# GREEN BUILDING

## WORKING IN GREEN BUILDING SECTOR

GDAŃSK, 2020



BALTIC SOUTH BRIDGE

FOR GREEN TECH FUTURE!

Materials developed within the framework of the " SB Bridge – building bridges for green-tech future" Project.



# Author

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In the years 2005-2017 head of the Centre for Ecological Information and Education in Gdansk (CIEE). An active member of Polish Ecological Club Pomeranian Branch (PKE OP) for many years.

Co-creator and coordinator of numerous pro-environmental educational projects e.g. national „Fruit - observation, knowledge, responsibility, act", „Biodiversity - learn to preserze" (both National Fund for Environmental Protection and Water Management co-financing), „Infoeko pomorskie - Information for the Society on sustainable development and the state of the Pomeranian Voivodeship" (with EU funding), „The mature taste of adventure" as well as educational workshops and competitions addressed to children, youth and retired people. Co-implementer of many international educational projects with members of PKE OP, e.g. „Plastic Free Baltic", „EkoAgora - social communication platform", „Rain is a lot of drops - everyday activities for the protection of biodiversity and prevention of the effects of climate change" and many educational activities addressed to the local community.

Interreg South Baltic
EUROPEAN UNION

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# Introduction

> Innovative ideas and supporting sustainable infrastructures are the basis for adapting and minimizing the effects of climate change.

**A holistic approach to construction gives the effect of green construction / sustainable buildings / passive houses / intelligent self-sufficient houses and systemic design of urban spaces permeated by nature.** Green construction fashion, a trend, or rather a necessity and a future look at urban planning and architecture, looking for new energy-saving, environmentally friendly and human-friendly solutions. Creativity is unlimited and creates new opportunities for people, creates new professions and changes the view of the old. Innovative ideas and supporting sustainable infrastructures are the basis for adapting and minimizing the effects of climate change.

# Introduction

Cities covering only 3% of the Earth's surface are responsible for 60-80% of energy consumption and 75% of carbon emissions. The number of their inhabitants is constantly increasing, constituting a challenge for modern urban planning. It is assumed that global building resources will double by 2060, and two-thirds of the world's population will live in cities. The use of increasingly intelligent urban planning maximizes the potential for creating low-carbon buildings and surrounding infrastructure.

The main goal is to reduce the negative impact of cities on the environment and improve the quality of life of residents, by introducing green areas in city centers, promoting urban gardens and developing clean forms of mobility, e.g. efficient, energy saving public transport, bicycle routes... An extremely important role is also played here by approach to multi-family, single-family, office and industrial construction. A significant reduction in material consumption, energy efficiency or even energy self-sufficiency, the use of energy from renewable sources and rainwater in buildings, and the improvement of the urban microclimate are just some of the challenges faced by architects. Designers must move away from energy-intensive urban developments that poses ecological threats, towards a new, productive, safe and emission-reducing urban model.

According to EU regulations on circular economy, comprehensive thinking about construction is becoming an extremely important issue.

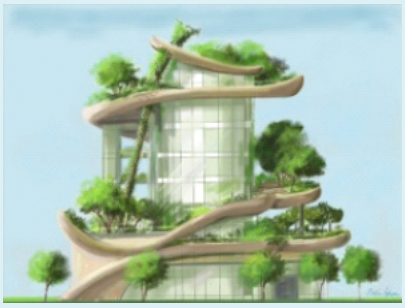
Taking into account the impact of the production of building materials on the environment, their transport, design and construction methods, building operation system and the utilization of materials after its technical death. Interestingly this approach to the product, from raw materials, through production, sales process, use to disposal, is presented by Daniel Goleman in the book "Ecological Intelligence".
Designing Green Building is a very complex area. This approach to construction philosophy should take into account many stages - the production and transport of building materials, the way construction is carried out, the design of urban spaces and individual buildings, the way the building is operated, taking into account the sources and amount of energy consumed, ease of demolition of the building and utilization or reuse of materials . To understand the idea, it's good to start with a definition.

## GREEN BUILDING

# What does it mean *Green*?

**BIQ BUILDING, HAMBURG, GERMANY**

RETRIEVED 19.06.2020
LINK



**GREEN BUILDING'S FUTURE**

RETRIEVED 19.06.2020
LINK

*Green Building is a comprehensive design and construction process, a system of architectural and technical solutions aimed at minimizing the adverse impact on the environment (carbon and water footprint) and reducing energy consumption in the building (preferably from renewable sources), while contributing to health, efficiency and comfort of its inhabitants.*

WWW.USGBC.ORG/ARTICLES/WHAT-GREEN-BUILDING

**RETRIEVED 19.06.2020**

Technical and architectural solutions decide about the qualification of a building for sustainable construction (Green building), and its reliability is confirmed by certificates.

The most popular certification systems:

- **LEED (Leadership in Energy and Environmental Design)** - international, most widely used system in the world (168 countries) for multi-criteria building assessment, introduced in 1998. By 2019, several amendments, currently LEED v4, retrieved 19.06.2020 from: www.usgbc.org/help/what-leed,

- **BREEAM (BRE Environmental Assessment Methods)** focuses on assessing the quality of the investment process, retrieved 19.06.2020 from: www.thenbs.com/knowledge/what-is-breeam,

# Spatial planning

**BUTTERFLY SQUARE IN ALLARP MASTER PLAN IN HALLAND, SITUATED ON THE WEST COAST OF SWEDEN**

**RETRIEVED 19.06.2020**
LINK

The idea of Green Building also includes urban planning, i.e. spatial planning of the city or its parts in order to obtain low-carbon and material-saving buildings. Morphological development of buildings, designing streets, squares or individual architectural objects affects the climate in the city, leveling the so-called urban heat islands, ventilation of the city, amount of greenery... Eco friendly city or district plan is a condition for the well-being of the inhabitants and nature.

# Spatial planning

**ULTRA-EFFICIENT DANISH HOME PRODUCES MORE ENERGY THAN IT NEEDS**

**RETRIEVED 19.06.2020**
LINK

Existing, traditional buildings can be renovated to obtain Green Building status. It's much easier to design a Green Building from the beginning. The decision to build an energy-efficient or passive building must be made before the start of the project.
To achieve the most satisfactory passive house effect, its specific requirements should be considered at the location and design stage:

- a plot with south orientation, protected e.g. by trees from the north, large enough that neighboring buildings do not cover the Sun
- a block of a one-story building with an attic, compact, rectangular, oriented to the south,
- the most effective building size 90 - 120 m2
- any glazed outbuildings, terraces and halls, only on the south side
- technologies for building double-layer walls, skeleton construction (often wooden)
- elimination of thermal bridges and moisture threat due to very good insulation and proper seating of doors and windows
- large glazing only from the south (tripple glazed windows with heat transfer parameters less than 0.8 W / m2)
- interior layout - living rooms are located on the south side, from the north wardrobe, storage room, technical room
- room temperatures - bathroom (22-24°C), living room and children's room (approx. 22°C), bedrooms (18-20°C), utility rooms e.g. wardrobe, pantry (16-18°C).
- insulation with polystyrene, mineral wool, innovative recycled materials
- heating - mechanical supply and exhaust ventilation with heat recovery (recuperator) with efficiency over 75%. The essence are two systems - fresh air forced in by the system of diffusers and ducts and heated air

in the recuperator (it draws in cold air from the outside and heats from the air removed from the inside of the building). The heat pump can provide additional heating

- it is worth installing solar and photovoltaic panels on the roof, possibly a small wind turbine

INSTITUTE OF PASSIVE BUILDINGS IN DARMSTADT

## Construction and building materials

BIOLOGICAL HOUSE IN DENMARK

RETRIEVED 19.06.2020
LINK

ALUMINIUM AND GLASS INTERIOR

RETRIEVED 19.06.2020
LINK

BUILDING WITH STRAW PANELS

RETRIEVED 19.06.2020
LINK

SUSTAINABLE HOME IN DENMARK

RETRIEVED 19.06.2020
LINK

In classic construction, materials with a high carbon footprint, such as concrete and steel, play a key role in shaping the urban environment.
The Green Building idea promotes the use of natural, local and even recycled materials. An important thing in choosing a material is its local availability, which shortens the transport route. In addition, natural materials are completely recyclable after the technical death of the building. Due to these properties, the environmental load (carbon footprint) is minimized already at the stage of production and transport, as well as the utilization of used materials.
Reducing the amount of materials used in construction, without limiting the strength and the possibility of shaping the form of the building, skeletal structures are used. Still one of the construction materials used especially for large-scale construction is steel, but less is consumed thanks to innovative solutions. Often in smaller projects it is replaced with wood, a good and natural construction material. Larger structures use elements made of glued wood, more durable and allowing the creation of large spaces without the need for support. In countries where bamboo is available, bamboo is used instead of wood.
Construction aspiring to the title of Green is trying to eliminate the main sources of pollution generated by the production of raw materials and energy-consuming. We also gladly return to traditional materials such as straw or clay, treating them in an innovative way. Straw is used, e.g. in the form of prefabricated panels, which fill the skeleton structure of the building. External clay-cement plasters, and internal clay plasters provide a favorable microclimate.

