

rethinking design

appro-tech and minimal materials: materials design-interior

Elizabeth White

What/Why:

Appro-tech design is about appropriate process with regards to the environment. Within this are issues of site-specific procedures and processes for the particular context of a project. Material minimisation, pre-fabrication and material re-use are methods of achieving this. These issues are extremely important in order to reduce the consumption of new resources, avoid landfill waste and pollution, create value-added markets and increase cost effectiveness.

Who:

There are a lot of institutes and companies working on this approach to regenerative design, companies particularly interested in concepts of minimal material use and low-tech solutions for interior materials are:



The Building Materials Reuse Association are a non-profit educational and research organization whose mission is to facilitate building deconstruction and the reuse / recycling of recovered building materials, in America. They believe that building materials reuse is one of the most sustainable activities associated with the built environment. Deconstruction is the practice of disassembling a building in such a way that the materials (joists, flooring, siding, fixtures, and more) can be reused for new construction. Deconstruction is a cost competitive alternative to conventional building demolition.



Level is an organization within New Zealand, which has been developed for the construction industry. Level has a website which will help people to design and build homes which will have less impact on the environment and are healthier, more comfortable, have lower running costs. In regards to interior materials level supplies a section on the impact of building materials, and how to go about re-using and minimizing waste. They also supply the NZ

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statutory requirements according to the New Zealand Building code in regards to interior materials.

New Zealand statutory requirements

A key purpose of the Building Act 2004 is that buildings are designed, constructed and used in ways that promote sustainable development. The NZ Building Code requires that designers, builders, local authorities and building owners consider:

- minimizing waste during construction
- use of sustainable materials
- use of safe and healthy materials
- energy conservation and efficiency

Material durability (designers must make homeowners aware of the maintenance requirements of the materials specified and that whole of life costs are a better determining factor in material selection rather than just initial cost).

How:

There are many methods in regards to how we can implement ideals of appro-tech or use of minimal materials in regards to materials design for interiors. Initially these ideals should be implemented in the design process. The following designers and architect practices demonstrate just how simple this can be.



Bates Masi Architects have designed several houses based on ideals of appro-tech and re-use/minimal use of materials. North Main House: The house is assembled rather than built, with prefabricated foundation, panel sliding and cabinetry minimizing construction debris or toxins such as concrete foundation tar on the site. The concrete foundation is also precast with an added insulation layer, "Less construction, better environment". In addition to this the architects had the concept of tyres in that they are prolonged through rotation, custom stainless steel clips hold in place finishing ceiling surfaces and light fixtures to the structural concrete planks. Rearranging and modifying these elements permits the future user to adapt these spaces' lighting, reflectance, acoustics and technology without disturbing the permanent structures.



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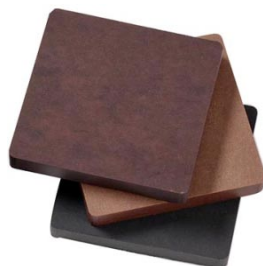
dARCH Studio is an architecture firm who collaborated with fashion designer Yiorgos Eleftheriades to create a project called 'paper cut'. The shop is 90m2, located on the first floor of a two-storey building at the center of Athens, where the fashion designer exhibits his work. Existing furniture were rearranged in order to bring forth two new constructions that were handmade, using eco –friendly (100% recyclable materials) corrugated packaging carton that were used to ship the designers clothing to the site and low cost OSB wood.



An easy way to implement these ideals into the design process is to use building materials that have been designed with the environment in mind. In particular low-tech methods and resources need to be considered.



PaperStone Certified is the only architectural solid surface certified by the Smartwood program of the Rainforest Alliance for using 100% post-consumer recycled paper. It is made from cellulose fiber (paper) and a non-petroleum phenolic resin derived in part from natural phenolic oil in the shells of cashews. Phenolic resin and paper composites have long been known to have superior tensile, compression, impact and flexural strengths. They are very abrasion resistant. They absorb very little water. They are the products of choice in applications requiring high fire resistance (PaperStone has a Class A fire rating). Common applications include interior countertops, wall cladding, conference tables, signs, cutting boards, window sills, and toilet partitions. Standard panel sizes are 60" x 144" in standard thicknesses of 3/4", 1" and 1-1/4". PaperStone panel prices are roughly the same as quality granite and brand name solid surface or quartz material products.



