Green Building

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Green Building

- Green building refers to both a structure and the using of processes that are environmentally responsible and resource-efficient throughout a building's life-cycle: from siting to design, construction, operation, maintenance, renovation, and demolition

- In other words, green building design involves finding the balance between homebuilding and the sustainable environment. This requires close cooperation of the design team, the architects, the engineers, and the client at all project stages

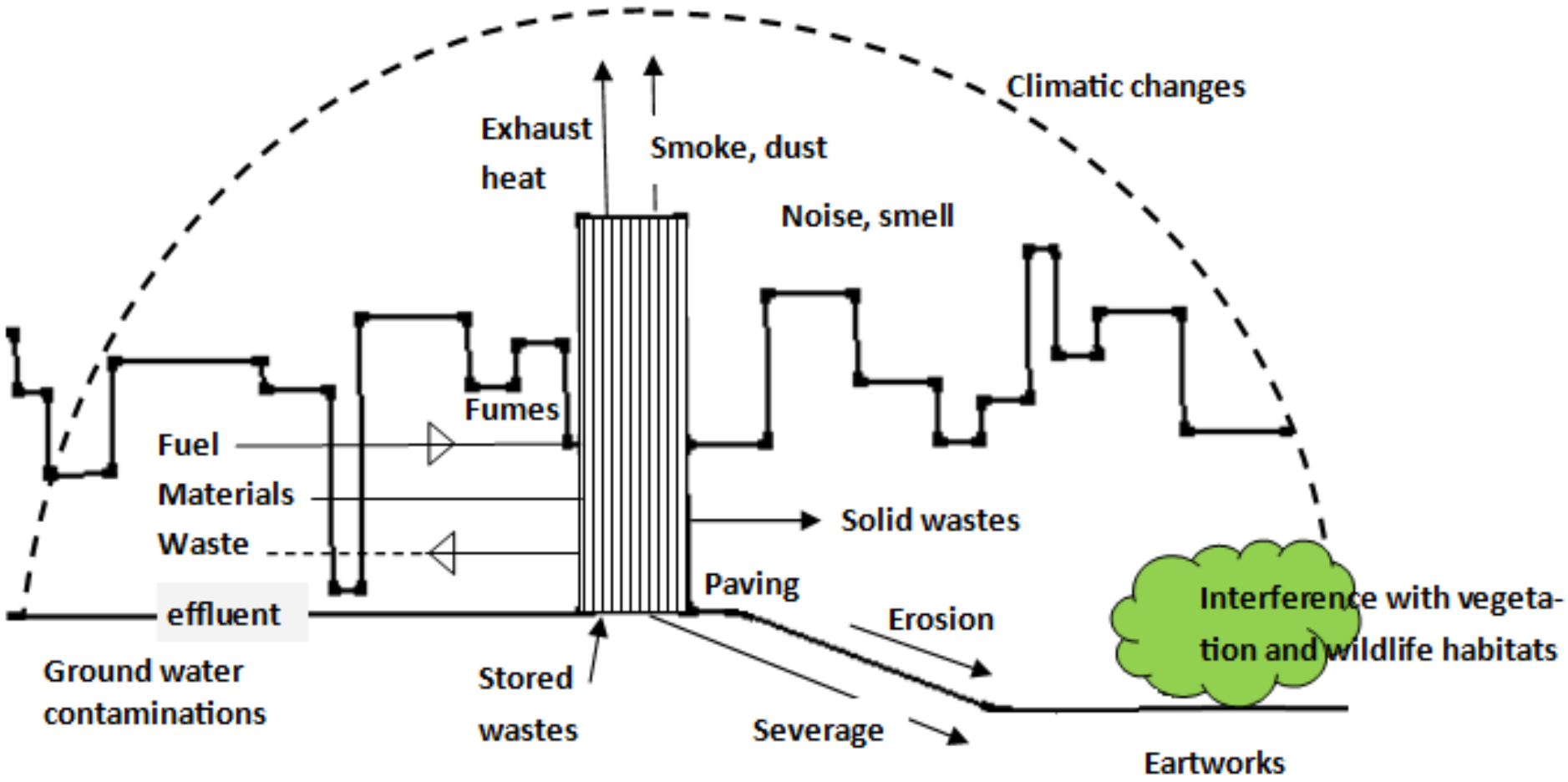
Reducing environmental impact

- Green building practices aim to reduce the environmental impact of building. The first rule is that the greenest building is the building that doesn't get built. Since construction almost always degrades a building site, not building at all is preferable to green building, in terms of reducing environmental impact.

- The second rule is that every building should be as small as possible. The third rule is not to contribute to sprawl, even if the most energy-efficient, environmentally sound methods are used in design and construction.