# KNOWLEDGEBASE

## Source of knowledge + links

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| **SWEDEN** | |
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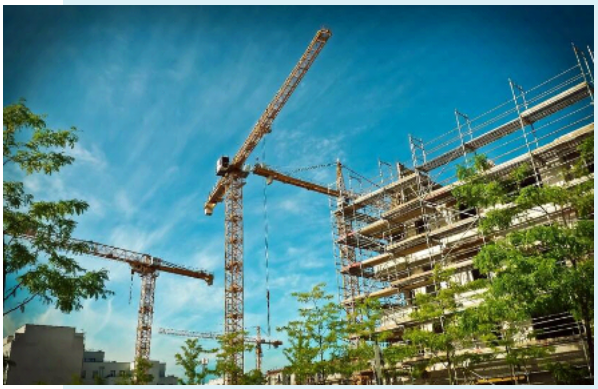
| SWEDEN'S PIONEERING ECO-DESIGN HOTELS | medium.com<br>RETRIEVED 19.06.2020 |
| SWEDEN'S HOUSE -IN-A-GREENHOUSE GROWS FOOD SUSTAINABLY WITH RECYCLED WASTEWATER | inhabitat.com<br>RETRIEVED 19.06.2020 |
| **POLAND** | |
| HOW POSITIVE-ENERGY BUILDING CAN CREATE TINY HOUSES WITH A BIG, GREEN IMPACT | redshift.autodesk.com<br>RETRIEVED 19.06.2020 |
| **GERMANY** | |
| BUGA WOOD PAVILION 2019 | achimmenges.net<br>RETRIEVED 19.06.2020 |

# Building site



**CIRCULAR ECONOMY IN CONSTRUCTION**

**RETRIEVED 19.06.2020**
LINK

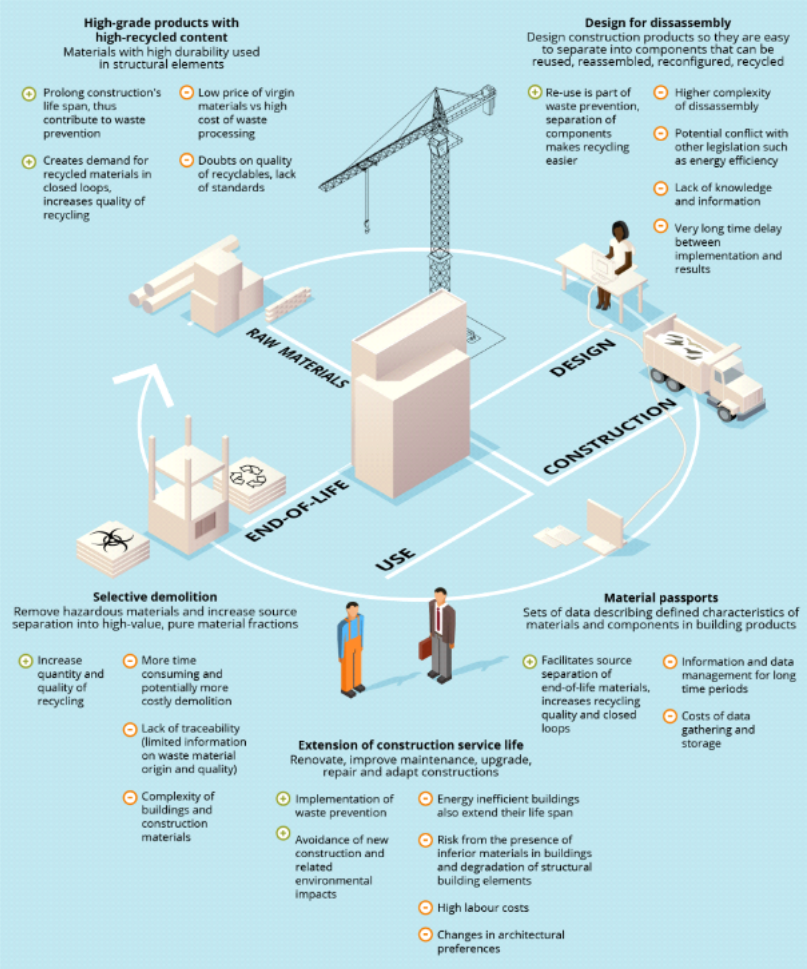
**An eco friendly construction site is:**

- well-planned activities and zones within the plot
- great logistics
- perfect calculation of the amount of necessary materials
- using, where possible, natural prefabricated materials

# Circular economy in construction

The building industry is responsible for a massive environmental footprint. It consumes almost half the world's resources extracted every year. Construction and demolition waste makes up just over one third of total waste generation in the EU. These are concrete and reinforced concrete, asphalt, wood, glass and plastics. Most of them cannot be reused.
Construction also consumes almost half of the resources extracted annually. Aggregates such as sand and gravel, gypsum and stone are in high demand in construction. Their extraction is associated with the opencast exploitation of huge areas, which they lose due to natural and landscape reasons. The extraction and transport of materials is accompanied by noise and air pollution. Therefore, it is important to use technologies that consume as little raw material as possible, which can easily be reused.

According to the assumptions of the circular EU economy in construction, materials and raw materials should remain in the economy as long as possible and waste generation should be minimized as much as possible. All stages of the life cycle of a construction material / product are considered, starting with its acquisition or design, through construction, operation and collection of waste, to its disposal. Therefore, comprehensive innovation efforts are undertaken at every stage of production.




CIRCULAR ECONOMY

**RETRIEVED 19.06.2020**
LINK

*Improving circular economy practices in the construction sector key to increasing material reuse, high quality recycling*

# KNOWLEDGEBASE

## Source of knowledge + links

| SUBJECT / LINK / SOURCE | |
|---|---|
| EUROPEAN CIRCULAR ECONOMY | circulareconomy.europa.eu<br>RETRIEVED 19.06.2020 |
| BEST PRACTICES FOR SUSTAINABLE CONSTRUCTION | fieldwire.com<br>RETRIEVED 19.06.2020 |
| CIRCULAR CONSTRUCTION IN PRACTICE | innowo.org<br>RETRIEVED 19.06.2020 |

# Energy efficiency

GERMANY HAMBURG, SMALL WIND TURBINE ON ROOF

RETRIEVED 19.06.2020
LINK

GERMANY SOLAR PANELS OF GREENPEACE BUILING IN THE HAFENCITY

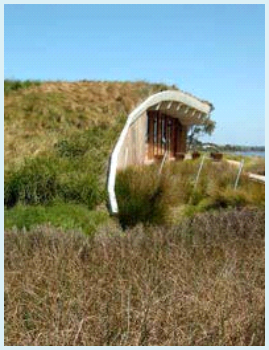
RETRIEVED 19.06.2020
LINK

The use of renewable energy is also necessary in the process of reducing the carbon footprint, if possible even at the material production stage.
Solar or photovoltaic panels are no longer new today, although they are constantly being improved in order to gain ever greater efficiency. It is definitely also worth focusing on the use of wind energy. Large wind turbines are known and increasingly used. It is increasingly common to use small vertical axis wind turbines mounted on the roofs of buildings aspiring to be Green. This approach provides the building with energy self-sufficiency and creates a distributed energy network.
Energy efficiency also means using less electricity and heat. It is already included in the function at the design stage of energy-saving, passive buildings. Is the sum of thought-out design activities related to the location of the building, solution of the interior function, number and size of windows, heat and moisture insulation, materials used and heating technologies.

