Using Recycle Wastes In Developing The Visual Image of The Egyptian City

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ABSTRACT

Sustainable development is a development that meets the present needs without compromising the future generation's ability to meet their own needs. That is done by satisfying both the basic needs and environmental preservation through rationalizing the use of current resources and recycling the waste materials. The importance of open spaces comes with the development of educational, psychological and social science, where specialists see that the aesthetic need is the highest of the psychological needs for the basic necessity of life to be able to achieve the integration and balance psychological, personal development of the mental capacity and raise the creativity and innovation degrees. In spite of the importance of open spaces in urban areas, its weak presence in the majority of Egyptian urban areas is noticeable, and if it is present it is weak in its capabilities having high maintenance cost. On the other hand, 50 million tons of industrial and agricultural waste is annually produced in the various Egyptian governorates, its littering or burning ways of disposal has a detrimental effect on health and environment. The world's attention turned recently on recycling waste materials to reduce its risks and dangers. According to the recommendations of the Ministry of Environmental Affairs and many previous research studies that aim is to make good use of recycled waste materials. The research finds a need to take the advantages of waste recycling and re-use it in landscaping of the open spaces which improve the image of the Egyptian urban areas. Due to the difficulty of increasing present open spaces, the research aimed to use and recondition small spaces between the residential blocks and building roofs to compensate for the shortage of green spaces by using the recycled wastes. The research paper takes Sakr Korash – El Maadi area Cairo Egypt, which is considered as one of the Egyptian crowded urban areas as a case study.

Key words: open space, roofs, visual image, recycling wastes, crowded urban areas.

Introduction

The crisis and the difficulty of discarding waste materials all over the Egypt are escalating year by year. The increase of population leads to an excessive increase of the produced waste materials which is the major source of pollution for urban environment (Al-Ansary, 2004). Untreated littered waste materials distort the appearance of city civilization as well as its role of causing spread of disease, and economic burden due to its transportation cost. On the other hand, decline of open spaces and poverty of its elements is noticeable in many Egyptian urban areas (Osman, M and El Hakim, S, 2000), which lead to high crime rates, spread of mental and social diseases.

A clear research problem is in the absence of the use of waste materials. Despite of that it is an economist that can be exploited in the coordination of open areas through waste recycling and reuse.

By studying the current situation of green spaces in a sample of Egyptian urban residential areas, one can notice the following points:

- Cities are transformed to un-environmental concrete masses that lack to green areas (Abbas M. el-Zafarany, 2003), fig. (1).
- Bad distribution of green areas (Urban Planning Commission, 2002).
- Motor ways govern the urban form with a lack of the pedestrian needs and rights (IDSC, 2002).
- Absence of human scale regarding green areas and open spaces design.
- Bad utilizing for the existing open areas (Sims, D, 2000).

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Research Goal:

The research aims to suggest some reusing alternatives for the agricultural and industrial waste materials in the field of open areas landscape, and to transfer the waste materials from being an economy and environment burden to become a useful tool for decorating urban areas.
- Contribute to the economic, societal and environmental revitalization of Egypt.
- Create employment opportunities for the residents
- Clean and maintain neglected urban areas in Egypt.

1- Waste materials:

The country's social and economic development may cause pressure increase on its environment, which needs to increase the reduction rate of environmental damaging activities. Some of these damaging activities involve the production and disposal of waste materials. The more waste we produce, the more we have to dispose (Local Government Commission, 1992). The production of consumables in the first place, and their disposal when used uses up valuable natural resources and energy processes which can impact upon the environment and in particular way the atmosphere through pollution (Ackerman, F., 2000).

Sorts of waste materials:

Most waste materials come from domestic and municipal consumption of goods, manufacturing, construction, sewage treatment, agriculture and generation and disposal of hazardous substances.

Waste materials include:

Paper, plastics, glass, metals, foods, chemicals, oils, bricks, wood, soil, and effluent.

'Sustainable development' is developing the idea of a 'waste management hierarchy' which encourage the generation of less waste. This encompasses the processes of reduction, re-use, recycling and recovery, in that order of priority, fig. (2).

Fig. 1: City transformation to concrete blocks with narrow open spaces, and miss use of existing open spaces.

Fig. 2: Waste management hierarchy.

2- Benefits of green spaces upon human beings:

Interaction with gardens and natural spaces offers a variety of mental, physical and social benefits for humans, ranging from stress reduction, quick healing, and mitigation of Attention Deficit Disorder in children decreasing crime rates and air pollution (Rohde, C.L.E. and Kendle, A.D., 1997). Sustainable sites consider human energy and creativity as renewable resources, recognizing the potential for healthy living and
employment conditions. City planners, governments, and ordinary citizens are only just beginning to appreciate the tangible of green spaces and to take advantage of its opportunities for improving quality of life in urbanized areas.