Building environment impacts on it's surround

(Source: Yeang, The Green Skyscraper, 2000)



Goals of green building

- There are a number of motives for building green, including environmental, economic, and social benefits. However, modern sustainability initiatives call for an integrated and synergistic design to both new construction and in the retrofitting of existing structures

- Also known as sustainable design, this approach integrates the building life-cycle with each green practice employed with a design-purpose to create a synergy among the practices used.

- Green building brings together a vast array of practices, techniques, and skills to reduce and ultimately eliminate the impacts of buildings on the environment and human health

- It often emphasizes taking advantage of renewable resources, e.g., using sunlight through passive solar, active solar, and photovoltaic equipment, and using plants and trees through green roofs, rain gardens, and reduction of rainwater run-off

- Many other techniques are used, such as using low-impact building materials or using packed gravel or permeable concrete instead of conventional concrete or asphalt to enhance replenishment of ground water.


SvR Design Company

- While the practices or technologies employed in green building are constantly evolving and may differ from region to region, fundamental principles persist from which the method is derived:

- siting and structure design efficiency, energy efficiency, water efficiency, materials efficiency, indoor environmental quality enhancement, operations and maintenance optimization and waste and toxics reduction.

- The essence of green building is an optimization of one or more of these principles.

- On the aesthetic side of green architecture or sustainable design is the philosophy of designing a building that is in harmony with the natural features and resources surrounding the site.

- There are several key steps in designing sustainable buildings: specify 'green' building materials from local sources, reduce loads, optimize systems, and generate on-site renewable energy.

Energy efficiency

Green buildings often include measures to reduce energy consumption – both the embodied energy required to extract, process, transport and install building materials and operating energy to provide services such as heating and power for equipment.

- As high-performance buildings use less operating energy, embodied energy has assumed much greater importance – and may make up as much as 30% of the overall life cycle energy consumption. Studies show buildings built primarily with wood will have a lower embodied energy than those built primarily with brick, concrete, or steel

- To reduce operating energy use, designers use details that reduce air leakage through the building envelope (the barrier between conditioned and unconditioned space). They also specify high-performance windows and extra insulation in walls, ceilings, and floors.

Happy Birthday !Happy Birthday !

- Another strategy, passive solar building design, is often implemented in low-energy homes. Designers orient windows and walls and place awnings, porches, and trees to shade windows and roofs during the summer while maximizing solar gain in the winter.

- In addition, effective window placement (daylighting) can provide more natural light and lessen the need for electric lighting during the day. Solar water heating further reduces energy costs.

- On site generation of renewable energy through solar power, wind power, hydro power, or biomass can significantly reduce the environmental impact of the building. Power generation is generally the most expensive feature to add to a building.

. Water efficiency

- Reducing water consumption and protecting water quality are key objectives in sustainable building..

One critical issue of water consumption is that in many areas, the demands on the supplying aquifer exceed its ability to replenish itself

- To the maximum extent feasible, facilities should increase their dependence on water that is collected, used, purified, and reused on-site

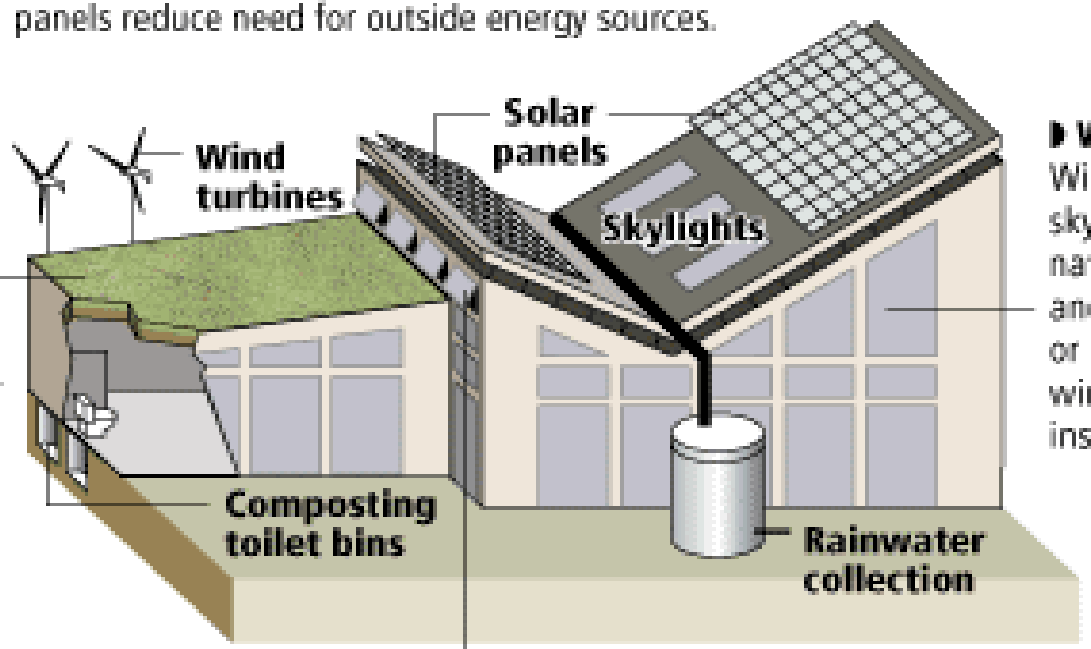
- The protection and conservation of water throughout the life of a building may be accomplished by designing for dual plumbing that recycles water in toilet flushing or by using water for washing of the cars

