

Sustainability and Friendly Plants

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The rising world population and urban sprawl have not only led to habitat destruction and extinction of biological species but also, pose a major challenge to the healthy living environment especially in the urban areas. Sustainability science has emerged as a beacon of light under the current conditions of crisis where the green habitats are being replaced by concrete jungles, leading to increased carbon in the environment. Urbanization has created multiple problems all the way from the risk to plant and animal health to climate change and global warming. One of the strengths of this science is its aim to create more eco-cities that can sustain using minimum environmental resources. We attempted to grow and use plants keeping the urban space limitation and limited resources as a criterion. There are many ways by which we can reduce our carbon footprint and one of the most important ways is the greening of our cities both indoors and outdoors.

Biological Monitoring of Air Pollutants and Its Influence on Human Beings

Using plants to monitor air pollution



Extent of damage and span of polluted time

Vertical arrangements



Hydroponics

Why is urban hydroponics useful in urban environments?

Decide what and how many plants you are growing. Evenly mark and space the holes for the pot/cup to place them (3-4 inches)



Plants can be grown almost anywhere

Mix water and the appropriate soil that consists of the nutrients to the plants (hydroponic solution fertilizer)

Better control over plant growth

Conserve water and nutrients

There is limited green space to grow in urban areas

Plant the seeds by taking the seedlings out of the pot and washing the soil away from the roots. Place the seedlings into the tube (growing medium)



This is cost efficient and benefits the environment because there are no harsh chemicals needed

Control the balance of nutrients.



Objectives

Learn how to grow a variety of plants in urban spaces
Benefits of plants and upcycling
Multiple uses of plants for sustainable living
Hydroponics in urban environments

Uses of plants in urban environments

Plants can monitor pollutants
Plants can absorb pollutants (Heffernan, 2013)
Plants are a source of food and energy
Plants reduce stress (McSweeney *et al*, 2014)
Plants also absorb vast amounts of carbon
Plants generally make the environment look more appealing
Plants can be used as aids to stop pain.

Mosses as Indicators of Pollution

When exposed to air pollution mosses appear brown or black
Moss communities decline under long term pollution



A terrarium is a miniature indoor garden inside a glass container. The plants are low maintenance and are perfect for people who don't have time to care for a garden. A wide variety of plants can be grown inside glass containers. Terrariums absorb many indoor and outdoor pollutants. Terrariums adds a bit of outdoor beauty and peace to desks, night tables or any place where space is limited.