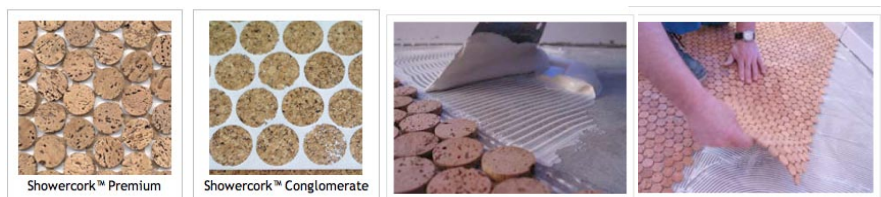
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Coconut wood flooring is made from coconut trees. Coconut trees rejuvenate quickly, growing to full maturity in 5 to 6 years. This makes it a truly sustainable resource. Coconut wood flooring is harvested from coconut plantations at the end of their coconut-bearing years and are then cut down and replanted with new coconut palms with the old palms made into our coconut wood flooring.



Showercork mosaic tiles made from post-industrial wine cork material. These pieces of clean wine corks, approximately 1/4" thick, are attached to a special paper backing which enables easy adhesion to the subfloor or wall substrate. Once the showercork sheets are set and bonded, the installation is completed in a similar fashion to a traditional ceramic or stone mosaic, using a "sanded" grout pasted down around the cork discs. Showercork is very versatile it is sometimes either prefinished with 2 coats of a water-based urethane, or unfinished, which can be stained any colour. Due to the stability and durability with grout, the result is a product which is durable and versatile. It can be used in almost any interior finish application, however demanding the environment.



EcoRock is a new product which acts like a dry wall.

It uses 80% less energy to produce than gypsum drywall

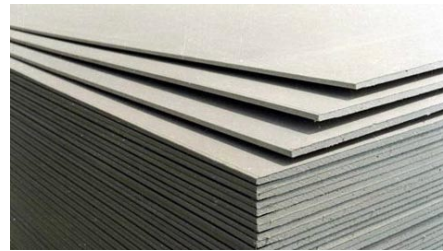
Naturally cured and dried. EcoRock eliminates the energy-intensive, high CO₂ generating calcining and oven-drying found in gypsum drywall production.

It is made of 80% recycled materials

EcoRock is made using 80% post-industrial recycled waste, including waste from steel and cement plants with no gypsum.

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end of life EcoRock can be used as pH additive for soils and can be returned to the production of EcoRock and other building materials as a valuable raw material. Unlike gypsum, EcoRock may be safely disposed of in landfills if necessary.



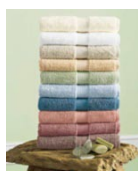
An important material to consider within interiors is fabric. There are three things to consider in regards to environmentally friendly fabrics; the renewability of the product, the ecological footprint of the resource and how many chemicals it requires to grow and process in order to make it ready for market. Listed below is the most environmentally friendly fabric on the market.



Hemp is by far, the crop with the most potential for eco-friendly textile use. Hemp plants grow very quickly and densely, which makes it difficult for weeds to take hold, eliminating the need for herbicides and artificial fertilizers. It requires no irrigation as it thrives on the amount of water in the average rainfall, and it is highly pest-resistant. Hemp has naturally long fibers, which makes it suitable for spinning with a minimum processing. Hemp fabrics come in a variety of weights and textures.



Organic cotton is much more environmentally friendly than the traditional variety as it uses no pesticides, herbicides, or insecticides during the growing cycle. There are many growers of this crop, and the number is steadily increasing. Usually manufacturers using this plant to make textiles follow up the process by using natural dyes to further reduce the amount of chemicals dumped into our ecosystem.



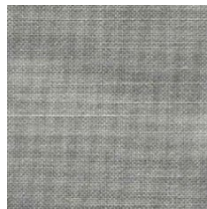
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Soy silk is made from the by-products of the tofu-making process. The liquefied proteins are extruded into fibres, which are then spun, and used like any other fibre (woven, knitted, etc.). The high protein content makes it receptive to natural dyes



Bamboo is a highly renewable grass, and it is probably this property that has resulted in its being classified as "eco-friendly". It also has natural antibacterial properties and the fabric "breathes". The resultant cloth is biodegradable.



Fortrel is a polyester fibre made out of recycled plastic bottles, which can be made into fleece. Manufacturing this fibre is preferable to creating new petroleum-based fibres, and given the sheer amount of plastic bottles in existence, finding a new use for them is a plus. The fleece that is created is prized by backpackers for its warmth and durability.



Another method of minimising use of material is to create designs that use less space and therefore using fewer materials. Here is an example of this by a designer called Pavel.

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This is a design for an apartment for someone who lives by themselves. All components of the space fold out of the shelves of the walls.