ECOFRIENDLY CONSTRUCTION

With 32 "green" buildings, Seattle has become a leader in environmentally sensitive building and design. Green construction aims to reduce pollution and reduce dependence on power plants and logging.

GREEN ROOFS: A thin layer of plants and soil on rooftops provides insulation, reduces stormwater runoff, absorbs carbon dioxide and creates oxygen.

ALTERNATIVE ENERGY: Roof-mounted wind turbines and solar panels reduce need for outside energy sources.



WINDOWS Windows and skylights provide natural lighting and heat. Glazed or double-paned windows provide insulation.

WATER EFFICIENCY Cisterns collect rainwater to use for landscaping irrigation. Low-flow, waterless or composting toilets help reduce water use.

VENTILATION: Vents and operable windows assist in heating and cooling by circulating air better.

BUILDING MATERIALS: Recycled building materials reduce waste. Building with certified lumber helps protect forests and using non-toxic paints and carpets creates a healthier interior space.

Source: P-I reporting

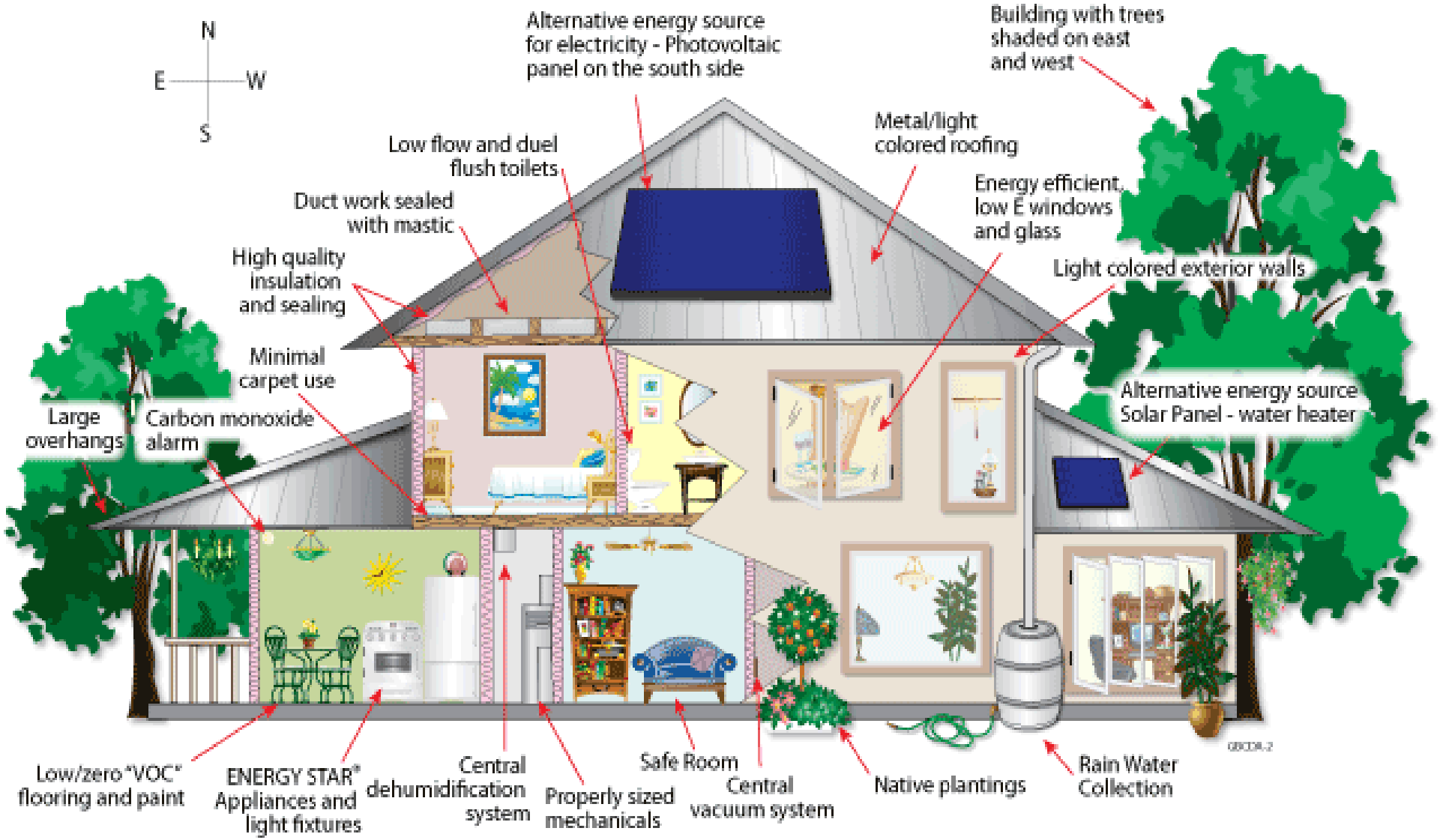
SEATTLE POST-INTELLIGENCER

- Waste-water may be minimized by utilizing water conserving fixtures such as ultra-low flush toilets and low-flow shower heads.

- Bidets help eliminate the use of toilet paper, reducing sewer traffic and increasing possibilities of re-using water on-site.

Point of use water treatment and heating improves both water quality and energy efficiency while reducing the amount of water in circulation.

- The use of non-sewage and greywater for on-site use such as site-irrigation will minimize demands on the local aquifer


N
E
W
S
Alternative energy source for electricity - Photovoltaic panel on the south side
Building with trees shaded on east and west
Low flow and duel flush toilets
Metal/light colored roofing
Duct work sealed with mastic
Energy efficient, low E windows and glass
High quality insulation and sealing
Light colored exterior walls
Minimal carpet use
Alternative energy source Solar Panel - water heater
Large overhangs
Carbon monoxide alarm
Low/zero "VOC" flooring and paint
ENERGY STAR® Appliances and light fixtures
Central dehumidification system
Properly sized mechanicals
Safe Room
Central vacuum system
Native plantings
Rain Water Collection

Materials efficiency

- Building materials typically considered to be 'green' include lumber from forests that have been certified to a third-party forest standard, rapidly renewable plant materials like bamboo and straw, dimension stone, recycled stone, recycled metal, and other products that are non-toxic, reusable, renewable, and/or recyclable

Materials efficiency

For concrete a high performance or Roman self-healing concrete is available

Indoor environmental quality enhancement

- The Indoor Environmental Quality (IEQ) category in LEED standards, one of the five environmental categories, was created to provide comfort, well-being, and productivity of occupants.

- The LEED IEQ category addresses design and construction guidelines especially: indoor air quality (IAQ), thermal quality, and lighting quality.

- Indoor Air Quality seeks to reduce volatile organic compounds, or VOCs, and other air impurities such as microbial contaminants.