- **Mental Health Benefits:**

  People need to scratch about in the soil, breath in the scent of plants and flowers, let off steam and meet other people (Browne, C. A., 1992). For many people it's almost like therapy.

  - **Stress and violence reduction:**

    Studies have shown that stressed individuals feel better after exposure to natural scenes. Accordingly, green spaces also reduce instances of aggression and violence.

  - **Improved concentration:**

    Focusing on natural scenes gives voluntary attention a rest and allows involuntary attention to take over and recharge the human psyche.

- **Physical Benefits:**

  - **Enhanced health:**

    Recent studies in the Netherlands and Japan show that people with easy access to green space boasted better health, lower mortality rates and more rapid healing.

  - **Improved environmental conditions:**

    City greenery cleans and cools the air for improved quality of life. A study in Chicago determined that the city's trees filter d234 tons of particulate pollution and cleaned the air of 98 tons of nitrogen dioxide, 93 tons of sulfur dioxide and 17 tons of carbon monoxide. Vegetated areas also provide relief from the "heat island effect" caused by the heat-trapping quality of asphalt, concrete, and building materials. Air under a tree's canopy can be as much as 5-10o F cooler compared to full sun, with the underlying pavement up to 36o F cooler.

- **Social benefits:**

  - **Crime reduction**

    A Study in 1998 in Chicago showed that vegetated spaces cut crime rates by half. Besides mitigating psychological precursors to violence by reducing stress and anxiety, green spaces increase a neighborhood's collective surveillance.

  - **Increased workplace productivity:**

    Studies show that desk workers with a view of nature – either out a window, in a picture frame, or around them in the form of indoor plants- feel more relaxed overall, while those who does not have visibility of plants suffer most of stress and anxiety (Frumkin, H., 2000).

  - **Positive effects on children:**

    Studies show that home tree views improve self-discipline, after a creative play in verdant settings children overall demonstrate increased ability to concentrate, complete tasks, and follow directions.

### 2-1 Design considerations for open space elements:

Many issues and factors must be considered when determining a vision for a community’s future (Clare Cooper Marcur, Carolyn Francis, 1998), fig. (3), (4).

- **Artwork:**
A piece of art such as a sculpture or mural lends visual excitement to the atmosphere of plaza activity and may be provided as an additional amenity. Create unique handcrafted mosaic garden art designed to enliven any garden setting.

Sculpture abstract shapes and simple forms are best to be used for entertainment activities – Sculpture scale, safety of the used materials; attractive colors are important design elements.

- **Fountains and pools:**

  Moving water has the property of alleviating noise and cooling spaces, the provision of Waterscape features is an added attraction to a plaza. Fountain and reflection pool locations should be studied with the regard of sun direction during day time and its lighting during night time.

- **Play equipment:**

  Play equipment is recommended in those areas that have large children population. The play equipment should match various ages, safety, economy are important factors that affect the design process. Also natural features like green slopes can be used for entertainment.

- **Lighting:**

  Provision of illumination during the hours of darkness increase plaza safety and usage. Lighting is important particularly for mid-and through –block plazas where the use is restricted and the visibility limited. Light is an element that is used in art and function – in art it has major effect on the human feeling of space through lighting sculptures, water features and focal points. In function it is used to illuminate walkway intersections, steps, direction signs etc...

  Light design constrains shall be taken in consideration like high light levels which causes glare should be avoided, light source level should be far away from human level of sight in various conditions – standing up, sitting down etc..

- **Stairs:**

  Stairs are used to connect different garden levels; step material, dimension and height should match the garden style. Safety rails and light source should be taken in consideration.

- **Paths and Roads:**

  Having a customized patio or walkway is a good way to enhance any outdoor space. One of the many advantages of the paving is not only can make the garden more exciting, but if it is properly done it can also add to the value of the garden.

  You can make a bold statement with a patio or walkway using concrete, stamped concrete, flagstone, bricks, or pavers. Cockleshell and seashell aggregates are totally organic, and they are most commonly used as a gravel replacement for paths and driveways.

  Walkway slopes are from 1 – 1.5 % in both directions. Walkway shapes and widths vary according to the expected traffic. Visual studies including focal points especially at the human sight level should be done for all pedestrian walkways.

