eco-design strategies

arunas oslapas, idsa
western washington university
“Only one in 10,000 products is designed with the environment in mind.”

- Edwin Datschefski
reclaim
reuse
recycle
recycle
Life Cycle Assessment

Reclaim

Reuse

Recycle
Life Cycle Assessment

Reclaim

design for DISASSEMBLY

Reuse

Recycle
Life Cycle Assessment

design for DISASSEMBLY

IMPACT REDUCTION
Life Cycle Assessment

design for DISASSEMBLY

IMPACT REDUCTION

energy consumption
the tree

- renewable raw material
- creates its own energy from sun
- fixes CO₂ + creates O₂
- by-products are compostable
- provides food, shelter, & home
- regenerates itself
“Approach the natural world as a library of ideas, rather than a warehouse of materials.”

- Barry Katz
“The aims of the environment-conscious designer are to use the minimum resources throughout, to get the maximum possible use and value out of the least quantity of materials or energy, and to minimize pollution created during the manufacture and life of the product.”
strategies
SUSTAINABLE DESIGN STRATEGIES

- Product Stewardship
- Life Cycle Analysis
- Green Purchasing and Sourcing
- Servicizing
- Takeback
- Design for Disassembly
- Specify Recycled Materials
- Resource Consumption
- Biodesign
- Extending Product Life
- Improving quality of life
DON’T PEE IN THE POOL
wasteful habits and disposal paradigms
outputting more bad stuff (i.e. pollution) and permanently losing the good stuff (i.e. natural resources)...

NON TOCCARE SI MUORE!!
“Protecting life on earth is the unprecedented responsibility of our generation.”

- Philip White
SUSTAINABLE DESIGN STRATEGIES

- Product Stewardship
- Life Cycle Analysis
- Green Purchasing and Sourcing
- Servicizing
- Takeback
- Design for Disassembly
- Specify Recycled Materials
- Resource Consumption
- Biodesign
- Extending Product Life
- Improving quality of life
cradle ➔ grave
CRADLE TO CRADLE
Material Extraction
Sand and lime are mined from the Earth.
Materials Processing

Raw materials are cleaned and processed into glass.
Component Manufacturing

The material is formed into a drinking glass.
Assembly and Packaging

The drinking glass is boxed.
Distribution and Purchase

The glass is distributed and bought.
Installation and use
People drink from the glass.
Maintenance and upgrade
It is washed and reused many times.
The glass is returned for material recycling.
LIFE CYCLE ANALYSIS

Acquisition of raw materials
Manufacturing process
Assembly
Purchase of product
Shipping
Packaging
Advertising
Printing of instruction manuals
Use of product
Energy consumption
Collection of the product after use
Reuse, recycling, disassembly…
Final disposal

True cost of a product?
Kaiser Permanente
Aneroid sphygmomanometer
SUSTAINABLE DESIGN STRATEGIES

- Product Stewardship
- Life Cycle Analysis
- Green Purchasing and Sourcing
- Servicizing
- Takeback
- Design for Disassembly
- Specify Recycled Materials
- Resource Consumption
- Biodesign
- Extending Product Life
- Improving quality of life
Green Purchasing and Sourcing

FedEx Kinko’s
Office and Print Center
SUSTAINABLE DESIGN STRATEGIES

- Product Stewardship
- Life Cycle Analysis
- Green Purchasing and Sourcing
- Servicizing
- Takeback
- Design for Disassembly
- Specify Recycled Materials
- Resource Consumption
- Biodesign
- Extending Product Life
- Improving quality of life
Product Service System

Case Quick provides a home-delivery distribution of detergents. Customers take the products from mobile vans on a regular route, using special containers and paying only for the quantity taken.
Servicizing
SUSTAINABLE DESIGN STRATEGIES

- Product Stewardship
- Life Cycle Analysis
- Green Purchasing and Sourcing
- Servicizing
- **Takeback**
- Design for Disassembly
- Specify Recycled Materials
- Resource Consumption
- Biodesign
- Extending Product Life
- Improving quality of life
A Kodak employee inspects inbound cameras at the firm’s primary recycling facility in Rochester, New York. Vibrating tables sort the cameras by model.