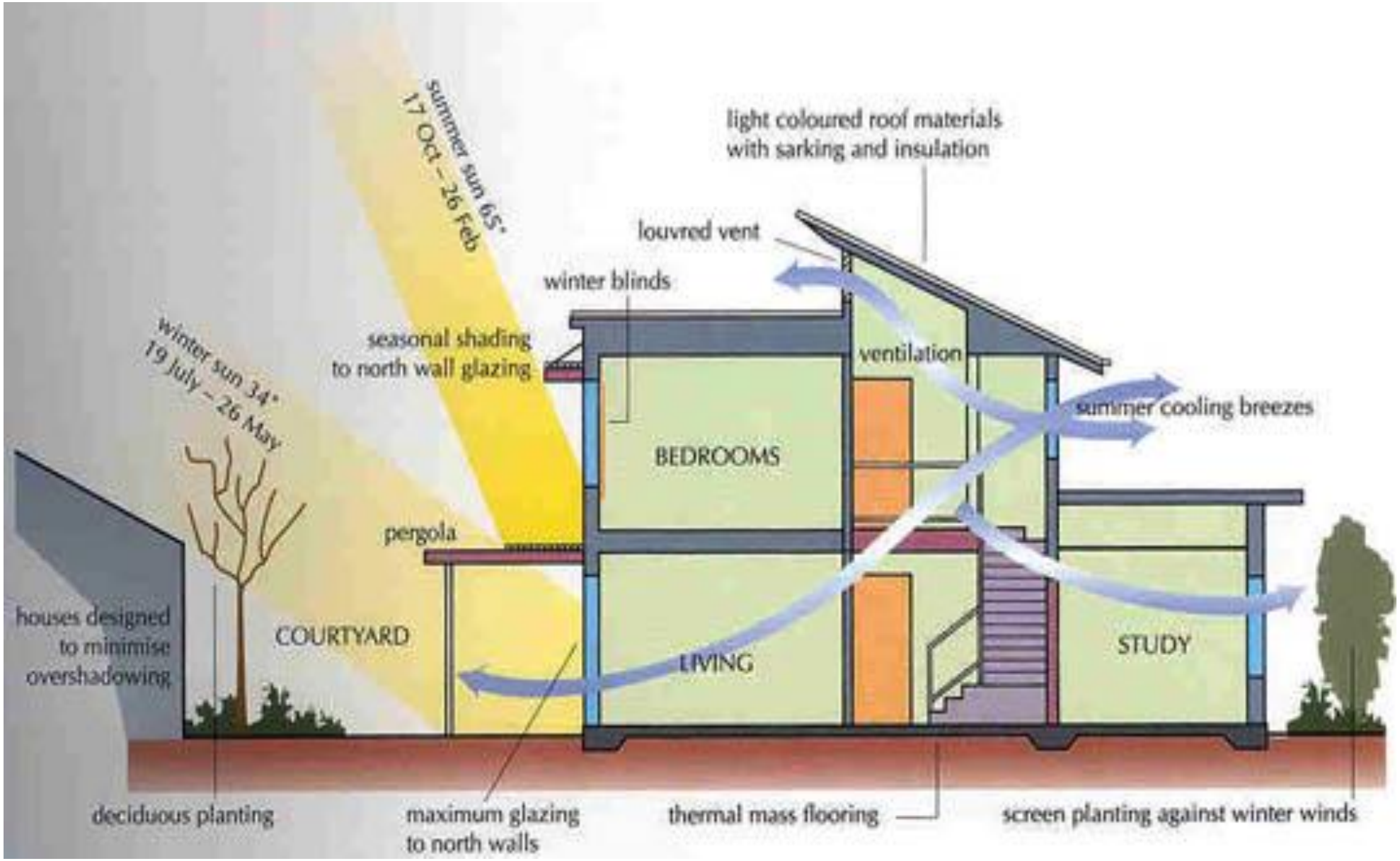
2. Use Healthy Building Materials

The air you breathe can change your life. For interiors, low-VOC (volatile organic compound) paints and finishes rank first in a long list of healthy materials choices that are beautiful as well as functional.

Recommended green materials also include glazed ceramic tile; solid wood furniture and cabinetry from sustainable resources; and linoleum, bamboo, and cork floor coverings.

For more information on Green Buildings or Applied Building Science, visit http://www.csgrp.com

- Buildings rely on a properly designed ventilation system (passively/naturally or mechanically powered) to provide adequate ventilation of cleaner air from outdoors or recirculated, filtered air as well as isolated operations (kitchens, dry cleaners, etc.) from other occupancies.


summer sun 65°
17 Oct – 26 Feb
winter sun 34°
19 July – 26 May
light coloured roof materials
with sarking and insulation
louvred vent
winter blinds
seasonal shading
to north wall glazing
ventilation
summer cooling breezes
BEDROOMS
pergola
houses designed
to minimise
overshadowing
COURTYARD
LIVING
STUDY
deciduous planting
maximum glazing
to north walls
thermal mass flooring
screen planting against winter winds

- During the design and construction process choosing construction materials and interior finish products with zero or low VOC emissions will improve IAQ.