# Green roof and rain garden

**VIBORG TOWN HALL IN DANMARK**

**RETRIEVED 19.06.2020**
LINK



**ECO FRIENDLY CONSTRUCTION AND MATERIALS**

**RETRIEVED 19.06.2020**
LINK

Green Building is an environmentally friendly building at every stage of operation. When building, we annex biologically active spaces by changing their structure into more or less concrete / impervious. By preventing such unfavorable changes on the roofs and in the immediate vicinity of buildings green areas are created. In the new buildings that are being erected and even in many old places, greenery is installed on the roofs, sometimes on the walls. Green roofs restore elements of biodiversity to cities and they have many functions - lowering temperature, absorbing water, cleaning the air, better insulation. Nature, if it is given a chance, perfectly adapts to changes in agglomerations, using every scrap of greenery, which Menno Schilthuizen interestingly tells about in the book "Evolution in the urban jungle".

# Energy efficiency

RAIN GARDEN IN GDYNIA, POLAND

(OWN PHOTOS)

RAIN GARDEN IN GDANSK, POLAND

(OWN PHOTOS)

Already experienced climate changes cause periodically occurring, among others, drought and heavy storms. The effect of this is a decrease in the amount of fresh water mobilizing to care for its every drop. One of the ideas helping with that occurrence is a rain garden, i.e. rainwater capture and management. The green roof, with properly selected vegetation, efficiently manages part of the rainwater, preventing local flooding. Excess water flowing down through specially designed downpipes (gutters) is discharged e.g. into underground rain gardens. Similar systems are designed for roadways and pavements.

## SUMMARY

It's good that individual buildings are being built in the Green Building standard. Every year there are more and more of them. However, the situation related to climate change, the need to save resources, minimize the amount of energy consumed can only be improved by a systemic approach to the issue and the design and implementation of green building and urban infrastructure. This is an exciting challenge that is an open field for innovative solutions based on understanding natural processes and a holistic approach to design.

## GLOSSARY:

### ECOLOGICAL FOOTPRINT

the ecological footprint of Europe is a proxy measure of the amount of biologically productive land and water areas that Europe requires to produce all the bio-logical resources it consumes and to absorb the emissions it generates, using prevailing technology and mana-gement strategies.

These areas could be located anywhere in the world. This can be compared with the biocapacity of the planet or the biocapacity available within a given region.

## WATER FOOTPRINT

the total amount of fresh water consumed by individuals, communities or companies to produce the goods and services consumer

**RETRIEVED 19.06.2020**

- *What is a water footprint?*

## PASSIVE HOUSE

**RETRIEVED 19.06.2020**

- *Passive house*

## SUSTAINABLE CONSTRUCTION

exerting less impact of industry on the environment due to use of renewable and recyclable resources, lower energy consumption and waste production, environmental protection

**RETRIEVED 19.06.2020**

- *What is sustainable construction and why is it important?*

## URBAN HEAT ISLAND

meteorological phenomenon consisting in increasing the temperature of the urban space relative to the surrounding undeveloped areas

**RETRIEVED 19.06.2020**

- *What is an urban heat island?*

**RETRIEVED 19.06.2020**

- *Urban heat island*

**TECHNOLOGICAL DEATH OF THE BUILDING**

methods of demolition and utilization or reuse of materials

**VERTICAL AXIS WIND TURBINE**

the main rotor shaft is positioned transversely to the wind, while the main components are at the base of the turbine

**RETRIEVED 19.06.2020**

- *Vertical axis wind turbine*

**SOLAR COLLECTOR**

device for converting solar energy into heat

**RETRIEVED 19.06.2020**

- *Energy education*

**PHOTOVOLTAIC PANEL**

**RETRIEVED 19.06.2020**

- *Photovoltaics*

**SOLAR PANEL**

a device consisting of solar cells connected together to generate electricity by converting solar rays

**RETRIEVED 19.06.2020**

- *Solar panel*

## RAIN GARDEN

hydrotechnical constructions in containers, on roofs or on the ground. They collect rainwater, clean it thanks to specially selected vegetation and gradually give it back to the ekosystem

**RETRIEVED 19.06.2020**

- *Rain garden*

## RECUPERATION OF / HEAT RECOVERY VENTILATION

mechanical ventilation with heat recovery operating between two sources at temperatures used in buildings to reduce the demand for heat energy from external sources

**RETRIEVED 19.06.2020**

- *Heat recovery ventilation*

## CITY VENTILATION CORRIDOR

pace within a city with a system close to linear, facilitating the penetration of air from areas surrounding the city to areas within the city, due to the fact that there is less resistance to the flowing air there or no resistance at all - e.g. river beds.

# KNOWLEDGEBASE

## Source of knowledge + links

| SUBJECT / LINK / SOURCE | |
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| CIRCULAR ECONOMY IN CONSTRUCTION / FROM BUILDING MATERIALS TO THE TECHNOLOGICAL DEATH OF THE BUILDING | eionet.europa.eu RETRIEVED 19.06.2020 |
| ECOLOGICAL FOOTPRINT | footprintnetwork.org RETRIEVED 19.06.2020 |

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| ECOLOGICAL FOOTPRINT OF EUROPEAN COUNTRIES | eea.europa.eu<br>RETRIEVED 19.06.2020 |
| TOTAL GREENHOUSE GAS EMISSION TRENDS AND PROJECTIONS IN EUROPE | eea.europa.eu<br>RETRIEVED 19.06.2020 |
| INTENSITY OF FINAL ENERGY CONSUMPTION IN EUROPE | eea.europa.eu<br>RETRIEVED 19.06.2020 |
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| EXCEEDANCE OF AIR QUALITY STANDARDS IN URBAN AREAS | eea.europa.eu<br>RETRIEVED 19.06.2020 |

## General information about green construction

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| CREATING LOW-CARBON CITIES | climate2020.org.uk<br>RETRIEVED 19.06.2020 |
| TOWARDS ZERO-CARBON BUILDING | climate2020.org.uk<br>RETRIEVED 19.06.2020 |

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| HOW CITIES MUST CHANGE | climate2020.org.uk<br>RETRIEVED 19.06.2020 |
| THE EUROPEAN PORTAL FOR ENERGY EFFICIENCY IN BUILDINGS | buildup.eu<br>RETRIEVED 20.06.2020 |
| LEED RATING SYSTEM AND EXAMPLES | usgbc.org<br>RETRIEVED 20.06.2020 |
| TOP 5 GREEN ROOF BENEFITS | buildings.com<br>RETRIEVED 20.06.2020 |

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| 12 REASONS WHY CLAY CONSTRUCTION PRODUCTS ARE SOCIALLY, ENVIRONMENTALLY AND ECONOMICALLY SUSTAINABLE | tiles-bricks.eu<br>RETRIEVED 20.06.2020 |
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| STRAW BALE CONSTRUCTION: A SUSTAINABLE AND RENEWABLE BUILDING MATERIAL | buildabroad.org<br>RETRIEVED 20.06.2020 |

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| INTELLIGENT ENERGY EUROPE | ec.europa.eu<br>RETRIEVED 20.06.2020 |

# National examples

## DENMARK

| | |
|---|---|
| DENMARK'S NATIONAL ENERGY EFFICIENCY ACTION PLAN | ec.europa.eu<br>RETRIEVED 20.06.2020 |
| A GUIDE TO THE MOST SUSTAINABLE BUILDINGS IN COPENHAGEN | scandinaviastandard.com<br>RETRIEVED 20.06.2020 |
| 8 EXAMPLES OF SUSTAINABLE ARCHITECTURE PROJECTS IN DENMARK | architecturequote.com<br>RETRIEVED 20.06.2020 |
| SUSTAINABLE ARCHITECTURE: COPENHAGEN IS SETTING NEW STANDARDS | blog.allplan.com<br>RETRIEVED 20.06.2020 |
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| ECO-INNOVATION IN DENMARK | ec.europa.eu<br>RETRIEVED 20.06.2020 |
| VARIOUS ECO ISSUES | ec.europa.eu<br>RETRIEVED 20.06.2020 |
| ECOLOGICAL MODERNIZATION | tandfonline.com<br>RETRIEVED 20.06.2020 |
| HOLISTIC SUSTAINABLE CONSTRUCTION | buildinggreen.eu<br>RETRIEVED 20.06.2020 |
| FIRST PASSIVE HOUSE | treehugger.com<br>RETRIEVED 20.06.2020 |
| EXAMPLES OF PASSIVE / LOW-ENERGY HOUSES | langenkamp.dk<br>RETRIEVED 20.06.2020 |
| THE PASSIVE HOUSE INSTITUTE (PHI) | passivehouse.com<br>RETRIEVED 20.06.2020 |
| **GERMANY** | |
| PASSIVE HOUSE | thesmartcitizen.org<br>RETRIEVED 20.06.2020 |