- **Retaining walls:**

  Fig. 3: Pools, Play equipment, Lighting, Stairs for open space.
Retaining walls are not only constructed for esthetic reasons, but are also useful for holding back soil or rock from buildings and structure areas. Retaining walls prevent down slope movement or erosion and provide support for vertical or near-vertical grade changes. Retaining walls come in many different shapes, colors, and sizes. Variety of choices is available it includes as examples veneer stone, natural boulders, railroad ties, and all other types of blocks.

- **Tables, benches:**

  Sitting areas are to be provided and clearly noticeable, overlooking on important site views, seating area style, kind of seats should match the garden style; seating areas should not interact with pedestrian walkways and traffic flow. Human scale, bench materials, shading devices should be taken in consideration (City Parks Forum, 2002).

- **Pergola:**

  A wooden structure that is used in the garden to provide a shaded area and to act as a support for climbing plants. pergolas have different shapes and sizes, human scale should be taken in consideration in pergola design phase.

**Fig. 4:** Pergola, benches, Retaining walls, Paths for open space.

2-2 **Principles of Landscape Design:**

Basic understanding of the principles of landscape design should be known to generate ideas and increase the designer's creativity (Dewayne L. Ingram, 2003).

- **Unity**

  It should be one of the main goals in the design process. It may be better understood and applied as consistency and repetition. Repetition creates a unity by repeating alike elements like plants, plant groups, or decor throughout the landscape. Consistency creates unity in the sense that some or all of the different elements of the landscape fit together to create a whole. Unity can be achieved by the consistency of character of elements in the design (the height, size, texture, color schemes, etc. of different elements).

- **Simplicity**

  It is actually one of the principles in design and art. Just keep things simple to begin with. You can do more lately. Simplicity in planting and hardscape.

- **Balance**

  There are basically two types of balance in landscape design. Symmetrical and Asymmetrical. Symmetrical balance is where there are more or less equally spaced matching elements of the garden design. With a garden equally divided, both sides could share all or part of the same shape, form, plant height, plant groupings, colors, bed shapes, theme, etc. Asymmetrical balance on the other hand is one of the principles of landscape design that's a little more complex. While textures, forms, colors, etc. may remain constant to create some unity, shapes and hardscapes may be more random. This form of balance often has separate or different themes with each having an equal but different type of attraction. Contrast can be very interesting and this type of form can create a neat contrast. Flowing lines are pleasing to the eye but the bold contrast of a curve combined with a straight line can be very interesting. Contrast and harmony can also be achieved using plants. Fine foliage verses coarser foliage, round leaves verses spiked leaves as well as color compliments and contrasts.

- **Color**

  It adds the dimension of real life and interest to the landscape. Colors can also be used to direct your attention to a specific area of the garden. A bright display among cooler colors would naturally catch the eye.

- **Natural transition**

  It can be applied to avoid radical or abrupt changes in your landscape design. Transition is basically gradual change. It can best be illustrated in terms of plant height or color but can also be applied to all elements in the landscape including but not limited to textures, foliage shape or...
size, and the size and shape of different elements. In other words, transition can be achieved by the gradual, ascending or descending, arrangement of different elements with varying textures, forms, colors, or sizes.

**Line**

It is of the more structural principles of landscape design. It can mostly be related to the way beds, walkways, and entryways move and flow. Straight lines are forceful and direct while curvy lines have a more natural, gentle, flowing effect.

**Proportion**

It refers to the size of elements in relation to each other. Of all the principles of landscape design, this one is quite obvious but still requires a little thought and planning. Most of the elements in landscape design can be intentionally planned to meet the proper proportions. The goal is to create a pleasing relationship among the three dimensions of length, breadth, and depth or height. Also, special consideration and study should be given to proper plant selection to avoid using plants that are out of proportion.

**Repetition**

It is directly related to unity. It's good to have a variety of elements and forms in the garden but repeating these elements gives variety expression. Unity is achieved by repeating objects or elements that are alike. Too many unrelated objects can make the garden look cluttered and unplanned. There's a fine line here. It's possible that too much of one element can make a garden or landscape feel uninteresting, boring and monotonous.

3- Sustainable Landscaping:

As more people become concerned about the health of our environment, sustainable landscape concept is popularly increasing (Lyle, John Tillman, 1994).

The over-riding principle of a sustainable landscape design, fig. (5), is creating a garden that conserves resources. The typical landscape requires many inputs: time, money, labor, water, chemicals, and fertilizers. Our landscapes also produce wastes which most of us never consider: plant trimmings, polluted run-off from chemicals and fertilizers, and water lost by evaporation. The concept of sustainable landscape requires us to examine the input and output of our landscape and find ways to minimize both. Applying the following principles can save time and money, and create a landscape that is environmentally responsible.