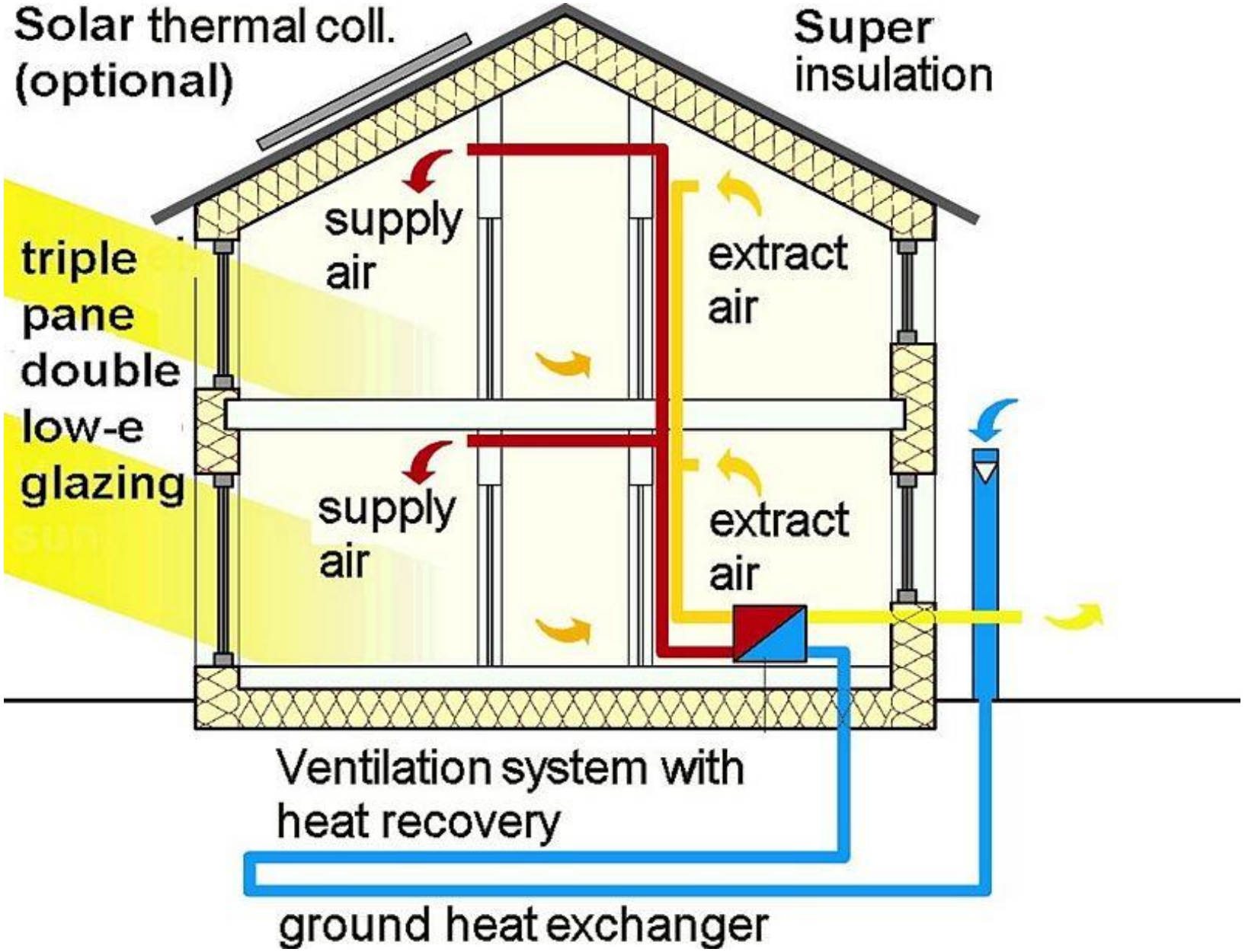
- Most building materials and cleaning/maintenance products emit gases, some of them toxic, such as many VOCs including formaldehyde. These gases can have a detrimental impact on occupants' health, comfort, and productivity


Green building materials
Energy efficiency
Indoor air quality
Low or non-toxic
Minimal chemical emissions
Low-VOC assembly
Moisture resistant
Healthfully maintained
Systems or equipment
Resource efficiency
Recycled Content