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| GERMANY'S INSIGHTS ON GREEN BUILDING | greenbiz.com<br>RETRIEVED 20.06.2020 |
| STATE IN GERMANY WITH MOST LEED CERTIFIED GREEN BUILDINGS | usgbc.org<br>RETRIEVED 20.06.2020 |
| GERMANY - FOUR DECADES OF SUSTAINABLE POLICYMAKING | thesolutionsjournal.com<br>RETRIEVED 20.06.2020 |
| MULTI-FAMILY PASSIVE HOUSE BUILDINGS IN GERMANY | passipedia.org<br>RETRIEVED 20.06.2020 |
| **SWEDEN** | |
| RESIDENTIAL MALMÖ SWEDEN | thenextgreen.ca<br>RETRIEVED 20.06.2020 |
| A TWO FAMILY HOUSE BUTLI TO PASSIVE STANDARD IN SWEDEN | diva-portal.org<br>RETRIEVED 20.06.2020 |
| DESCRIPTION OF THE PRINCIPLE OF PASSIVE AND DIVERSE DESIGN | wsp.com<br>RETRIEVED 20.06.2020 |
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| SWEDISH ORGANIZATIONS AND CERTIFICATION SCHEMES FOR ECOLOGICAL CONSTRUCTION | boverket.se<br>RETRIEVED 20.06.2020 |
| SOME GENERAL COMMENTS | swedishcleantech.com<br>RETRIEVED 20.06.2020 |
| GREEN BUILDING ASSESSMENT | researchgate.net<br>RETRIEVED 20.06.2020 |
| SWEDISH COUNCIL FOR ECOLOGICAL CONSTRUCTION | sgbc.se<br>RETRIEVED 20.06.2020 |
| 7 EXAMPLES OF SUSTAINABLE DEVELOPMENT | sweden.se<br>RETRIEVED 20.06.2020 |
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| LITHUANIA | |
| ECO-INNOVATION IN LITHUANIA 2014-15 | ec.europa.eu<br>RETRIEVED 20.06.2020 |
| SNOW ARENA IN DRUSKININKAI | ekonomie-management.cz<br>RETRIEVED 20.06.2020 |
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| **POLAND** | |
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# EXERCISE (1)

# STRENGTH BRIDGE

FOR GREEN TECH FUTURE!

## Background for the teacher:

Currently, there are more and more multi purpose buildings being built. Consequently, saving materials and using locally sourced materials become important issue. This helps to reduce the building's carbon footprint and resource consumption, often non-renewable, e.g. sand. Minimizing the amount of materials used in the construction process, without reducing the strength and quality of the building reduces construction costs, save valuable raw materials, reduce the use of energy for the production of building materials, and after the technical death of the building facilitates their disposal. Therefore, Green building is most often a skeleton building with an innovative skeleton structure filled with well-insulating materials. Strong construction creates the possibility of creating interesting, sometimes surprising shapes of buildings.

# EXERCISE (1)

Time: 20 min

| | TASK EXPERIENCE | IMPLEMENTATION |
|---|---|---|
| 1 | EXERCISE TITLE: | STRENGTH BRIDGE |
| 2 | TARGET OF THE EXERCISE: | Verification of the material strength depending on the construction used and design. Experience the possibilities of savings materials used in construction; Experience the possibility of reducing the amount of materials used in construction without reducing the quality of the structure. |
| 3 | DETAILED DESCRIPTION OF THE EXERCISE: | The teacher divides experience participants into groups of maximum four people. Each group receives five the same-size daily newspaper sheets and two chairs. Chairs should be placed back to back at a distance of approx. 50 cm from each other. All groups have 15 minutes to construct a bridge from newspapers connecting two chairs. After finishing the task, the strength of the structure is checked successively by placing student books or shoes on them. All participants are jury. The design that will support the heaviest weight wins. (15 minutes) |

| | | |
|---|---|---|
| 4 | MATERIALS NEEDED: | FIVE SHEETS OF DAILY NEWSPAPER, TWO CHAIRS WITH BACKS, A SET OF PARTICIPANT'S BOOKS OR SHOES |
| 5 | EFFECTS: | The exercise visualizes how using a small amount of materials and using a well thought-out structure, can build a durable and durable building. It also shows that skeletal structures are durable and allow you to design and build innovative, non-material-intensive buildings with interesting shapes.<br><br>Students understand the principle of skeletal structures, their low material consumption. They know that the skeletal structure can be filled with a variety of materials, often locally available, with good thermal properties.<br><br>Experience can also be an inspiration to further search and expand knowledge of construction and statics.<br><br>Experience may encourage to undertake technical studies at the polytechnic related to construction, architecture and constr-uctions in the future. |

EXERCISE (1)

# KNOWLEDGEBASE

## Source of knowledge + links

| SUBJECT / LINK / SOURCE | |
|---|---|
| **General information about the subject** | |
| SWEDISH SUSTAINABLE BUILDING | formas.se RETRIEVED 19.06.2020 |
| DENMARK'S BUILDINGS | theculturetrip.com RETRIEVED 19.06.2020 |
| GERMANY TIMBER CONSTRUCTION IN THE CITY | goethe.de RETRIEVED 19.06.2020 |
| ARCHITECTURE IN LITHUANIA | truelithuania.com RETRIEVED 19.06.2020 |
| POLISH SKYSCRAPERS | culture.pl RETRIEVED 19.06.2020 |

# EXERCISE (2)

# PASSIVE HOUSE, IS IT WORTH IT?

## CONVINCE A POTENTIAL INVESTOR

FOR GREEN TECH FUTURE!

## Background for the teacher:

A passive house is still not a very popular way of building. Investors often give up having a passive house because of higher construction costs. They amount to 10-20% more than a traditional house. This difference is caused primarily by a very careful insulation of the house and the use of modern ventilation equipment, possibly a heat pump or solar collectors.
On the other hand, operating costs are often forgotten, in which the cost of energy is an important element. It is worth trying to calculate how the percentage of annual energy costs in individual types of houses will differ. This simplified approach will show the advantages of a passive house.

**Annual energy demand:**

- passive house - 15 kWh/m2
- energy-efficient house – 50 kWh/m2
- traditional house – 120 kWh/m2

# EXERCISE (2)

Time: 15 min

| | TASK EXPERIENCE | IMPLEMENTATION |
|---|---|---|
| 1 | EXERCISE TITLE: | **PASSIVE HOUSE IS IT WORTH IT?**<br>CONVINCE A POTENTIAL INVESTOR. |
| 2 | TARGET OF THE EXERCISE: | Verification of the benefits of building a passive house. Convincing a potential investor to buy / build a passive house. Demonstration of environmental benefits but above all economic during many years of operation. Comparison of percentage differences in annual amounts of energy consumption per 1 m2 between a passive building, an energy-saving and traditional one. You can also, knowing the current amount of energy cost in a given country, calculate how much the annual energy consumption will cost in each type of home. |
| 3 | DETAILED DESCRIPTION OF THE EXERCISE: | The teacher divides experience participants into groups of maximum 4. Half of the groups write benefits and burdens for the environment, while the other half calculate the costs at the construction and operation stages indicating the burdens and economic benefits. |

| | | |
|---|---|---|
| | Calculations are made for buildings with an area of 100 m2.<br><br>Annual energy demand for:<br>• a traditional house - 120 kWh / m2<br>• energy-saving house - 50 kWh / m2<br>• a passive house 15 kWh / m2<br><br>*How soon will the investor get the benefits?*<br><br>*By what % will the annual fees for energy in a passive house be lower?*<br><br>After finishing the work, the leaders present its results. Discussion. | |
| 4 | MATERIALS NEEDED: | LARGE SHEETS OF PAPER, MARKERS |
| 5 | EFFECTS: | 1. The exercise visualizes environmental and economic benefits of building passive house.<br>2. The result of the experience gives arguments to convince the potential investor that it is worth building a passive house. |

## The formula to calculate:

$$\frac{15\ kWh/m^2 \times 100\%}{120\ kWh/m^2} = X$$

OR:

$$\frac{15\ kWh/m^2 \times 100\%}{50\ kWh/m^2} = X$$

120 kWh/m² OR: 50 kWh/m² = 100%

15 kWh/m² = X

X – % cost of annual operation of 1 m2 in a passive house

12.5% of the cost in a traditional house and 30% of the cost in an energy-efficient house, i.e. the cost of annual energy of a passive house is 87.5% lower than a traditional house and 70% lower than an energy-efficient house

## The formula to calculate:

$$\frac{15\ kWh/m^2 \times 100\%}{120\ kWh/m^2} = X$$

OR:

$$\frac{15\ kWh/m^2 \times 100\%}{50\ kWh/m^2} = X$$

EXERCISE (2)

# KNOWLEDGEBASE

## Source of knowledge + links

| SUBJECT / LINK / SOURCE | |
|---|---|
| **General information about the subject** | |
| BUILDING A GREEN HOME, PASSIVE HOUSE | insularcorporation.com<br>RETRIEVED 20.06.2020 |

# EXERCISE (3)

# DO NOT POUR WATER, COLLECT WATER

FOR GREEN TECH FUTURE!