Current Recycling Rates

- One-Time-Use cameras: 75%
- Corrugated containers: 73%
- Aluminum cans: 63%
- Steel cans: 58%
- Bottles: 33%
SUSTAINABLE DESIGN STRATEGIES

- Product Stewardship
- Life Cycle Analysis
- Green Purchasing and Sourcing
- Servicizing
- Takeback
- Design for Disassembly
- Specify Recycled Materials
- Resource Consumption
- Biodesign
- Extending Product Life
- Improving quality of life
SUSTAINABLE DESIGN STRATEGIES

- Product Stewardship
- Life Cycle Analysis
- Green Purchasing and Sourcing
- Servicizing
- Takeback
- Design for Disassembly
- Specify Recycled and Recyclable Materials
- Resource Consumption
- Biodesign
- Extending Product Life
- Improving quality of life
eat your leftovers! technical vs biological nutrients
SUSTAINABLE DESIGN STRATEGIES

- Product Stewardship
- Life Cycle Analysis
- Green Purchasing and Sourcing
- Servicizing
- Takeback
- Design for Disassembly
- Specify Recycled Materials
- Resource Consumption
- Biodesign
- Extending Product Life
- Improving quality of life
Resource Consumption

materials
- local materials
- re-usable
- elevate material status
- avoid habitat damage
Resource Consumption

energy
- material extraction
- manufacture
- transit
- use
- disposal
“Each day more solar energy falls to the Earth than the total amount of energy the planet’s 6 billion inhabitants would consume in 25 years.”

- US Dept. of Energy
Resource Consumption

minimalism
- simplification
- reduction of parts
- multi-functionalism
- miniaturization
- doing without
De-Materialization
SUSTAINABLE DESIGN STRATEGIES

- Product Stewardship
- Life Cycle Analysis
- Green Purchasing and Sourcing
- Servicizing
- Takeback
- Design for Disassembly
- Specify Recycled Materials
- Resource Consumption
- Biodesign
- Extending Product Life
- Improving quality of life
TOXIN FREE PEST CONTROL
SUSTAINABLE DESIGN STRATEGIES

- Product Stewardship
- Life Cycle Analysis
- Green Purchasing and Sourcing
- Servicizing
- Takeback
- Design for Disassembly
- Specify Recycled Materials
- Resource Consumption
- Biodesign
- **Extending Product Life**
- Improving quality of life
Extending Product Life

- quality
- durability
- upgradeable
- serviceable
- repairable
SUSTAINABLE DESIGN STRATEGIES

- Product Stewardship
- Life Cycle Analysis
- Green Purchasing and Sourcing
- Servicizing
- Takeback
- Design for Disassembly
- Specify Recycled Materials
- Resource Consumption
- Biodesign
- Extending Product Life
- Improving quality of life
Harnessing rolling energy
ROLLING ENERGY
WORKINGS

Each module is placed in a small hole within the road and rests upon the road surface. All of the wiring is be under the road bed, protected from wear and vandalism. As the vehicle travels over each module, a fluid-filled bladder is compressed, forcing the fluid into a small diameter tube. Due to the relatively small size of the tube, the fluid is displaced a much greater distance than the bladder itself is compressed. Within the compression tube (between the fluid and the end of the tube) lies a neodymium magnet. While the fluid is being displaced out of the bladder it forces the magnet down the tube, causing it to pass through a tightly wound solenoid. With each pass of the magnet through the coil, an electrical current is induced in the coil. Between the magnet and the end of the coil a compressible gas is encased. As the magnet travels down the tube it compresses the gas. As the vehicle travels past the module, the compressed gas forces the magnet, fluid and bladder back to their original positions. Due to the laws of energy conservation, the electrical energy produced by each module is the kinetic energy inherently removed from the vehicle. Although the energy loss from the vehicle is minimal, it can be almost completely overcome by placing the modules in sections of road where vehicle speeds are decreased (off-ramps, changes in speed limit, etc.).
INTERIOR

The main goals of our interior design was to cater to modularity and customizability, to ensure the bus could be serviceable anywhere and to anyone.