**PLAN AND DESIGN**

Begin by analyzing the site (sun/shade, slope, soil, wind, available moisture). Consider use and function (child play, vegetable production, wildlife habitat, rest, and meditation). Make a list of materials needed to create the landscape and use recycled materials if they are available locally.

**IRRIGATION & WATER EFFICIENCY**

Use deep irrigation whenever possible to irrigate individual plants. Use separate irrigation valves for each type of planting so individual scheduling is possible. Check and maintain the system regularly. Find ways to capture natural rainfall and consider use of greywater when allowed by municipality.

**SOILS**

Consider soil composition, slope, and need for amendments. These factors help determine choice of plants and irrigation. Increasing humus content will improve most soils. Use recycled materials like redwood compost, recycled compost, and plant to compost and recycle your own green waste once the garden is installed. Mulch to slow evaporation and erosion and to control weeds growth. As mulch decomposes, it adds to the nutrient content of the soil.

**PLANT SELECTION**

Use low water using plants. Group plants together according to water, sun/shade, and soil requirements. Maximize lawn areas as they are the most water intensive of plantings, and require additional fertilization and labor to mow. Leave clippings on the lawn or use as mulch. Choose plants that grow to an appropriate size to decrease need for pruning, and that resist pests and disease so less chemical controls are required. Look for organic methods of pest/disease control.

**Fig. 5: Sustainable Landscaping.**

3-1 Sustainable Landscaping Principals:

Sustainable landscape is about reducing waste, energy and materials. Its purpose is to design and create systems that imitate nature and turn the problems into solutions such as:

- Reducing or preventing pollution
- Conserving resources like labor, water, fertilizers etc.
- Maximizing ecological functions to enhance wild life habitat, organic food, family fun
• Attractive naturalistic landscapes with low water requiring (Robert Kourik, 1992) & low-maintenance plants to save water and time (Carol Bornstein et al., 2006).
• Recycle and reuse landscape materials wherever possible
• Avoid using toxic chemicals if possible, reducing exposure to injury, and preventing toxic run-off to storm drains and water bodies
• Grass cycling, composting and mulching to enhance the soil structure
• Maximizing natural resources, such as solar energy, reusable materials
• Innovative and thoughtful material by using recycled content, salvaged, durable or local materials conserves resources and will reduce waste and can reduce the amount of embodied energy that is consumed by the landscape.

Table 1: A few practices to consider when selecting landscape materials.

<table>
<thead>
<tr>
<th>Recycling Material</th>
<th>Savings: Energy, Water, etc.</th>
<th>Uses of Recycled Material in landscape</th>
</tr>
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<tbody>
<tr>
<td>*When trees need to be removed or pruned, chipping, stockpiling and reusing them on site as mulch will reduce cost of hauling and return important organic material to the soil while providing numerous other benefits such as protecting soil from erosion, conserving water, reducing weeds, fostering beneficial soil organisms and more (Chapman, Mary. 1996). *Specify local products and suppliers. Transporting items the least distance reduces fuel consumption and air pollution. *If mulch or compost can not be produced from on-site then specifying locally produced mulch or compost will reduce impacts from long distance transportation of foam.</td>
<td>*Use sustainably harvested wood (FSC Certified) if plastic or composite lumber is not appropriate. Use treated wood that does not contain chromium or arsenic for any application that specifies treated lumber (Meyer, Christopher J., et al., 1992). *Create wattle fences, arbors, trellises and garden art from twigs and branches left after pruning.</td>
<td>For use as mulch and/or compost.</td>
</tr>
<tr>
<td>*offers a great alternative to the environmental and economic expense of removing this resource from your property, reduce waste going to landfills, encourage improvement of soil through natural processes and reduce economic and environmental impacts of fertilizer use (Marr, Charles W. and Robert I. Neier., 1995).</td>
<td></td>
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<tr>
<td>Exposed littering of agricultural waste materials in agricultural fields and on the sides of the water canals causes rapid production of termites, burning it cause air pollution, fig(6), which reduces road vision and human health (Teodoro C. Mendoza, Roger Samson,1999)</td>
<td>An alternative to natural wood in wood industries. *Rice straw is an effective material both in commercial erosion control practices and in rice field erosion control. Bales of rice straw can be shredded on site and blown into cups and fills roadside to provide soil stabilization. Manual placing of the rice straw can also be practiced if the proper placement can be obtained. Fibrated rice straw when used in hydro seeding activities also acts to assist in erosion control and soil stabilization. *straw bales are creating the biodegradable equivalent of a raised bed (Wanek, C, 2001).</td>
<td></td>
</tr>
</tbody>
</table>