Natural, plentiful or renewable
Resource efficient manufacturing process
Locally available
Salvaged, refurbished, or remanufactured
Reusable or recyclable
Recycled or recyclable product packaging
Durable
Water conservation
Affordability

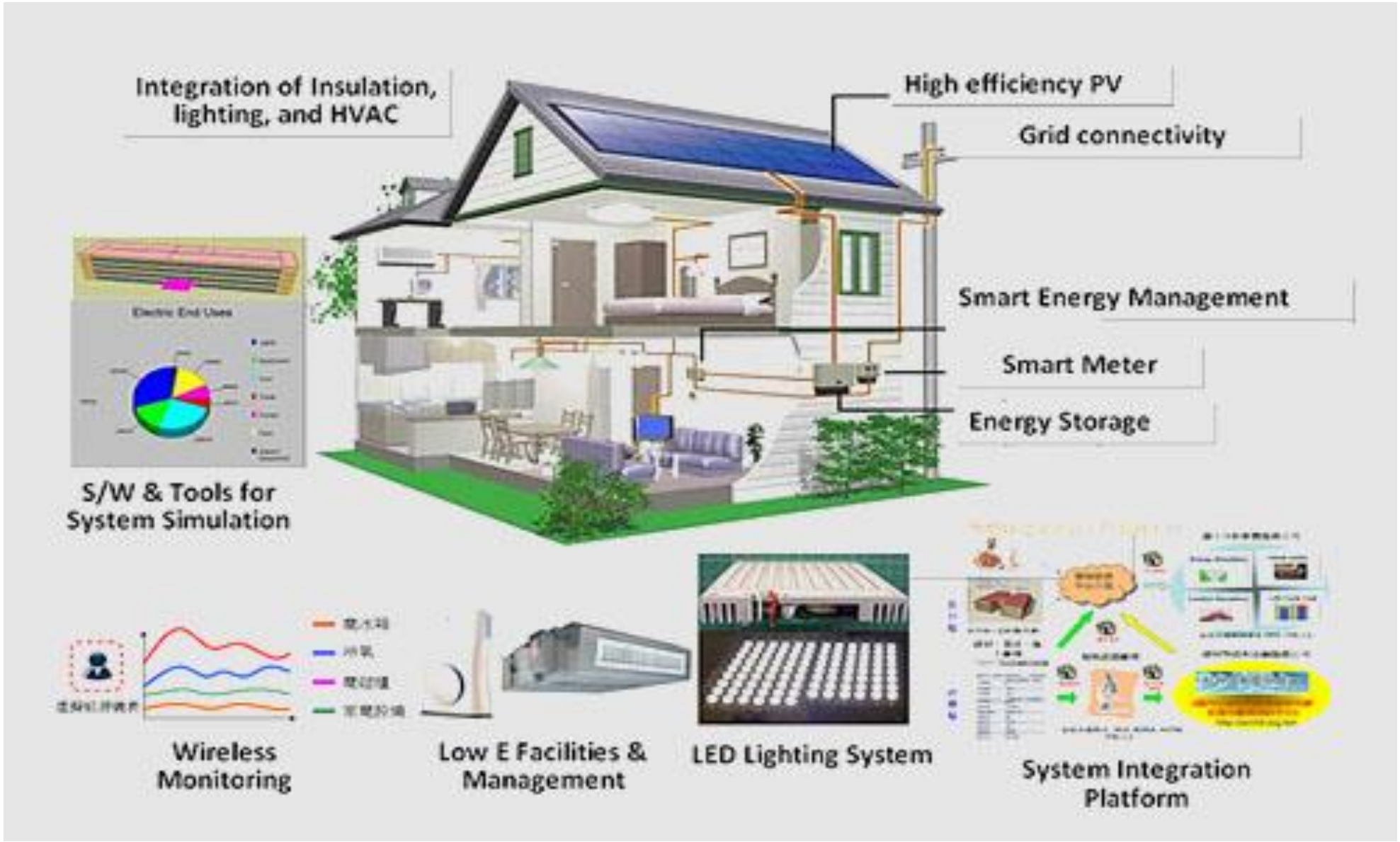
- Also important to indoor air quality is the control of moisture accumulation (dampness) leading to mold growth and the presence of bacteria and viruses as well as dust mites and other organisms and microbiological concerns