## Background for the teacher:

Water is becoming a scarce resource in the world. And as you know, it is necessary for the life of all organisms on Earth. Its lack threatens biodiversity and environmental well-being. We are dealing with the lack of it, prolonged drought or alternating rainfall, as a result of climate change. For this reason, you should learn to care for every drop of water.

Cities with concreted streets, squares and buildings contribute to the rapid flow and evaporation of water creating urban heat islands.

In order to create a favorable microclimate and to involve cities in the process of saving and storing water, an innovative approach of urban planners and architects is necessary. Hence the design projects of green buildings / garden buildings. Green areas, planted with plants on the roofs, capture and store rainwater. A system for intercepting and pre-treating rainwater from streets and pavements in the so-called rain garden. Properly selected and designed vegetation supports other ways to capture rainwater (tanks from which water is used to flush toilets or water flowerbeds).

# EXERCISE (3)

Time: 15 min

| | TASK EXPERIENCE | IMPLEMENTATION |
|---|---|---|
| 1 | EXERCISE TITLE: | DO NOT POUR WATER, COLLECT WATER |
| 2 | TARGET OF THE EXERCISE: | Focusing on to the huge role of biologically active surfaces / slowing down the runoff of rainwater / natural and artificial rainwater reservoirs. Possibilities of using rainwater in construction and urban planning, as well as preventing excessive water consumption and creating a favorable microclimate in urban spaces. Indication that water storage is a chance for its proper circulation in nature, beneficial effect on biodiversity, prevention of urban heat islands... |
| 3 | DETAILED DESCRIPTION OF THE EXERCISE: | Students prepare a board with garden hoses according to the teacher's instructions before class. Install straight garden hose to the edge of the board. Place the second garden hose (2m) with bends (meanders) over a length of 1m. Set the board with hoses at a 30° angle to the floor. Mount funnels on top of the hoses. Place a bowl under the outlet of the hoses. |

| | | |
|---|---|---|
| | | Fill one bowl with a sponge or sod or moss and place it under the meandering hose. Place empty bowl under a straight hose. Pour water from the bottles into each funnel at the same time and watch what happens. As all the water from the bottles flows through the hoses into the bowls, try to pour it into separate buckets without removing the sponge / turf. Hold it so that it doesn't fall out. Check how much water will go from each bowl to each bucket. (10 minutes) |
| 4 | MATERIALS NEEDED: | • 2 PLASTIC GARDEN HOSES - ONE 1M LONG, THE OTHER 2M LONG<br>• BOARD (CARDBOARD, PLYWOOD) 1M LONG, WIDTH MIN. 0,5M<br>• 2X 1,5L BOTTLES<br>• 2 BOWLS OF THE SAME SIZE TO ACCOMMODATE MIN. 1.5 L OF WATER<br>• 2 FUNNELS<br>• SPONGE OR TURF OR MOSS<br>• 2 BUCKETS / 1.5 LITER JARS / BOWLS |
| 5 | EFFECTS: | 1. Understanding the role of water in processes occurring in nature and the need to save it.<br>2. Highlighting the importance of biodiversity and natural ecosystems in the maximum use of water in the process of creating a favorable microclimate of green cities and buildings.<br>3. The student is able to identify the benefits from the use of rainwater.<br>4. He knows what is the green roof. |

EXERCISE (3)

# KNOWLEDGEBASE

## Source of knowledge + links

| SUBJECT / LINK / SOURCE | |
|---|---|
| **General information about the subject: Green roofs** | |
| SWEDEN | |
| GREEN BUILDING | buildinggreen.com RETRIEVED 20.06.2020 |
| SCANDINAVIAN GREEN ROOF INSTITUTE | towardsthehumancity.org RETRIEVED 20.06.2020 |
| AUGUSTENBORG BOTANICAL ROOF GARDEN | greenroofs.com RETRIEVED 20.06.2020 |
| HYDROLOGICAL FUNCTION OF A THIN EXTENSIVE GREEN ROOF IN SOUTHERN SWEDEN | researchgate.net RETRIEVED 20.06.2020 |

# EXERCISE (3)

DENMARK

| | |
|---|---|
| GREEN ROOFS | loe.org<br>RETRIEVED 20.06.2020 |
| GREEN ROOFS COPENHAGEN | 44mpa.pl<br>RETRIEVED 20.06.2020 |
| COPENHAGEN ADOPTS A MANDATORY GREEN ROOF POLICY | inhabitat.com<br>RETRIEVED 20.06.2020 |
| COPENHAGEN'S GREEN FUTURE IS BUILT ON THE ROOFTOPS | smartcitylab.com<br>RETRIEVED 20.06.2020 |
| SUSTAINABLE URBAN PLANNING | cultourmagazine.eu<br>RETRIEVED 20.06.2020 |

GERMANY

| | |
|---|---|
| GREEN ROOF POLICIES | institutocidadejardim.files.wordpress.com<br>RETRIEVED 20.06.2020 |
| GERMANY: STATE WHERE GREEN ROOFS ARE BECOMING PART OF ARCHITECTURAL TRADITIONS | yeu-international.org<br>RETRIEVED 20.06.2020 |

# EXERCISE (3)

GERMANY

| | |
|---|---|
| GREEN SIDE OF DUESSELDORF | zinco-greenroof.com<br>RETRIEVED 20.06.2020 |
| HAMBURG'S GREEN ROOF STRATEGY | climate-adapt.eea.europa.eu<br>RETRIEVED 20.06.2020 |

LITHUANIA

| | |
|---|---|
| BUILDING A GREEN ROOF | vsaa.lt<br>RETRIEVED 20.06.2020 |

POLAND

| | |
|---|---|
| PROBLEMS AND BENEFITS OF USING GREEN ROOFS | iopscience.iop.org<br>RETRIEVED 20.06.2020 |
| GREEN ROOFS AND WALLS IN POLAND | storymaps.arcgis.com<br>RETRIEVED 20.06.2020 |

# EXERCISE (3)

## General information about the subject: Rain garden

### SWEDEN

| | |
|---|---|
| RAIN BORDERS IN GOTHENBURG | klimatanpassning.se RETRIEVED 20.06.2020 |
| URBAN NATURE ATLAS | naturvation.eu RETRIEVED 20.06.2020 |

### DENMARK

| | |
|---|---|
| SUSTAINABLE URBAN DRAINAGE SYSTEMS | orbit.dtu.dk RETRIEVED 20.06.2020 |
| RAIN GARDENS | books.google.pl RETRIEVED 20.06.2020 |
| HOUSE WITH RAIN GARDEN | wsud-denmark.com RETRIEVED 20.06.2020 |

### GERMANY

| | |
|---|---|
| SEVEN MYTHS ABOUT RAIN GARDENS | fairfaxcounty.gov RETRIEVED 20.06.2020 |
| WATER BALANCE | sieker.de RETRIEVED 20.06.2020 |

# EXERCISE (3)

POLAND

| | |
|---|---|
| CITY GREENING BY RAIN GARDENS - COSTS AND BENEFITS | content.sciendo.com RETRIEVED 20.06.2020 |
| GDYNIA RAIN GARDEN | innovationinpolitics.eu RETRIEVED 20.06.2020 |
| FLOWER MEADOWS AND RAIN GARDENS | stopsuszy.pl RETRIEVED 20.06.2020 |
| DISCOVER THE RAIN GARDENS OF GDANSK | themayor.eu RETRIEVED 20.06.2020 |

# EXERCISE (4)

# GREEN CROSSWORD

## Background for the teacher:

Green building is characterized by a specific approach to saving materials and energy, both heat and electricity. The use, where possible, natural materials and renewable energy. Maximum use of natural lighting and heat from the heating of building surfaces by the Sun. It is also very important to use rainwater in the building as well as the use of e.g. roof crops to use water to create a friendly microclimate, prevent urban heat islands and reduce the water footprint.