The simplest way of putting these ideals into place is by using waste to create materials rather than just buying brand new materials. This method is useful in that one fundamental aspect of low-tech design is that it needs to relate to local conditions. This is therefore simple to do because waste surrounds us, whether one is located in developing or third world nations

satori

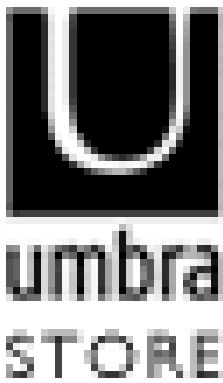
The Satori initiative is a biannual workshop organized by prominent green designer Alejandro Sarmiento and specialized journalist Lujan Cambariere, which aims to encourage responsible thinking in design students. A group of Argentine students from the Satori initiative have come up with ways of using old trainers, catalogs and fabrics donated by Adidas to create interior materials. There was a carpet from rubber soles stitched together, a puff from assembled trainers, a coffee table supported by old catalogs, a wall build from old brochures, a lamp from plastic straps, and some accessories from recovered fabrics.



This is a project undertaken in Barcelona where mass production is at large. Things like furniture and items, which once represented a serious investment and were expected to last a lifetime, are now thrown out when they are no longer in fashion. Every day the inhabitants of Barcelona generate more than 3000000 kilos of rubbish. Much of this rubbish is perfectly recyclable furniture, material, windows, doors, tile floors etc. This project is a house in Barcelona made entirely with recycled material and furniture from

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the streets of Barcelona. Once this project is over the contents of this house will then be recycled again and will be sold or swapped.



The designers from Umbra took mismatched glassware from the dump and sandblasted it. Now they are all united with a similar frosted exterior.



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Rethinking design:

In terms of rethinking design in regards to interior materials I have experimented with natural dyeing, making paper (which has the potential to be used as an interior material and knitting). Whilst these processes are reasonably well known, I want to really highlight exactly how easy and extremely low-tech it is to do use these processes to create sustainable materials ourselves, rather than going out and buying new.

Material samples and information were printed on fabric used as a curtain in the first week of term for the banquet. Document printed on my personal printer at home. Potentially there is no need for documents to be printed on paper, could just be done on old fabric scraps people have at home. Also could use this process to create materials for the interior rather than using dyes

Natural dyes

This process is great to use because instead of buying already dyed fabric which in most cases is dyed using extremely hazardous toxins, which then seep into the environment once the dyeing process is finished. I have experimented with everyday objects and plants from the garden to dye fabrics

Method

Boil plant material for 1 hour

Add mordent (rusty nails/aluminium sulphate)

Boil for half an hour

Leave over night

Blackberry



Silk

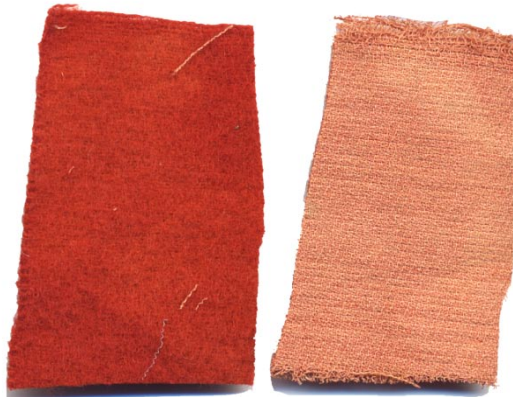
Eucalyptus



Wool

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Silver Dollar



Wool

Silk

Carrot Tops



Silk

Wool

Silk

Mordent

Rusty keys

Aluminium Sulphate

Pohutukawa



Wool

Silk

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Paper

Samples of paper that I have made from natural products and recycled paper which could then be used in interior for things such as, curtains, track blinds, lampshades screens etc. In most cases, because of the natural element of these papers, that being flax, grass, banana etc these papers are actually very strong.

Method

Boil Plant fibres

Rinse, make sure fibre is ph neutral, using litmus paper

Put through food processor paper pulper, (if using recycled paper add now)

Put in vats of water

Use a deckle

Put between sheets of Vilene

Put through press and squeeze all water

Put on flat surface to dry

Flax Paper



Flax and used paper



Wild Ginger



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Banana



Banana, paper pulp and used string

Cutty grass



Knitting

Cut an old shirt into rags and knitted it



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Wool and flax spinning

Spinning wool and flax to create a material.

Break down the flax by picking it and drying it. Next the outer stem of the flax needs to be broken in order to get to the fibre on the inside. Then get a board with nails in it and draw the fibres past the nails in order to get rid of all the broken bits of the outer stem of the flax. Then use a spinner to spin the flax fiber with wool. Alternatively this could be silk or cotton.



