directives for Green Building
- Updating National Law System and Regulations for Construction
- Initiating Green Building Changes in Public Sector
- Setting financial and other incentives for Green Building
- Upgrading Education and Training Programs

Construction21.eu

European Platform for Professionals to inform and communicate about the Leading Sustainable and Energy Efficient Buildings

Innovative Sustainable Building Case Studies

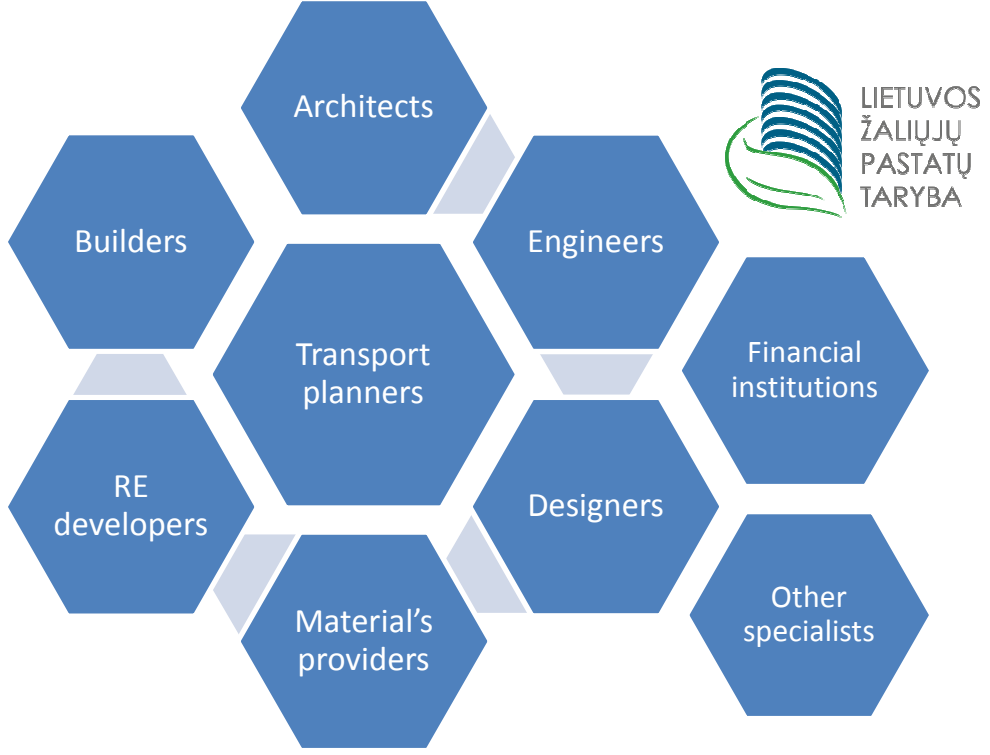
Construction21.eu partners

Construction21.eu partners

Construction21.eu partners



# Green Building Professional training



# GB Pro courses

## 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“

# Training methods

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





# GB Pro lecturers

[www.lzpt.lt](http://www.lzpt.lt)



## ***Lecturers:***

- Sue Clark, Sweden GBC
- Devyn Olson-Sawyer, Ireland 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



# Q & A

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

[Gintaras.Stauskis@vgtu.lt](mailto:Gintaras.Stauskis@vgtu.lt)