This concept features removable seats which can be reconfigured to fit the user's needs. The configuration shown utilizes staggered seating to maximize seats with standing and wheelchair space, while still providing room for convenient entry and exit of all passengers.

The driver's console features a height adjustable swivel chair which is located slightly to the right of the center of the bus for the best visibility. The console also contains screens projecting images from the rear and sides of the bus.
Details

The main goals of our design was to cater to modularity and customizability, to ensure the bus could be serviceable anywhere and to anyone.

Working in collaboration with the exterior and interior designers created features that complement the concepts modularity while highlighting the main theme of the project, which is function working around form. A bus is a small space which needs to meet many standards for functionality.

The storage nets are a lightweight and space-saving solution for securing passenger cargo. They take up no space when not in use, but are expandable to hold many different objects securely. The wheelchair securing mechanisms is designed so that it also takes up no space when not in use, so the bus can cater to many handicapped users.
MINOR IN sustainable design

APPLICATION DEADLINE: Applications are accepted semi-annually on the third Friday of fall and spring quarters.

A multi-disciplinary, cooperative degree minor in sustainable design and planning

Planning and Environmental Policy Program - Department of Environmental Studies - Huxley College of the Environment
Industrial Design Program - The Department of Engineering Technology
Western Washington University, Bellingham, Washington

ABOUT THE MINOR

Huxley College of the Environment and the Engineering Technology Department jointly offer a minor in Sustainable Design. Design is the process of conceptualizing, representing, and creating projects, processes, or products (ranging in scale from consumer objects to regions). Sustainability requires that designed products promote long-term economic, social, and ecological values and equity. The minor provides basic foundations in environmental studies and design, and allows for individualized tailoring according to the student’s interests.

GOALS OF THE MINOR

The goal of the program is to enable students with strengths in design, or in environmental studies, to gain complementary skills in the other area so as to pursue sustainable design careers more effectively. The program is also open to students from any area at Western who would benefit by the set of concepts and skills offered. Students in the program will obtain an understanding of the natural systems within which human institutions and technologies function, and of the social systems which mediate human interactions with ecosystems. This background allows the student to make informed decisions about how ecological constraints define sustainability, and how human choices shape the context in which sustainable projects may be implemented or used. The coursework in industrial design introduces the design process and provides skills in the representation of design concepts. A special course taken in the senior year, EST 415, will bring students together to consider the wider systems context of sustainable design, and to work collaboratively on real-world sustainable design projects.
Shipping Container Design
WWU Faculty & Staff Housing

- LEED Platinum
- 31 Units
- 1.07 Acre Greyfield
- Shipping Container Structure
- Pedestrian Friendly

Forrest Copeland
Becky Chapin
Spring 2007

Site Plan

Large Stack
4 Units

Medium Stack
3 Units

Front Stack
7 Units

West Fairhaven (Harris Ave.)
Green Roofs
Pervious Paving
InterUrban Trail Connection
Central Community Area
SCENARIO

Kade is a mother of three children. She and her husband Ramelan moved from their rural roots into Jakarta in hopes of providing a better life for their family. Ramelan's new job in auto parts manufacturing allows for the family to live in a better quality home. Since Ramelan works most of the day, the two eldest sons (Budi at 18 and Dian at 14) take care of the house so that Kade can continue nurturing her newborn daughter, Afn.

For the immediate safety of his family, Ramelan had the local roofing manufacturer to build and install a collapsible emergency shelter on the roof of his house.