3-2 conserve water and energy in the Landscape:

**Water:** Some experts estimate that more than 50 percent of landscape water use goes to waste due to evaporation or runoff caused by over watering (Winger, David, ed 1998).
*Consider installing a drip irrigation system to water the lawn and garden.
*There are several options for treating used water such as gray-water which can be stored and used for irrigation of trees or nonfood vegetation.
*Buildings can also play a role in capturing rainwater for either drinking or irrigation.
*Reduce evaporation losses from gardens by using an organic mulch or plastic ground cover between rows. Leave grass clippings in place; they provide a kind of mulch. Collect water from roof gutters to use for lawn and plant watering (Ash, Tom., 1998).
Energy: Because of the limited amount of nonrenewable energy sources on Earth, it is important to conserve our current supply or to use renewable sources so that our natural resources will be available for future generations. Energy conservation is also important because consumption of nonrenewable sources impacts the environment (A. S. Moffat and M. Schiler, 1991).

*Consider energy consumption in the choice of materials and equipment
*Site lighting can be designed to use less energy and minimize "light pollution". Use low voltage fixtures and energy efficient bulbs (Greening Federal Facilities, 2001).
*Trees conserve energy by shading, cooling the air through evapo-transpiration and reducing the velocity of wind.

4- Basic requirements that must be taken into account when designing open spaces using the Waste Recycled materials:

Open space is considered to be the environment that fulfills the ethical, educational and social human needs, that reflects the essentiality of having various elements and activities, either natural or artificial elements to reach the target goals. The main design is affected by basic needs that should be taken in consideration at the beginning of the design phase, such as: construction cost, maintenance, safety and flexibility (Jack E. Ingels, 2004). A good designer try to make a good use of the available recourses to be able reach the best possible results (Stappers, P.J., 2006).

Fig. 7: Examples of simple and economic designs for open spaces.

Requirements that should be taken in consideration during landscape design phase:

- **Finance:**
Administration sector considers finance and construction cost to be the main obstacle against having open spaces between buildings, a comparative study between cost and usage percent for a number of open spaces in Britain showed that it is not necessary that high construction cost increases the percentage of use, that is despite of using simple and inexpensive materials an attraction to lot of people, fig. (7). Selection of recycled materials that does not need high cost for its transporting and cleaning, fig. (8), also site natural resources can be utilized without spending lots of money.

Fig. 8: Examples Recycle concrete with a garden path and wall.
- **Maintenance:**

  Proper maintenance increases the usage period of the open space areas and reduces the running cost (Jack E. Ingels, 2004). Proper choices of tough and high durable materials not only increase the factor of safety but also increase visitors' attraction. Regular and scheduled maintenance auditing site visits increases open space life time and its sustainability.

  Careful planning helps, but most of landscapes require some maintenance. Prune carefully (and recycle clippings), mow lawns higher (and compost grass) water wisely and adjust according to weather patterns. Consider using slow release fertilizers (organic if possible) which reduce the possibility of runoff.

- **Research Goal:**

  Utilizing recycled waste materials for good environmental uses instead of its defection. Different efforts should integrate to accomplish good open space landscape design which fulfills user's experiment, experience and safety it should include the following:
  - Variety of Space shapes and forms.
  - Development of movement skills, exploration, and social interactions (World Health Organization, 2007).
  - Increase the human environmental reactions, development of adventure spirit and site form utilization.

- **Safety and comfort:**

  The landscape designer should fulfill the user's comfort needs for the open spaces, supply rest facilities such as rest areas, drinking water fountains, shaded areas, fire safety. Safety elements should be taken in consideration in floor design, openings, corners and entrances.

  - Select and use renewable, local, and/or low-energy input landscape materials.
  - Avoid materials, products, and practices that are harmful to the environment.
  
  For examples, Granulated or chipped rubber mulch made from recycled rubber tires is one of the new wonder products on the garden design market - but as with most things, it should be used with caution.

- **Flexability:**

  - Design flexibility for future changes, previous researchs aproved the essentaility of open spaces to fulfill flexability for space improvement and change needs along time.
  - Recycled materials flexability and its ability to be re-used in other sites.
  
  Sustainability includes three key factors: the material incorporates the principles of "reduce, reuse, and recycle", the product's impact on the environment once installed, the material's maintenance requirements.