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Bibliography:

The Building Materials Reuse Association
www.bmra.org

Level
www.level.org.nz

Bates Masi Architects
www.batesmasi.com

dARCH Studio
www.darchstudio.com

Paperstone
www.paperstoneproducts.com

Coconut flooring
<http://cocnutfloorings.com>

Showercork
www.sustainableflooring.com/

Eco-fabrics
<http://www.ecotextile.com/>

Pavel
<http://www.yankodesign.com/2005/10/12/oneself-bathroom-for-person-who-lives-itself/>

Satori
http://m.treehugger.com/Design_and_Architecture/2069/;jsessionid=BAD81B03F1D192635ADF12583451ADFC.wap1

Barcelona Forever
<http://www.mettebakandersen.com/barcelonaforever/indexENG.html>

Umbra
<http://www.umbra.com>

EcoRock
<http://www.seriousmaterials.com/index.html>

Flax
<http://weedwackerknits.blogspot.com/search?q=flax>

Paper making

Paper Machine Clothing: Key to the paper making process by Sabit Adunur

Natural dyeing

The Craft of Natural Dyeing: Glowing colours from the plant world by Jenny Dean

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Appro-tech:

Design of heating, cooking and/or cooling systems.

Maree Leppard

What/Why:

Appro-tech is short for appropriate technology, which is being mindful of what we're doing and aware of the consequences. Appro-tech changes with every situation, and every different environment. For example; it is not appropriate to install solar modules in a place with very little sun.

Appro-Tech:

- Meets peoples needs
- Helps protect the environment
- Uses local skills and materials
- Helps people earn a living
- Affordable
- Paves the way for a better future

Therefore Appro-Tech is inventing technological innovations necessary to meet these needs. A good quote to summarise this is "Appropriate technology has to fit the infinite variety of life on earth, rather than forcing life to fit the technology."
(<http://journeytoforever.org>)

Minimal materials is the use of materials more efficiently and effectively.
For example; using as little materials as possible.

Appro-tech is a very important area of research in relation to sustainable design. Designers have great potential in identifying resources that are readily available and recycling, re-using, regenerating or reconstructing these to give them a purpose in the modern world. Minimising materials is equally as important to sustainable design because there are many problems that have evolved from waste products. Working with local materials is a step in the right direction to minimize problems like deforestation.

Who:

Amy Smith is a Mechanical Engineer who designs cheap, practical solutions to tough problems in developing countries. Many of her designs have particular focus on appropriate technology and sustainability.

Droog design is an enterprise based in Amsterdam. They have made a strong claim on sustainable ideas and have created a number of designs with the intention of generating a reaction from the public. These designs intend to push the boundaries and make one feel compelled to think about cultural specificity, what do we need to live?

Shigeru Ban is a Japanese architect well known for his 'relief projects' and works with strategies such as material minimization to quickly and efficiently house disaster victims. Appropriate technology is another strategy incorporated in many of his designs. As the 'disaster relief houses' are only temporary the material selection is local, recyclable, and perishable.

Kengo Kuma is also a Japanese architect who uses material minimization and appropriate technology to promote sustainable design. Many of his designs are innovative and minimalist, and use local materials such as bamboo, and within these designs local circumstances are considered.

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Emily Pilloton is a designer and architect working to bring elegant appropriate technology to where it is needed most. Project H Design, (founded by Pilloton) has worked with LA's homeless, and are known for their 'Hippo rollers' which they delivered to Africa. Emily's attitude is fresh and has a different modernist stance on sustainability in comparison to many other architects. She believes that "The world doesn't need another bamboo coffee table," and that design "should be about solving our most pressing problems." (www.projecthdesign.com)

Mohammed Bah Abba is a Nigerian teacher who came from a family of pot makers. His innovative design called 'Zeer Pot,' or 'pot in a pot' uses minimal materials and has great potential for sustainable design in developed countries.

How:

Responses using appropriate technology and minimal materials in relation to the design of heating, cooking, and/or cooling systems:

Amy Smith "Sugar cane charcoal" in Haiti.

Respiratory diseases due to cooking fuels are the leading cause of death in children. And Haiti is 98% deforested, so when the wood is gone, the people will face an uncertain future. In response to these problems Smith set out with a goal, to create an alternative charcoal briquette that burns more cleanly than wood, and is less costly and environmentally damaging to produce. This process uses Bagasse, (a locally available material) which is the fibers from sugar cane stalks that remain after the juice is extracted, and a charcoal extruder also designed by Smith.



Sugarcane charcoal Briquettes. A. Smith

Mohammed Bah Abba "Pot in a Pot Refrigerator" aka "Zeer pot".

This is the Worlds cheapest refrigerator, made with two earthenware pots, one pot smaller than the other, and wet sand. Heat rises, and heat will always move toward cooler areas, and if it happens to draw liquid with it, and that liquid evaporates...the inside surface of what just evaporated will be cooler. The Zeer pot will keep water, and other beverages at about 15 degrees Celsius; meat and fresh produce can be kept for long periods.