Green building, like most disciplines, has its own specific terminology. Understanding of naming helps you understand the topic and further expand your knowledge.

# EXERCISE (4)

Time: 15 min

| | TASK EXPERIENCE | IMPLEMENTATION |
|---|---|---|
| 1 | EXERCISE TITLE: | GREEN CROSSWORD |
| 2 | TARGET OF THE EXERCISE: | Knowledge and understanding of concepts related to green construction. |
| 3 | DETAILED DESCRIPTION OF THE EXERCISE: | A group of maximum 2 students completes the crossword by entering individual entries. The main slogan will appear in the well-filled green fields, which is the name of the area in subject. In addition, students will create phrases related to the environment and green construction/building based on the terms entered in the crossword. (10 minutes) |
| 4 | MATERIALS NEEDED: | A PRINTED A4 SHEET WITH A CROSSWORD AND SLOGANS (APPENDIX 1 FOR TEACHER AND 2 FOR STUDENTS) A PEN, PENCIL OR MARKER |
| 5 | EFFECTS: | Knowledge of the correct nomenclature in the Green building glossary and understanding of its meaning. Ability to use the correct terminology. |

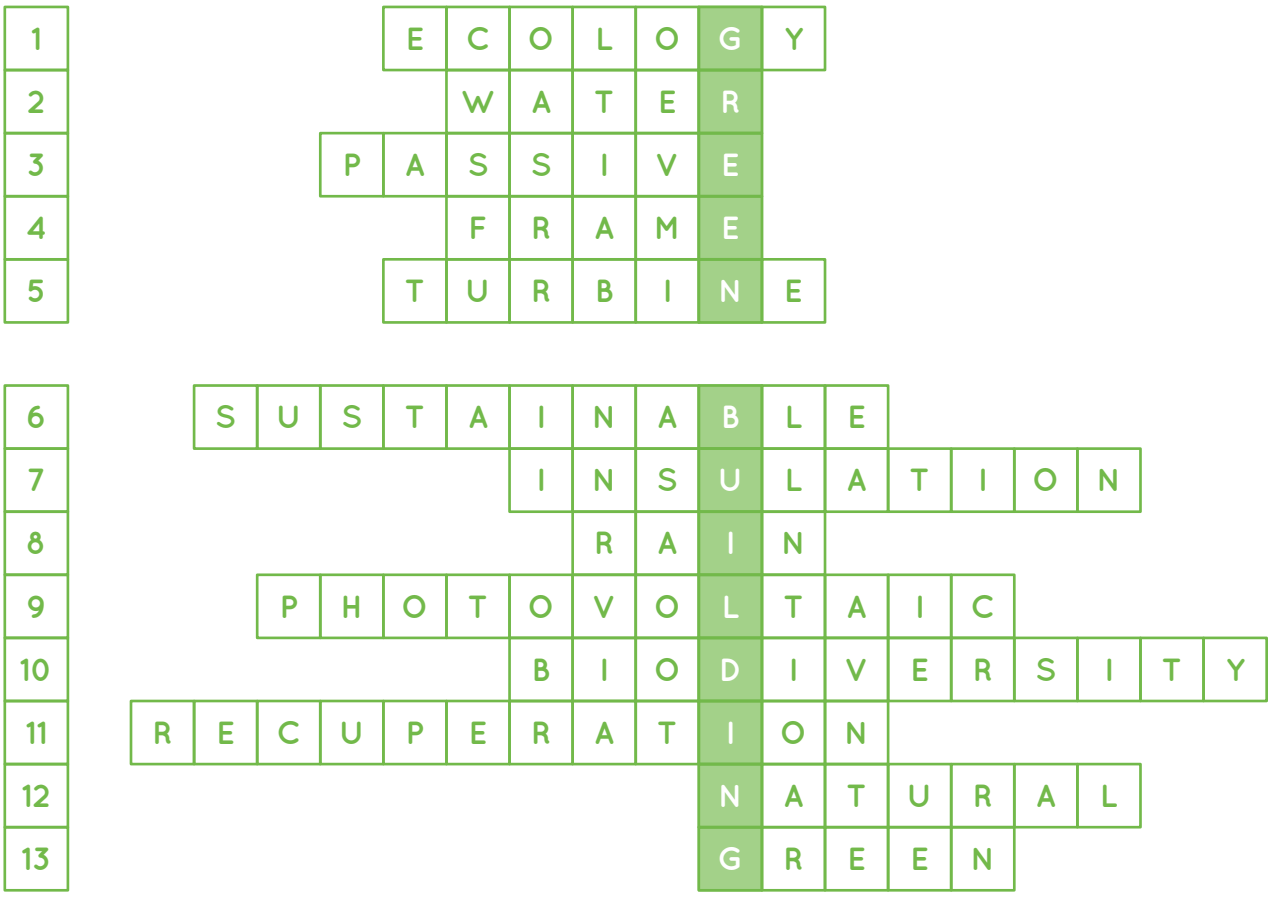
EXERCISE (4)

# KNOWLEDGEBASE

## Source of knowledge + links

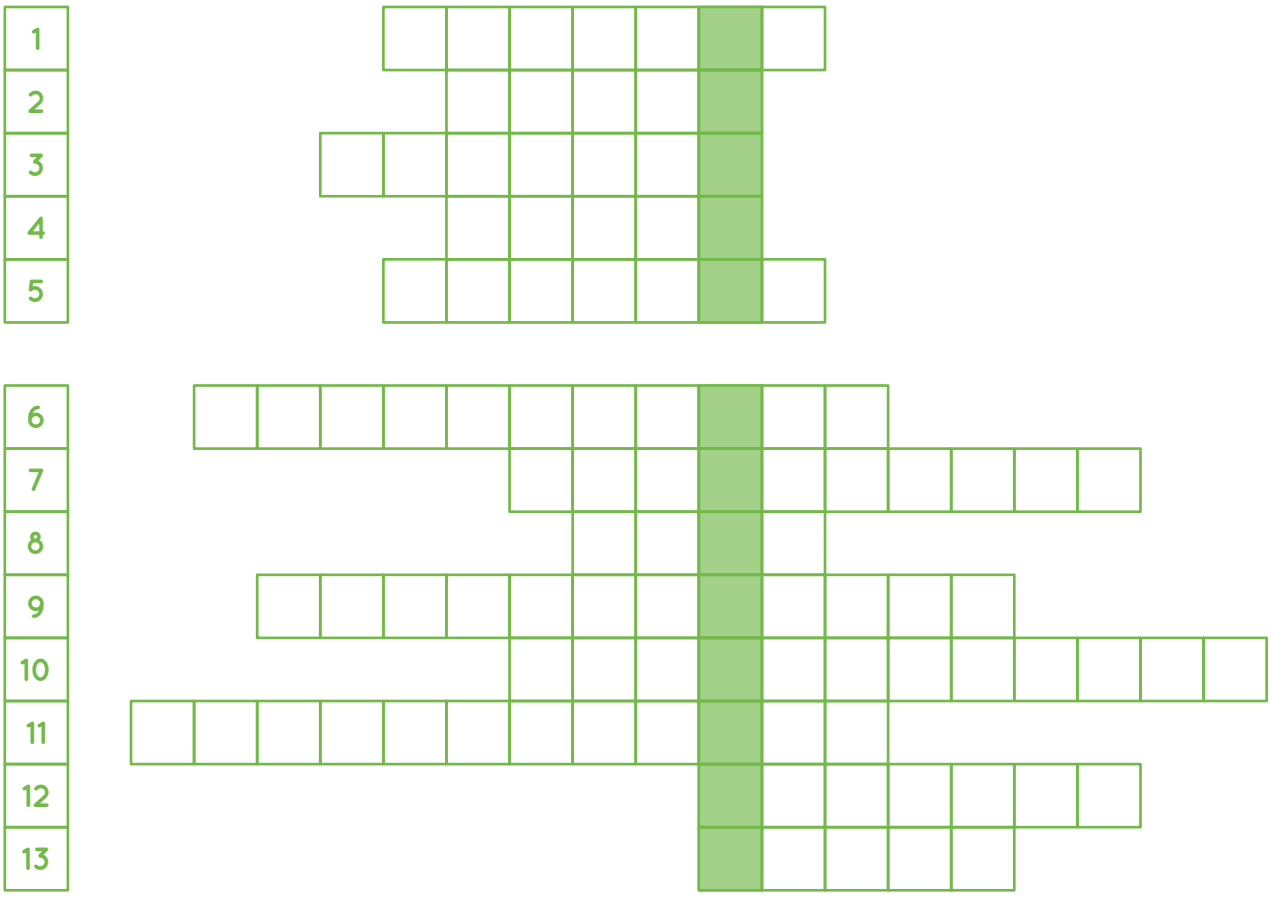
| SUBJECT / LINK / SOURCE | |
|---|---|
| **General information about the subject** | |
| GREEN BUILDING | yourdictionary.com<br>RETRIEVED 20.06.2020 |
| GREEN BUILDING GLOSSARY | greenspec.co.uk<br>RETRIEVED 20.06.2020 |