PANIC

Monsoon season hammers the city with heavy rainfall. It’s mid afternoon and the water level is quickly rising. Ramelan hasn’t made it home from work yet, but much to Kade’s relief Budi and Dian made it home safely from school. Kade then immediately instructs the boys to set up the emergency roof shed by simply pulling down its rip chords that were dangling from the rafters.

DISASTER

Budi and Dian hurry to bring up the radio, water jugs, food, and other basic needs that can be stored in the space provided underneath the shelter. Kade made sure not to forget to bring up the precious heirlooms she inherited from her grandmother. Now Kade and her children can wait safely above ground until the arrival of relief.

RECOVERY

Two days later the flooding subsided and Ramelan finally was able to reunite with his family. The shelter is dried out and then collapsed flat against the roof, ready again for another emergency.

C. FREDERICKSON

Roof Shelter

WATER DISASTERS IN INDONESIA
72 HOUR EMERGENCY SOLUTIONS

REFUGE
SCENARIO Indonesia is one of the largest lumber exporters in the world. However, recently deforestation has become a serious environmental concern. The loss of stability that the roots provide contributes to the growing number of flash floods which can quickly wipe out any community or village unfortunate enough to be in their path.

PANIC A fear for Indonesians revolves around the concrete spheres currently erected to plug the flow of water, mud, and other debris. Many individuals worry about the building pressure created by the concrete plugs which could result in a shotgun explosion of water and debris.

DISASTER Hurricanes, tsunamis, and heavy rains can cause mudflows throughout the islands. Mudflows may be generated when hillside colluvium and other material become saturated with water. The volume increases rapidly and the strength can pick up rock fragments large enough to crush buildings.

SOLUTION KeRang is an emergency shelter built within a tree and designed specifically for floods to be above ground. Tree roots can help reduce mudflows and make the structure strong enough to withstand the intense forces of flash flooding. By building the structure in the trees, people might better understand how delicate the relationship is between humanity and nature.

USAGE Pulping of emergency hatch rope releases access ladder and automatically unrolls the outside shelter fabric. The support structure can then be assembled after entering the shelter.

J. H. TSAI
KeRang

WATER DISASTERS IN INDONESIA
72 HOUR EMERGENCY SOLUTIONS

REFUGE
SCENARIO A flash flood suddenly hits North Sumatra, an island of Indonesia. Families are forced to leave their homes in search of dry land. They quickly grab some personal belongings, but the water level has drastically increased and the children are up to their waist in the murky waters of waste and disease.

PANIC As the villagers scramble to stay with their loved ones, they realize that dry land is too far and will have to immediately find shelter until the water subsides and help arrives.

DISASTER The flash flood has ruined several homes, and and there is little left standing. Shelter from the harsh rainfall and out of the filthy water is crucial for surviving the next 72 hour period.

RECOVERY The villagers grab onto the floating buoys that are attached and built around the tall, smooth palm trees that still stand. Small groups huddle together while the water level continues to rise. Thankfully, the buoys rise with ease as it lifts them higher towards the large canopy of shelter that the palms provide.

FLOOD FLOAT is made from local manufacturers located in Jakarta. The base is designed with two halves that connect securely around the base of a palm tree and is made of high-buoyancy foam. The top portion is made from bamboo blocks which is abundantly available and cost effective. These safety rings are placed strategically throughout Indonesia in high flood zones, and are designed to address basic survival.

WATER DISASTERS IN INDONESIA 72 HOUR EMERGENCY SOLUTIONS

S. OWEN FLOOD FLOAT

REFUGE
WWU ID Presents:

Recycled: Eco-friendly products made from recycled materials

Opening: November 10th

Available at:
Goods For the Planet
505 Nisica Ave, North
Erie, PA 16502
(888) 652-3427
Products will be on sale November 2nd - The New Year

WWU Industrial Design
Presents: Recycled materials
Available: May 8-27
Meeting location:
February 12th
Contact: 360.673.6981
dine x 4

Place mats are uniquely designed table accessories that are naturally handmade out of exotic plants and herbs. Each one is unique and features a combination of geometric shapes with dynamic, organic detailing. These durable place mats are easy to wipe clean and fully machine washable.