![Fig. 9: Sakr Korash – El Maadi area Cairo Egypt (source: Google Earth).](image-url)
5- Case study:

The research paper takes Sakr Korash – El Maadi area Cairo Egypt, which is considered as one of the Egyptian crowded urban areas as a case study, fig.(9),(10),(11).

Fig. 10: Sakr Korash – El Maadi area Cairo Egypt (source: researchers).

Fig. 11: Sakr Koresch area analysis.

5-1 Analysis Study:

The research aims to suggest some reusing alternatives for the waste materials in the field of open areas landscape and roof gardens, and to transfer the waste materials from being an economy and environment burden to become a useful tool for decorating urban areas. So the study suggests samples of landscape design for the open areas and the roof gardens by using recycled materials.

Green roof:

It can address many of the challenges facing urban residents. Life cycle costing indicates that green roofs cost the same or less than conventional roofing and they are an investment which provides a significant number of social environmental and economic benefits that are both public and private in nature. These benefits include increased energy efficiency (from cooling in the summer and added insulation in the winter) (A. S. Moffat and M.Schiler, 1991), longer roof membrane life span, sound insulation, and the ability to turn wasted roof space into various types of amenity space for building occupants. Green roofs filter particulate matter from the air, retain and cleanse storm water and provide new opportunities for biodiversity preservation and habitat creation. They generate aesthetic benefits and help to reduce the "urban heat island effect" - the overheating of cities in the summer which contributes to air pollution and increased energy consumption, fig. (12) Shows Example of using building roof as entertainment garden using waste materials in this study.
Fig. 12: Example of using building roof as entertainment garden using waste materials.
1- Shade-shelters (Recycled lumber and salvaged metal).
2- Planters (Old tires).
3- Planting beds (can be mulched with organic wood chips or recycled glass).
4- Chairs (brick, stone, or recycled plastic).
5- Central Satellite Receiver
6- rubber tile flooring
7- Water Tanks
8- Walkways and paths (brick, pavers, recycled broken concrete, crushed stone)

Open spaces:

The importance of open spaces comes with the development of educational, psychological and social science, fig. (13).

- “In laboratory research, visual exposure to settings with trees has produced significant recovery from stress within five minutes, as indicated by changes in blood pressure and muscle tension.” — Dr. Roger S. Ulrich Texas A&M University

- **Air cleaning:** Studies show that treed urban streets have 10-15% fewer dust particles than found than similar streets without trees. One estimate suggests that a grass roof with 2,000 m² of unmown grass (100 m² of leaf surface per m² of roof) could cleanse 4,000 kg of dust from the air per year (2 kg per m² of roof). One acre of forest absorbs six tons of carbon dioxide and puts out four tons of oxygen. This is enough to meet the annual needs of 18 people.” — U.S. Department of Agriculture

- **Urban heat island effect:** Green roofs intercept the solar radiation that would strike dark roof surfaces and be converted into heat, thereby improving energy conservation like urban forests and reflective roofing surfaces they absorb and/or deflect solar radiation so that it does not produce heat.

- **Sound insulation:** Green roofs can be designed to insulate for sound, with the growing medium blocking lower frequencies of sound, and the plants blocking the higher frequencies. Tests show that 12 cm (5”) of growing medium alone can reduce sound by 40 db.

- **Energy saving:** If you plant a tree today on the west side of your home, in 5 years your energy bills should be 3% less. In 15 years the savings will be nearly 12% (Simpson, James R.; McPherson, E.Gregory. 1996), three trees will save an average household between $100 and $250 in energy costs annually.

5-2 How to Use recycle Materials in the Landscape:

Creative people have been finding good uses to recycle materials in many ways. The landscape is one perfect place to for reusing items. Reclaimed landscaping materials may well cost more than new materials but they can give the new garden design a unique edge you won't find anywhere else.

Results:

Egypt having a large population (85 Million) as well as many developing countries face a problem of getting rid of different waste materials, in improper ways of disposal like burning and deseret burying makes lots of environmental problems. Major populations are concentrated in large cities like Cairo which is currently characterised by the tall cementic residential blocks and very few green areas in between. The research paper
showed an example for the benefits of reusing recycled materials to revit the landscape in one of Cairo’s residential zones as follows:

- Conserve and protect valuable resources and protect the environment.
- Usable products from what we used to consider garbage.
- Make the world a better place by making it cleaner and greener.
- Promote a clean and healthy environment to live and to let our kids and next generation live in.
- Eliminate non bio-degradable waste.
- Reduce and eliminate landfill space.
- Preserve the planet and live in a clean planet.
- Encourage local industries.
- Stop presenting hazardous waste concerns.
- Being healthy.
- Recycle wastes to Save Resources & Energy.