Disadvantages: The Zeer pot only works for small quantities, and is relatively high maintenance, sand needs to be wet twice a day.



Mohammed Bah Abba and his Zeer pot.



The Zeer pot.

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Common & Gies Architects, Germany. "Biogas"

In the home and workplace 'Freiberg im Briesgau,' garden waste, compostable kitchen waste and sewage are collected in a single container and their fermentation produces 'biogas' which is used for cooking, in place of the mains natural gas supply. The remaining compost is spread onto the fields as fertilizer by local farmers, therefore completing the natural cycle.

Bio-gas can be piped directly into kitchens from a plant, and burns without smoke. Cookers account for a significant proportion of household energy consumption, so the resulting savings are considerable.

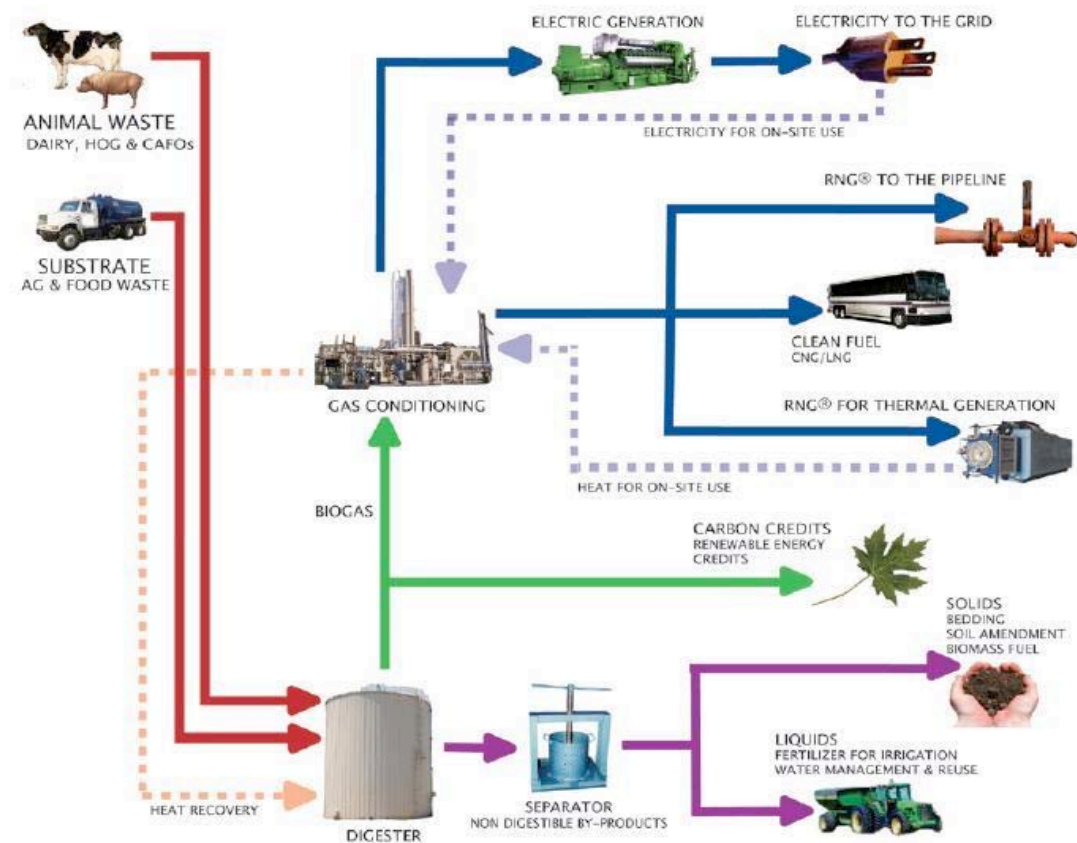


Diagram of The Process, uses and functions of biogas.

Nickbaum "Eco-pot"

This "eco-pot" works on a principal of conservation and addresses both energy and water use while cooking. Cooking two items in one pot saves water and energy

Disadvantages: This is considered sustainable, and is a good step towards the right direction, but how sustainable is this? It still runs on electricity, and needs water.

Considered sustainable, but how sustainable? Also Flavour carries over when cooking certain foods together.



The "Eco-pot". Nickbaum.

Geothermal cooking:

Geothermal energy has been used for thousands of years in some countries for cooking

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and heating. It is simply power derived from the Earth's internal heat. This thermal energy is contained in the rock and fluids beneath Earth's crust. It can be found from shallow ground to several miles below the surface, and even farther down to the extremely hot molten rock called magma. New Zealand is well set up for geo thermal cooking, and heating with the volcanic activity below the earth's crust.