$24
WWU students turn trash into eco-friendly treasures

By AMY ROLER
SEATTLEPI.COM REPORTER

Bracelets made from used chopsticks, sushi rollers made from old bicycle spokes and postcards fashioned out of discarded magazine covers -- it reads like an eco-conscious holiday wish list.

They are a few of the items a group of 12 Western Washington University students designed and manufactured this fall, proving garbage doesn't have to stay garbage if people learn to think innovatively about what they throw away.

Now those items -- including luggage tags made out of used gift cards and utility knives made from old toothbrushes -- have found their way onto the shelves of Seattle-based "green store" Goods for the Planet and the Seattle Art Museum's gift shops. The students, all juniors at Western, designed the earth-friendly products as part of the ReMade Project in an industrial-design class.

"The point is maybe open your mind a bit -- that something made out of a totally recycled product can look as good as something that is"
+ =

STARBUCKS COFFEE
Tallow soaps are crafted using the ancient and increasingly rare method of making authentic soap by saponification. This yields an all natural soap that is safe for all skin types, and whose production lessens environmental burdens, rather than adding to them like that of the common petroleum based “soap”. Tallow soaps incorporate the skin-nourishing tallow normally discarded by the meat industry, with finely tumbled glass sand, to create a cleanser that is both exfoliating and softening.

S. Blott
blotts@cc.wwu.edu
Glass bottles are thrown away or recycled in extraordinary numbers on a daily basis. Each ‘shake’ set uses the base and the mouth of reclaimed bottles which are the hardest parts to crush when recycling. Only two bottles are used in the creation of each salt and pepper shaker set. No additional waste is created from the construction of ‘shake’, an eco-friendly version of a common household product.

Erin M. Yoakum
YoakumE@cc.wwu.edu
R&R is a bottle opener made from used railroad spikes. After railroad maintenance fixes a section of track the old spikes are left lying along side of the fixed track. This product utilizes this wasted material and brings a rugged aesthetic to a home.

Phelan W. Miller
millerp8@cc.wwu.edu
Glass bottles and computer waste are recyclable, but once recycled the integrity of the materials is reduced. LUX combines used Starbucks Frappuccino® bottles and discarded computer power cords to create lighting for anyplace.

Ryan Mahan
rdmahan@gmail.com
The Necktie has been a men’s fashion accessory for over a century. Lüp is a neck tie made from furniture and textile factory scrap. Factories around the world accumulate an excess of material which cannot be used. Unlike traditional neckties, Lüp is made primarily from furniture vinyl. This helps the tie to lay flat on the chest and allows for an easy wipe down in the case of a spill. Lüp features unique patterns which are screen printed using water based, non-toxic ink and individually stitched with a sewing machine.

Evan McCormack
www.edu/id
dine placemats are elegantly designed table accessories that are carefully hand-crafted out of common plastic shopping bags. Each one is unique and features a combination of graceful organic shapes and dynamic stitch-detailing. These durable placemats are easy to wipe clean and fully recyclable.

Beth Blair
bethblair@gmail.com

remade
Paper Or Plastic wallets are made from reclaimed shopping bags. Many layers of either durable kraft paper or polyethylene plastic bags are sewn together to form a thicker stronger material. The paper wallets are coated with beeswax to repel water and to help resist wear. Both styles of wallet can be recycled when their useful life is done.

Justin Thoreau Lund
mysterlund@gmail.com
TRASHION.2010
SOPHOMORE DESIGN
CONCLUSION
TOTAL BEAUTY

(inside and out)
“Sustainable Design means we have to rethink everything we do.”
“Our first green products must be ourselves.”
eco-design strategies

arunas oslapas, idsa
western washington university