- Water intrusion through a building's envelope or water condensing on cold surfaces on the building's interior can enhance and sustain microbial growth.

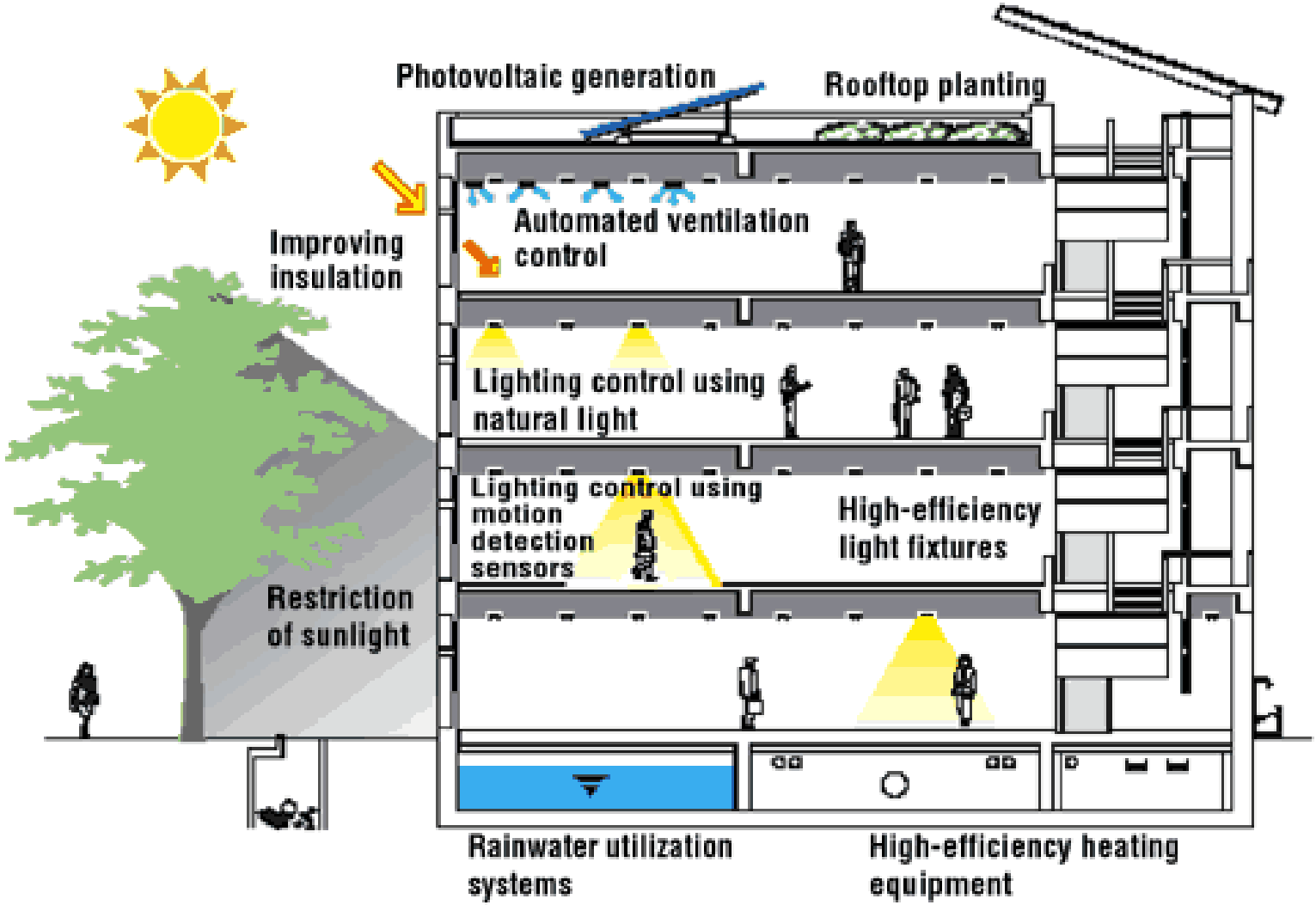
- A well-insulated and tightly sealed envelope will reduce moisture problems but adequate ventilation is also necessary to eliminate moisture from sources indoors including human metabolic processes, cooking, bathing, cleaning, and other activities.