Disadvantages: It does depend on where you come from, the environment may not be suitable.



A geyser near Rotorua, New Zealand.



Maori women cooking at Whakarewarewa in New Zealand.

Rethinking design:

The amount of potential that the "pot in a pot refrigerator" has in correspondence to sustainable design is huge, but somewhat unpredictable.

Something that sparked an interest in me was the reason why we do not use these pots as a form of refrigeration. I believe that it comes down to the fact that these 'refrigerator systems' were considered relatively high maintenance. In a busy modern day world, where time is of great value and importance; we are expected to fill every moment with doing and producing. When is there time to stop and water your 'pot in a pot refrigerator system?' And twice a day? Technology has made us lazy, and are we about to change our lazy habits to save our planet?

Designers need to realise that it is not going to be easy for many to change their ways, that sometimes small steps need to be taken in order for this paradigm shift to occur. So my aim was to design a 'pot in a pot refrigerator' that is self-watering and relies on rainwater and no electricity to keep the food inside fresh.

There are certain design problems that will have to be solved in creating this refrigerator. The variables that will have to be controlled are the amount of water that drips into the pot, and to avoid overflowing a drainage system, or spout will be installed to remove excess water. A problem could be that there may not be enough rainwater to supply this refrigerator. It would be good if this water could be recycled but this would not work, as this innovation works with evaporation of the water by sunlight. This design should be explored and the various problems solved, because it seems as though we are stupid not to use this genius innovation.



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Reference list and Bibliography:

Barnes, D.J.E and Meister, S. A. (2006) *Passive Cooling*.
Retrieved Wednesday 18th March, 2009, from; <http://www.energybulletin.net/node/22792>

Gauzin-Muller, D (2002) *Sustainable architecture and urbanism: Concepts, technologies, examples*. Birkhauser: Boston.

[www.gdrc.org
appro-tech.html](http://www.gdrc.org/appro-tech.html)
www.projecthdesign.com
<http://journeytoforever.org>
http://www.treehugger.com/files/2008/02/inflatable_tea.php
<http://www.inhabitat.com>
www.lowtechmagazine.com
www.villageearth.org
www.massivechange.com
www.worldchanging.com
nickbaum.com/tag/design/
<http://meche.mit.edu/news/mechefeatures/index.html?id=2>

Winchip, S.M (2007) *Sustainable design for interior environments*.
Fairchild: New York

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appro-tech: spatial design

Jane P. Dunlop

What/Why:

Steve Troy defines appropriate technology as “being mindful of what we are doing and aware of the consequences” (Troy, 2009). Appropriate technology offers a new sustainable approach to rethinking design projects within the world. These technological approaches are beneficial in reducing environmental pollution, as appropriate technology pushes towards using sustainable materials that are site specific. Material minimization is a particular strategy that is used in an attempt to utilize sustainable materials. Materials that are renewable or recyclable are a good example of minimizing materials, as it reduces waste. This strategy contributes towards decreasing the emission of carbon dioxide that is released into the atmosphere. Appropriate technology relies strongly on its context, with what materials are suitable to use on the site. Considerations have to be made into the circumstances and conditions of the site, as it is not appropriate to build a wind generator in a location that does not get much wind (Troy, 2009). The materials have to be appropriate to the site, to produce a positive outcome for the environment.

Some benefits of using local resources within communities are that it cuts down the costs of the materials and it requires less transportation. It is a positive strategy long term, as it creates employment within local communities. It allows the locals to be involved with the projects increasing their skills and knowledge, which can be passed down within the community (Troy, 2009). Other benefits for using appropriate technology is that it improves the health of locals, it has economical benefits and is better for the environment

Spatial design is a field that needs to be more considerate and conscious towards the environment. Using materials that are site specific and sustainable is a good start to help cut down pollution in the world. It is a method that should be considered in developing and developed countries.

Who/ How?

Kengo Kuma: Bamboo House.



Kengo Kuma is a Japanese architect, who has designed a project that employs the methods of appropriate technology. This can be seen in his project the Bamboo House, which is situated north of Beijing. This project uses site-specific materials as Kuma has used Bamboo from the local environment to construct this house. Kuma has used bamboo in a variety of different ways from sculpting to casting shadows. This has enhanced the aesthetic qualities of

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the material, by creating a new life spatially for bamboo. Overall this is a remarkably sustainable design, as bamboo “grows so quickly that it’s stocks can be replenished very efficiently” (Stang & Hawthorne, 2005, p.101) Bamboo is a good example of appropriate technology. It is low in cost and doesn’t have to travel far to get to the site. Kuma has used the bamboo in a very minimalist way, which is appropriate to the site and the environment.