# GREEN CROSSWORD:




1. ECOLOGY - SCIENCE ABOUT THE STRUCTURE AND FUNCTIONING OF NATURE
2. WATER FOOTPRINT – ITS LACK IS THREAT TO BIODIVERSITY AND LIFE
1. PASSIVE HOUSE - BUILDING WITH LOW ENERGY DEMAND
2. FRAME STRUCTURE – NAME OF CONSTRUCTION WITH FILLING
3. VERTICAL WIND TURBINE - A DEVICE THAT CONVERTS WIND INTO ELECTRICITY
4. SUSTAINABLE CONSTRUCTION - ENVIRONMENT, CONSTRUCTION, TRANSPORT BEST PERFORMANCE
7. INSULATION – WAY OF PROTECTING ADJACENT SPACES AGAINST MUTUAL INFLUENCE
8. RAIN GARDEN – WATER FROM CLOUDS
9. PHOTOVOLTAIC PANEL - PANELS PRODUCING RENEWABLE ELECTRICITY
10. BIODIVERSITY - DIVERSITY OF PLANT AND ANIMAL SPECIES
11. RECUPERATION - MECHANICAL VENTILATION WITH HEAT RECOVERY
8. NATURAL MATERIAL - PRODUCED BY ENVIRONMENT MATERIALS
9. GREEN ROOF - NAME OF ROOF WITH COVER ALLOWING IT TO CULTURE PLANTS

# GREEN CROSSWORD:




1. SCIENCE ABOUT THE STRUCTURE AND FUNCTIONING OF NATURE
2. ITS LACK IS THREAT TO BIODIVERSITY AND LIFE
3. BUILDING WITH LOW ENERGY DEMAND
4. NAME OF CONSTRUCTION WITH FILLING
5. A DEVICE THAT CONVERTS WIND INTO ELECTRICITY
6. ENVIRONMENT, CONSTRUCTION, TRANSPORT BEST PERFORMANCE
7. WAY OF PROTECTING ADJACENT SPACES AGAINST MUTUAL INFLUENCE
8. WATER FROM CLOUDS
9. PANELS PRODUCING RENEWABLE ELECTRICITY
10. DIVERSITY OF PLANT AND ANIMAL SPECIES
11. MECHANICAL VENTILATION WITH HEAT RECOVERY
12. PRODUCED BY ENVIRONMENT MATERIALS
13. NAME OF ROOF WITH COVER ALLOWING IT TO CULTURE PLANTS

# EXERCISE (5)

# DESIGN A PASSIVE HOUSE

FOR GREEN TECH FUTURE!

## Background for the teacher:

A passive house is a house with a simple, compact shape, well insulated and airtight. It acquires as much heat as possible by combining the internal heat of people, household appliances, etc. with passive solar energy through glazing of southern facades and with heat recovery from ventilation through the use of heat exchangers in installations and thanks to excellent insulation, minimizing its losses. The day zone should be located from the South. Rooms with large windows, in addition to heat accumulation, allow for good interior lighting and reduce electricity consumption. In this type of buildings, as a rule, technical rooms, sanitary facilities, kitchens and passageways are designed with a minimum number of windows and are located from the North. While the heat demand for a traditional building is 120 kWh / m2, energy saving about 50 kWh / m2, a passive house consumes only 15 kWh / m2.

# EXERCISE (5)

Time: 20 min

| | TASK EXPERIENCE | IMPLEMENTATION |
|---|---|---|
| 1 | EXERCISE TITLE: | DESIGN<br>A PASSIVE HOUSE |
| 2 | TARGET OF<br>THE EXERCISE: | Understanding of passive building design principle and its role in reducing greenhouse gas emissions, i.e. the carbon footprint. |
| 3 | DETAILED<br>DESCRIPTION<br>OF THE EXERCISE: | The teacher recommend students to become familiar with the passive house principle before the class. Teacher shares sources of knowledge.<br>A group of maximum 3 students designs a passive house. The project presents the ground floor plan and floor plan with an indication of the room functions, number and size of windows and doors. It is important to mark the geographical sides of the world.<br>Students presenting the project indicate the differences between a passive and energy-saving building. (15 – 20 minutes) |

| | | |
|---|---|---|
| | After presentations discuss with students:<br>• Which countries use the most nonrenewable energy and why?<br>• How the presence of natural resources effects diversity<br>and development of the renewable energy sources used?<br><br>Now students discuss in groups:<br>• What arguments would you use to convince the government in given country to give up nonrenewable fuels.<br><br>Each group has a 30 second to present its argumentation. | |
| 4 | MATERIALS NEEDED: | CARDS WITH A MINIMUM DIMENSION A3<br><br>PENCILS, MARKERS, CRAYONS |
| 5 | EFFECTS: | 1. Understanding the principles of house design, visualization of plans, teamwork.<br>2. Understanding how a passive house works and its role in reducing CO2 emissions. Interest students in specific technical solutions and encourage them to look for new ones.<br>3. The student knows what a passive house is.<br><br>Can indicate:<br>- how to position the building in relation to the parts of the Word<br>- how the location of interiors with different functions affects the use of natural lighting<br>- how the concept of the building body minimizes the consumption of thermal energy and maximizes the use of solar heat |

EXERCISE (5)

# KNOWLEDGEBASE

## Source of knowledge + links

| SUBJECT / LINK / SOURCE | |
|---|---|
| **General information about the subject** | |
| GERMANY | |
| THE PASSIVE HOUSE INSTITUTE | passivehouse.com RETRIEVED 20.06.2020 |
| GERMAN MUNICIPALITIES LEAD | thesmartcitizen.org RETRIEVED 20.06.2020 |
| PASSIVE HOMES HEAT UP AROUND THE WORLD | inhabitat.com RETRIEVED 20.06.2020 |
| GERMANY LEADS THE CHARGE IN LOW -ENERGY HOMES | dw.com RETRIEVED 20.06.2020 |

# EXERCISE (5)

DENMARK

| | |
|---|---|
| CONCEPTS OF PASSIVE HOUSES | vbn.aau.dk<br>RETRIEVED 20.06.2020 |
| STRATEGY FOR PASSIVE | vbn.aau.dk<br>RETRIEVED 20.06.2020 |

SWEDEN

| | |
|---|---|
| CITY BUILDS 'PASSIVE HOUSES' - $CO_2$ REDUCTION TARGETS | theguardian.com<br>RETRIEVED 20.06.2020 |
| PASSIVE HOUSES IN STOCKHOLM | dwell.com<br>RETRIEVED 20.06.2020 |
| SWEDEN - PASSIVE HOUSES | lth.se<br>RETRIEVED 20.06.2020 |
| PASSIVE HOUSES FOR ACTIVE PEOPLE | majuprojekti.lv<br>RETRIEVED 20.06.2020 |

LITHUANIA

| | |
|---|---|
| HEATING LOAD DETERMINATION FOR PASSIVE BUILDINGS IN CLIMATE CONDITIONS | researchgate.net<br>RETRIEVED 20.06.2020 |

# EXERCISE (5)

POLAND

| | |
|---|---|
| PASSIVE HOUSE APPLICATION FOR CLIMATE | core.ac.uk<br>RETRIEVED 20.06.2020 |
| CERTIFIED PASSIVE BUILDING IN POLAND | buildup.eu<br>RETRIEVED 20.06.2020 |
| POLAND - PASSIVE HOUSES | drewland.com.pl<br>RETRIEVED 20.06.2020 |

# Effects

Students will learn how huge number of people live in cities and is expected to grow further in the next 40 years. The stock of existing and constantly emerging buildings is huge. This is associated with a change in land use, the need for aggregate mining, CO2 emissions, energy consumption at every stage of building construction and life. Based on research published by the EU, it is estimated that residential buildings in Europe are responsible for 40% of energy consumption and 36% of CO2 emissions to the atmosphere [1]. In addition, construction accounts for around half of all extracted materials, a third of water consumption, and a third of waste production. Some of them, such as aggregates, as well as traditional energy sources are non-renewable. This is a huge burden on the environment, especially in face of climate change.