Solar thermal coll.
(optional)
Super
insulation
triple
pane
double
low-e
glazing
supply
air
extract
air
supply
air
extract
air
Ventilation system with
heat recovery
ground heat exchanger

- Personal temperature and airflow control over the HVAC system coupled with a properly designed building envelope will also aid in increasing a building's thermal quality.


Integration of Insulation, lighting, and HVAC
High efficiency PV
Grid connectivity
Smart Energy Management
Smart Meter
Energy Storage
S/W & Tools for System Simulation
Wireless Monitoring
Low E Facilities & Management
LED Lighting System
System Integration Platform

- Creating a high performance luminous environment through the careful integration of daylight and electrical light sources will improve on the lighting quality and energy performance of a structure.



Conceptual Drawing of Green Building

- Solid wood products, particularly flooring, are often specified in environments where occupants are known to have allergies to dust or other particulates.

- Wood itself is considered to be hypo-allergenic and its smooth surfaces prevent the buildup of particles common in soft finishes like carpet. The use of wood products can also improve air quality by absorbing or releasing moisture in the air to moderate humidity

Waste reduction

- Green architecture also seeks to reduce waste of energy, water and materials used during construction.

- During the construction phase, one goal should be to reduce the amount of material going to landfills

- Well-designed buildings also help reduce the amount of waste generated by the occupants as well, by providing on-site solutions such as compost bins to reduce matter going to landfills.

- When buildings reach the end of their useful life, they are typically demolished and hauled to landfills.

- Deconstruction is a method of harvesting what is commonly considered "waste" and reclaiming it into useful building material

- Extending the useful life of a structure also reduces waste – building materials such as wood that are light and easy to work with make renovations easier.

- To reduce the impact on wells or water treatment plants, several options exist.

- "Greywater", wastewater from sources such as dishwashing or washing machines, can be used for subsurface irrigation, or if treated, for non-potable purposes, e.g., to flush toilets and wash cars. Rainwater collectors are used for similar purposes.

- Centralized wastewater treatment systems can be costly and use a lot of energy. An alternative to this process is converting waste and wastewater into fertilizer, which avoids these costs and shows other benefits.

- By collecting human waste at the source and running it to a semi-centralized biogas plant with other biological waste, liquid fertilizer can be produced.

- Practices like these provide soil with organic nutrients and create carbon sinks that remove carbon dioxide from the atmosphere, offsetting greenhouse gas emission.

- Producing artificial fertilizer is also more costly in energy than this process

Regulation and operation

- As a result of the increased interest in green building concepts and practices, a number of organizations have developed standards, codes and rating systems that let government regulators, building professionals and consumers embrace green building with confidence

- In some cases, codes are written so local governments can adopt them as by laws to reduce the local environmental impact of buildings.

- **Green building rating systems**
- **BREEAM** (United Kingdom),
- **LEED** (United States and Canada),
- **DGNB** (Germany),
- **CASBEE** (Japan),
- **GBI(M)** (Malaysia) Green Building Index
- **GREENMARK** (Singapore) help consumers determine a structure's level of environmental performance.

- They award credits for optional building features that support green design in categories such as location and maintenance of building site, conservation of water, energy, and building materials, and occupant comfort and health. The number of credits generally determines the level of achievement.

Myanmar National Building Code (MNBC)

- In Myanmar, Myanmar National Building Code (MNBC 2020) have a chapter "Architecture for Energy Efficiency and Green"to provide minimum design requirements that will promote efficient utilization of energy and green building criteria in buildings and "JADE" award for Green Buildings submitted to be classified as required.

Questions and Answer

Thanks for your attention