Gustavo Dieguez and Lucas Gilardi: Plug and System.



Gustavo Dieguez and Lucas Gilardi are two Argentinean architects that have turned waste into inhabitation units. In their project Plug and Live System, they have used eighteen crate boxes, from Brazil and have transformed what was once considered to be waste into “transitory habitats” (Alvarado, 2008). They have reused materials in a minimal way that is appropriate to the site. Overall this design is low in cost and in transportation, as the crates can be “dismantled, the modules fit into a container and can be transported very easily” (Alavarado, 2008). This project is an outstanding design. It is a good example of appropriate technology within a site. It employs strategies of material minimization, by using materials that have been recycled and reused in an appropriate manner within the site.

HDR Architecture: Unit Load_Redux.



HDR Architecture has created an innovative temporary design called Unit Load_Redux. They have constructed a bike stand from recycled wooden pallets (Alter, L, 2008). Each year roughly two billion pallets are produced around the world, “in America alone, about four billion board feet of wood pallets are thrown away every year” (Alter, L, 2008). This design from HDR Architecture is an innovative design that reuses pallets in an appropriate way. It requires minimal materials, as it has used waste in a constructive manner that is beneficial towards the environment.

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Adam Kalkin: Shipping Container Prefabs.



Shipping containers can be used to create innovative sustainable designs. The 20 to 40 foot shipping containers are today being converted into liveable homes. Adam Kalkin has designed a home made out of shipping containers, which can be seen in his Quik House project. The Quik House is a cheap and affordable home, which cost Kalkin \$76000 to build. These shipping containers are a cheap and sustainable solution for houses. The prefabricated containers have a strong structural foundation and can be manipulated and stacked on top of each other and then “wedged into small plots and stacked up to nine units high” (Treehugger, 2005). Shipping containers are easy to transport and to construct. They can be transported by a train, boat or by trucks (Treehugger, 2005). Shipping containers are a design that is appropriate to the environment. They are low in cost and easily transported. They require minimal material as they are prefabricated.

Shigeru Ban: Paper Loghouse.



Shigeru Ban created the Paper Loghouse as relief architecture in Kobe after an earthquake destroyed hundreds of homes. The owners of the destroyed homes had no option but to live in tents. Ban's solution to the disaster was an affordable and simple idea to homes that anyone within the community could build. The foundation of the Paper Loghouse was constructed out of beer cases that were filled with sand. The walls were constructed out of paper tubes and the ceiling and roof were made from tent fabric. During the summer the roof and ceiling were divided to create air ventilation through the space. In the winter they remained attached, to create warmth within the space. It is a project that is beneficial towards the environment, as it requires minimal materials, is low in transportation and was quickly constructed to help during a crisis (Designboom, 1995).

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Rethinking design:

Every year within New Zealand three to four million tyres are disposed of in landfills. Tyres in landfills harm the environment and the health of New Zealanders. They have the potential to easily catch on fire, if not stacked correctly. This creates a greater risk to the lives and health of citizens within New Zealand (Ministry for the Environment, 2009). My design gives disposed tyres a purpose by reusing them in an innovative way that does not harm the environment. This will decrease the hazardous risk, as it will cut down the waste within landfills and provide a second life for tyres. I propose a design that applies the methods of appropriate technology. This proposal is site specific and appropriate to the environment. It has the possibility to be considered all over New Zealand, especially within rural areas. It is low in cost and transportation. It reuses waste materials within New Zealand in an innovative way.

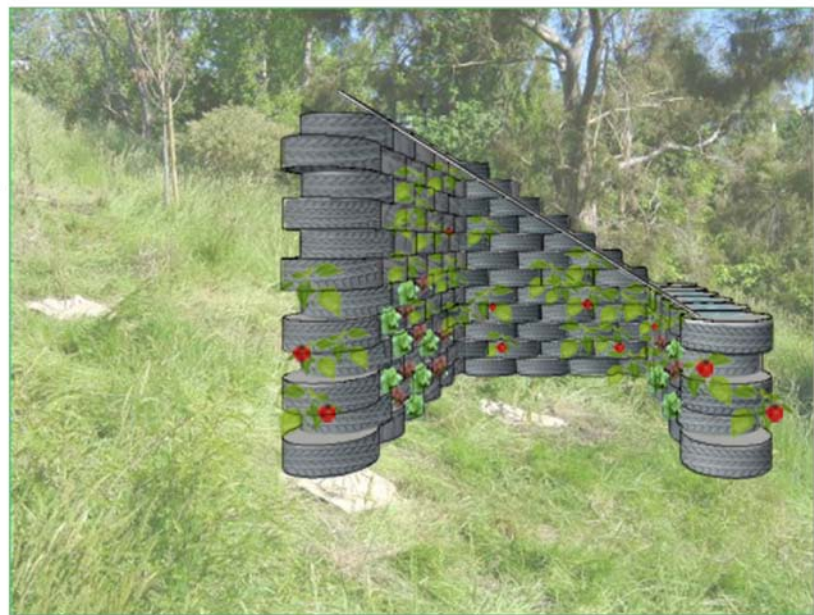
This proposal for spatial design within New Zealand is constructed out of tyres. The tyres are stacked on top of each other and filled in with dirt to form walls. There has the potential for vegetable plants to grow out of these tyres, which will allow the space to blend in with the natural environment. The roof is constructed from the rubber off car tyres and the door is constructed from the rubber off bike tyres. The pieces of rubber are sewed together with recycled copper wire. The tyre walls on the right have the potential to collect rainwater, from the sloping roof. This spatial design can become shelters that people can rest and relax in within New Zealand. It is overall a design that is beneficial towards the environment and has the potential to make radical changes to spatial design within New Zealand.