![Diagram of recycled materials usage](image)

**Fig. 13:** Example of using recycled materials for outdoor landscape design.

1- Playground equipment (recycled tires)
2- An Outdoor Bar (Salvaged Metal)
3- Garden Wall (Empty Glass Bottles)
4- Steps (bricks, or recycled broken concrete)
5- Playground equipment (recycled plastic material)
6- Children Play Area (recycled sand)
7- Walkways and paths (recycled tires)

![Diagram of trees and bushes](image)

**Fig. 14:** Example of using trees and bushes for traffic sound and vision prevention.
Table 2: To transfer the landscape into a more eco-friendly environment, here are some suggestions for interesting ways to use found materials in the landscape.

<table>
<thead>
<tr>
<th>Recycle Material</th>
<th>Uses of Recycled in landscape</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glass</td>
<td>*Glass never wears out -- it can be recycled forever. We can save over a ton of resources for every ton of glass recycled -- 1,330 pounds of sand, 433 pounds of soda ash, 433 pounds of limestone, and 151 pounds of feldspar. *Over 40 billion glass bottles are made every year. But 75% of them end up in landfills! Toilets, tubs and sinks also fill our landfills at alarming rates. Glass and porcelain are sustainable, inert and environmentally friendly materials that can be re-used in many ways (Clean Washington Center Report GL-96-2, 1996). *Long Lasting &amp; Beautiful Colors – Glass takes over 1,000 years to decompose!</td>
</tr>
<tr>
<td>Paper</td>
<td>*Each of us uses approximately one 100-foot-tall Douglas fir tree in paper and wood products per year. *One ton of de-inked pulp saves over 7000 gallons of water, 390 gallons of oil, and reduces air emissions by 60 lbs compared to traditional virgin fiber processes. *Recycling 1 ton of paper saves 17 mature trees, 7,000 gallons of water, 3 cubic yards of landfill space, 2 barrels of oil, and 4,100 kilowatt-hours of electricity. *Recycling paper instead of making it from new material generates 74 percent less air pollution and uses 50 percent less water. *Producing recycled paper requires about 60 percent of the energy used to make paper from virgin wood pulp.</td>
</tr>
<tr>
<td>Construction waste</td>
<td>*If the amount of construction waste going can be cut, energy consumption to landfill can be reduced and recycle, the environmental damage from quarrying on transport can be reduced; landfill capacity can be conserved (California Integrated Waste Management Board. 2001).</td>
</tr>
<tr>
<td>Metal</td>
<td>*Recycling aluminum saves 95% of the energy needed to produce new aluminum from raw materials. Energy saved from recycling one ton of aluminum is equal to the amount of electricity the average home uses over 10 years. *Recycling one aluminum can saves enough energy to run a 100-watt bulb for 20 hours, a computer for 3 hours, or a TV for 2 hours. *Recycling steel and tin cans saves 74% of the energy used to produce them. *A steel mill using recycled scrap reduces related water pollution, air pollution and mining wastes by about 70%. *When you toss out one aluminum can you waste as much energy as if you’d filled the same can half-full of gasoline and poured it into the ground?</td>
</tr>
<tr>
<td>Steel</td>
<td>*The steel industry's annual recycling saves the equivalent energy to electrically power about 18 million households for a year. Every time a ton of steel is recycled, 2500 pounds of iron ore, 1000 pounds of coal and 40 pounds of limestone is preserved.</td>
</tr>
<tr>
<td>Plastic</td>
<td>Plastic waste materials forms from 16 – 18 % of the solid wastes in a lot of countries, most of it is comes from different packing services (plastic bags). Recycling plastic materials saves about 85% of the energy used for new plastic production, also it saves Nafatha Material that is used in plastic production – Nafatha is one of the petroleum crude components. Also plastic materials recycling reduces health risks and plastic environmental pollution.</td>
</tr>
</tbody>
</table>
Styrofoam (Polystyrene (No. 6))

*It is un-recyclable- you can't make it into new Styrofoam.

Previous studies approved the possibility of recycling and reusing of Styrofoam in many applications such as improving brick thermal insulation, and reduction of concrete weight.

*Many creative and unique applications for which expanded polystyrene has been used (Signs, logos, props) in any size or thickness.

*reuse a material that's hard to recycle and producing some fresh veggies for gardening With Styrofoam.