Students will become acquainted with the idea of Green building and understand why changing the approach to urban space design, building technologies, building design and operation is so important. Green building is an innovative look at the shape and functions of the building as well as a whole range of issues and associated technologies. It is designing new or using old materials in an innovative way so as to make the best use of their properties and reduce their consumption by reducing the level of energy consumption during the production of materials, their transport, construction, operation of the building and its utilization. Another challenge is the building's self-sufficiency or even the production of surplus energy thanks to installed renewable energy production equipment and green roofs absorbing rainwater. It is also the entire sector of technical devices and building equipment as well as specialists and certificates.

Stimulating innovative thinking in construction should be supported by well-thought-out financing and rewarding green investment systems, e.g. grants, partly repayable loans or reduction of energy bills. In public procurement, green design and construction should be given priority, which will result in recovery, economic and environmental. This applies to both new buildings and the modernization of old ones. An important element in the dissemination and availability of knowledge about Green building should be the digitization of information on the principles of building and financing, as well as easily accessible expert advice.

Currently, employment in the global construction sector is 7%, or about 220 million jobs. There are 18 million construction workers in Europe alone. Students will learn that Green Building is a huge, interesting and innovative job market that creates the demand for employees of various levels in construction and many supporting fields. It is also a chance for the creation of new, attractive professions.

# KNOWLEDGEBASE

## Source of knowledge + links

| SUBJECT / LINK / SOURCE | |
|---|---|
| **General information about the subject** | |
| [1] ENERGY RATING FOR GREEN BUILDINGS IN EUROPE | bit.ly/3180YBk RETRIEVED 20.06.2020 |
| BUILDING SUSTAINABILITY PERFORMANCE | bit.ly/2NbFFa6 RETRIEVED 20.06.2020 |
| COVID-19 STIMULUS SPENDING FOR GREEN CONSTRUCTION | bit.ly/3dhnr1y RETRIEVED 20.06.2020 |
| THE CASE FOR GREEN BUILDINGS IN THE COVID-19 RECOVERY | bit.ly/2YP5rGu RETRIEVED 20.06.2020 |

## Main goal:

Learning the Green Building principle, i.e. an innovative approach to city design and solutions promoted in residential, office and industrial construction. Classes will be taught how construction copes with the challenges of twenty-first century. They will show what solutions are used to minimize the amount of materials, electricity and heat used e.g. a passive building? How buildings get involved in creating a favorable urban microclimate, saving water and managing rainwater?

## Knowledge and skills:

**THE STUDENT WILL FIND OUT:**

- WHAT IS ENVIRONMENTAL RESPONSIBILITY? HOW DIFFERENT AREAS OF LIFE ARE INTERRELATED AND AFFECT THE ENVIRONMENT - E.G. TRANSPORT, CONSTRUCTION, EXPLOITATION OF NATURAL RESOURCES, ENVIRONMENT POLLUTION
- WHAT CONTRIBUTES TO THE IDEA OF GREEN BUILDING?
- GREEN BUILDING IS NOT ONLY CONSTRUCTION AND TECHNICAL SOLUTIONS, BUT THE PHILOSOPHY OF APPROACH TO THE METHOD OF SPATIAL PLANNING, CONSTRUCT-ING AND USE OF MATERIALS, SO THAT AT EVERY STAGE (FROM THE PRODUCTION OF BUILDING MATERIALS THROUGH DESIGN) CONSTRUCTION, OPERATION OF THE BUILDING, TO THE DISPOSAL OF MATERIALS AFTER ITS TECHNICAL DEATH, IT SHOULD CREATE THE SMALLEST POSSIBLE CARBON AND WATER FOOTPRINT (CIRCULAR ECONOMY IN CONSTRUCTION)

**THE STUDENT WILL BE ABLE TO:**

- INDICATE THE MOST IMPORTANT ISSUES RELATED TO GREEN BUILDING (PASSIVE BUILDING, INTELLIGENT BUILDING, SKELETAL STRUCTURES...)
- DEMONSTRATE THE RELATIONSHIP BETWEEN THE USE OF GREEN BUILDING AND THE IMPROVEMENT OF ENVIRONMENT QUALITY (REDUCTION OF ENERGY CONSUMPTION AT EVERY STAGE OF CONSTRUCTION, USE OF NATURAL AND LOCAL MATERIALS, USE OF RENEWABLE ENERGY)
- COOPERATE WITH PEERS WHILE PERFORMING CREATIVE EXPERIMENTS

# SCENARIO

| Time | Goals, Objectives, Skills achieved | Materials, Contents | Working methods |
|---|---|---|---|
| | **Warm up activities** | | |
| 5 | <u>Greeting students</u><br><br>Teacher asks students to write on the board in which world they would like to live in 20 years.<br><br>Hints:<br>*View from your window?*<br>*View around the school.*<br>*What color dominates?*<br>*What can I hear when I open the window?*<br><br>Teacher gives the slogan Green Building - and asks students if they understand this term? | BLACKBOARD / WHITEBOARD / FLIP CHART,<br><br>CHALK AND MARKERS | DISCUSSION, BRAINSTORM |

| Time | Goals, Objectives, Skills achieved | Materials, Contents | Working methods |
|---|---|---|---|
| 10 | <u>The identification and definition of the problem:</u><br>• why an innovative approach to design and building should be applied using the Green building principle<br>• drawing attention to the multifaceted aspect of the issue (type of constructions and materials used, energy and water savings...)<br>• highlighting the Green building issue to which group exercises will relate - e.g. construction and creating a favorable microclimate in the city, alternatively the principles of building passive houses and their advantages<br>• inspirational examples of using Green building | A COMPUTER WITH SOME EXAMPLES CHOSEN BY THE TEACHER,<br>COMPUTER, PROJECTOR | SHORT INTRODUCTORY TALK |

| Time | Goals, Objectives, Skills achieved | Materials, Contents | Working methods |
|---|---|---|---|
| | **Development and practice** | | |
| 2 | The teacher divides the team into groups by using color cards.<br><br>Gives groups experiment / exercise cards and explains how to work in groups and present the effects | COLORFUL STICKY NOTES AND EXERCISE CARDS TO WORK ON | 2 EXPERIMENTS SELECTED BY THE TEACHER FROM 5 PROPOSED.<br><br>EACH GROUP CAN PERFORM THE SAME OR DIFFERENT TASKS |
| 15 | Each group carries out one exercise selected by the teacher, e.g. regarding construction (fiche 1) and a green roof with a green garden (fiche 3) alternatively a passive house design (fiche 5) and an indication of the environmental and financial benefits of having it (fiche 2) | MATERIALS INDICATED IN EXPERIMENTS 1 AND 3, ALTERNATIVELY 2 AND 5 | EMPIRICAL WORK IN GROUPS, TEAMWORK<br><br>The teacher controls the pace of teamwork and motivates to innovative solutions |
| | **Wrap up** | | |
| 10 | Students present the results of the group work - short proposals in points | MATERIALS USED TO PERFORM EXERCISES, SHEETS OF PAPER / BOARD / FLIP CHART ... | PRESENTATION OF THE CONCLUSIONS BY THE GROUP LEADER AND DISCUSSION |

| Time | Goals, Objectives, Skills achieved | Materials, Contents | Working methods |
|---|---|---|---|
| 2 | The teacher summarizes the work of students, thanks them for their involvement in the teamwork, highlights interesting ideas and encourages to think about the possibility of widespread use of the Green building idea in their everyday life | WORDS, BLACKBOARD, PAPER | CONCLUSIONS, SUMMARY |
| 1 | <u>Homework:</u><br>The teacher encourages to broaden knowledge about innovative Green building solutions - distributes cards with links / sends links via e-mail / communication system agreed | CARDS WITH LINKS OR E-MAILS | OUT OF SCHOOL STUDENTS' OWN WORK |


FOR GREEN TECH FUTURE!

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