Monitoring by Plants-Symptoms

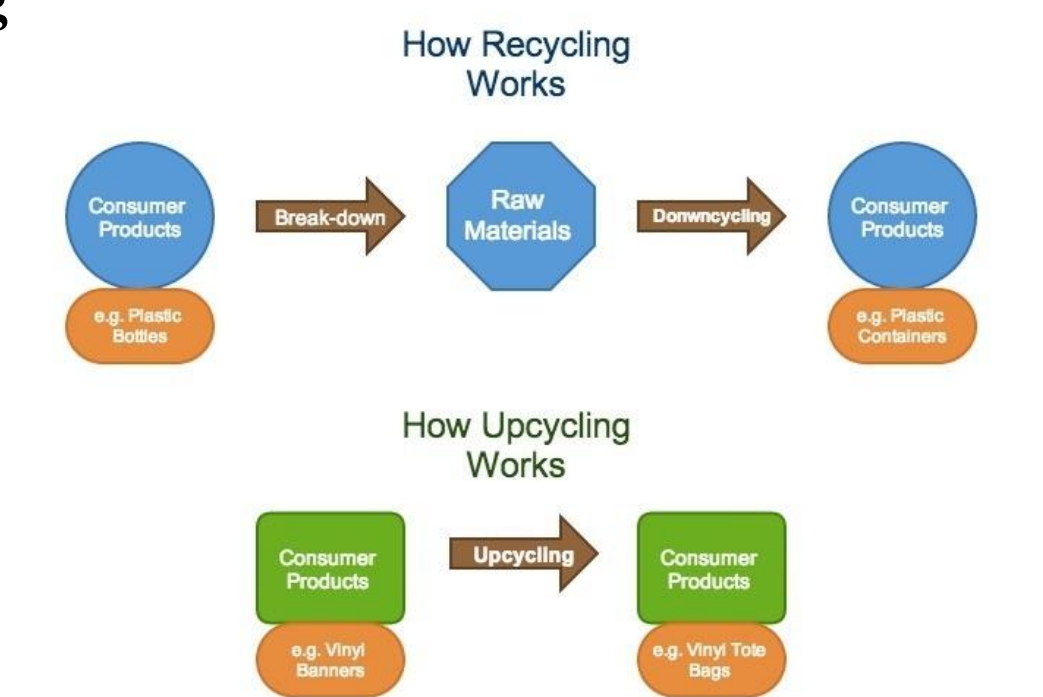
Air pollutants	Injury spot area	Injury spot shape	Injury spot color	Age and degree of the damaged leaf
SO2	Mainly pulse, occasionally leaf margin	Irregular points, block, clear boundaries	Brown, red brown	Expanded leaves > old leaves and mature leaves > unfolded leaves
fluoride	Mainly leaves and margin, occasionally pulse	A strip or band	Pale brown	Young leaves > mature leaf > old leaf
O3	Mainly leaf surface, occasionally pulse	Scattered dense punctate	Brown, tawny	Mature leaves > young leaves > old leaves
Peroxyacyl nitrates(PAN)	Mainly blade back, occasionally leaf tip	Glass, necrotic zone	Silvery white, brown, tan	Young leaves tip and old leaves base vulnerable
NO2	Pulse	Irregular spot or whole leaf spot	White, tawny, brown	Young leaves vulnerable
Chlorine and chloride	Pulse	Point block boundaries or transition	Severe chlorosis, bleaching	Mature leaves vulnerable

Common Plant Indicators

Zinnia
Gladiolus
Petunia
Pinus
Acer
Moss
Spinach
Cucumber



Recycling or upcycling



Upcycling and recycling are quite similar when it comes to the efforts of being energy efficient; the difference is upcycling pertains to the restoration of secondhand objects or materials in an innovative way.

We engaged in an interesting upcycling activity where we emptied old light bulbs and grew plants in them.



Upcycling with Coke Bottles

Benefits
Space efficiency
Cost efficiency
Reusable resources
Environment Friendly



Life Cycle Assessment

Life Cycle Assessment (LCA) is used as a tool to assess the environmental impacts of a product, process or activity throughout its life cycle; from the extraction of raw materials to processing, packaging transport, use and disposal.



Use of old/discarded household items



Plants can be used as medicine

Clove (*Syzygium aromaticum*)

- **Medicinal Uses:** reduces toothaches and sore throats, eliminates acne, boosts energy, acts as an antiseptic.
- **Extraction** of clove oil: Crush 10-12 cloves, 10ml of olive oil, store this mixture in a covered beaker for 2 weeks.

Tomatoes (*Solanum lycopersicum*)

Medicinal Uses: prevention of cancer, diabetes, asthma, heart disease, cataracts, treats digestive disorder and high blood pressure.
-**Extraction** of lycopene: Crush and blend a medium sized tomato with distilled water. Separate the pulp and serum by filtering the extract. Extract lycopene with ethyl acetate. The final product is obtained through evaporation of the solvent at 40-60 degrees celsius.



Turmeric (*Curcuma longa*)

- **Medicinal Uses:** Turmeric can be used to fight cancer. It can even decrease the symptoms from cancer. It also acts as an antiseptic.
- **Extraction** of turmeric oil: Take fresh turmeric roots and wash in water, grate them. Add 10ml of 70% ethyl alcohol. Shake once in two days and store in a dark place away from sunlight from 2-3 weeks. Strain and store in glass bottle.

Conclusion

If we use critical and innovative thinking skills we can reduce our carbon footprint by creating more environmental friendly spaces that deplete minimum resources from the environment.

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