Rubber

*Rubber Mulch cushions falls and minimizes dangerous playground impacts. It's safe, economical and long-lasting. Available in a variety of vibrant colors

*Pour-in-Place systems:

  Create a softer play environment than pea gravel
  Unlike wood chips, will not rot or attract insects
  Are slip and water-resistant and accessible by wheelchairs and crutches
  Withstand damage from cleats, golf spikes, and heavy traffic

Tires/Rubber

*Thousands of tires create not only an eyesore but public health and safety hazards as well (Chalker-Scott, Linda, 2005). Another problem with discarded used tires is the risk of fire; tire pile fires can smolder for weeks and months, releasing extremely toxic pollutants into the air, creating serious respiratory and other health problems for people in the vicinity and many miles away. Runoff water from such fires is also laden with toxins, which can contaminate water supplies.

*It takes half a barrel of crude oil to produce the rubber for just one truck tire.

*Production one pound of recycled rubber versus one pound of new rubber requires only 29% of the energy.

Health and Safety Benefits of Recycling and Reusing Waste Materials in Plantation:

Trees are important tools in the fight to stave off global warming, because they absorb and store the key greenhouse gas emitted by our cars and power plants, carbon dioxide (CO2), before it has a chance to reach the upper atmosphere where it can help trap heat around the Earth’s surface. All Plants Absorb Carbon Dioxide, but Trees are Best, Temperature Reduction, Removal of Air Pollutants, Emission of Volatile Organic Compounds (VOCs), Energy Effects on Buildings.

Health and Safety Benefits of Recycling and Reusing Waste Materials in Hardscape:

- Reduces waste/demand for landfill space:

  Materials that would otherwise be disposed of are reused or recycled

- Reuses waste materials:

  Hardscape and landscape waste is being reused directly on-site.

- Reduces air pollution or improves air quality:

  Reusing materials on-site results in fewer pollutants emitted from transporting waste materials and methane emissions from landfills are reduced from both reuse and recycling.

- Conserves fossil fuels:

  Energy needed to transport both hardscape and landscape wastes, as well as new materials, will be reduced. Also, compost can reduce the need for chemical fertilizers, the production of which is fossil fuel intensive.

- Conserves timber:

  Reused and recycled lumber reduces demand for virgin lumber. In addition to the above benefits,

The following benefits are associated with maximizing compost use and minimizing use of fertilizers and pesticides:

- Conserves water:

  Compost can improve the water retention of the soil, reducing the need for irrigation
- Reduces human exposure to hazardous materials or substances:

Compost can reduce the need for pesticides and herbicides and the associated human exposures.

- Reduces runoff and nonpoint source pollution:

Compost can substitute for pesticides and fertilizers, which can produce polluted runoff.

- Improves groundwater recharge:

Compost increases the soil's ability to retain water.

- Improves soil quality and retards erosion:

Using compost improves soil quality.

Cost of using Recycling Waste Materials Can be measured by using software such as Cost Calculator of Recycling and Reusing Hardscapes:

The Cost Calculator is designed to help landscaping companies and landscape managers estimate the cost savings associated with recycling and reusing hardscapes and green waste. Green waste includes yard trimmings, leaves, plants, grass and other organic waste. The specific hardscape materials addressed in this tool include: lumber, brick, and concrete and asphalt. The Cost Calculator demonstrates that recycling and reusing hardscapes and landscape waste can offer significant savings compared to disposal, depending on a facility's material needs and proximity to recycling facilities.

Recommendations:

Most of the Egyptian residential areas lack of adequate open green areas, while there is a problem of getting rid of different sorts of waste materials, the research recomends recycling and re-using waste materials in the landscape construction for existing and future residential areas. The research recomends the following:

Private sector should participate in using recycled waste materials in landscape construction for outdoor spaces that already exist between residential building also making entertainment use for the building roofs by making roof gardens which raises up the general residential development.

Raise citizens knowledge through advertisement about the importance of having green areas and children playgrounds by using recycled waste materials and its benefits on both the environment and the community.

Designing the outdoors furniture for residential blocks by using recycled materials needs defining the functional requirements and the user needs, also the site's environmental conditions and its construction cost.

Planning service areas locations in the landscape design for it is considered an attraction element for the residents also it supplies a lot of entertainment services.

Landscape detailed design using recycled materials includes urban planning, traffic design, pedestrian walks, outdoor spaces, site elements and needs, the way of using recycled waste materials for the site's sustainability.

To save water: Grey water can be re-used to flush toilets, or can be filtered to irrigate gardens.

Gardens can be created on roof tops and in living walls (vertical gardening) which use much less space. When implementing roof gardens check that the roof is designed to hold the weight of containers with wet soil, which is very heavy. Hydroponics and other lightweight methods can expand the possibilities of rooftop gardening by reducing the need for soil.

References