Roof:
The roof is constructed from the rubber off car tyres. It is sewed together with recycled copper wire.



Door:
The door is constructed from the rubber off bike tyres. It is sewed together with recycled copper wire.



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Reference List:

Alavarado, P. (2008). *Plug and Live System: 18 Boxes from Brazil to Argentina, from Waste to Art*. Retrieved March, 30th, 2009, from <http://www.treehugger.com/files/2008/10/houses-from-scrap-transitory-living-a77-argentina.php>.

Alter, L. (2008). *Recycling Pallets into Art and Architecture*. Retrieved March, 30th, 2009, from <http://www.treehugger.com/files/2008/06/recycling-pallets-into-art-and-architecture.php>

Designboom. (1995). *Shigeru Ban: Paper Loghouse*. Retrieved March, 30th, 2009, from http://www.designboom.com/history/ban_paper.html

Stang, A & Hawthorne, C. (2005). 'Great (Bamboo) Wall'. '. In *The Green House: New directions in sustainable architecture* (pp. 100-.105). United States: National Building Museum.

Treehugger. (2005). *Shipping Container Prefab*. Retrieved March, 30th, 2009, from http://www.treehugger.com/files/2005/01/shipping_contai.php

Troy, S. (n.d). *What is Appropriate Technology?*. Retrieved March, 30th, 2009, from <http://www.gdrc.org/techtran/appro-tech.html>

Ministry for the Environment. Retrieved April, 2nd, 2009, from <http://www.mfe.govt.nz/issues/sustainable-industry/initiatives/product-stewardship/special-wastes.html>

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appro-tech: energy generation

Catherine Keys

What/Why:

Appropriate technology is a term that refers to small scale technologies that respond to the basic needs of a particular culture. It acknowledges that different cultural and geographical groups will have different technologies that are appropriate to their circumstances. It is therefore wrong for outsiders to impose their technologies on others where they might not fit. Instead the best development is achieved when working amongst communities to provide them with the knowledge, skills and tools they need to solve their own problems. This approach turns end users into co-designers, helping to foster a sense of responsibility for the affects of their creations. Pride and participation can be used as key tools in design, creating "longer-lasting user relationships and a sense of ownership." (Project H Design, 2008, para.11)

Appropriate technology focuses on serving the basic infrastructure needs of a community, such as water, electricity, cooking fuel, heat, sanitation and housing. These needs can be met in simple ways that are easy to implement without harming the environment and without requiring a lot of money and materials. Wind turbines made of locally sourced scrap material are an example of such technology (when built in a windy place, where suitable scrap material exists). Such wind turbines have a positive impact on the user's life both socially and economically by providing a cheap, effective source of electricity. They also have a positive environmental effect, removing unwanted scrap product waste from the land and reducing the need for more polluting sources of power. Furthermore if used in a community with a functional mains power grid, the owner may be able to sell any extra power they don't require back into the grid for a small profit. Effective implementation of appropriate technology in this way can actually improve the economic position of individuals.

Although the term appropriate technology is commonly used in relation to technology within small, low income communities, appropriate technologies are just as applicable "among those people that have so much they are extraordinarily wasteful." (Darrow & Pam, 1981, p.10). Just like occupants of small villages there is potential for first world residents in large cities to implement small scale, low material, sustainable solutions to provide themselves with at least some of their electricity or other basic needs. No matter what the context technologies aiming to be appropriate can have "beneficial effects on income distribution, human development, environmental quality, and the distribution of political power in the context of particular communities and nations." (Village Earth, n.d., para.1). Above all appropriate technology is about positive designs that fit the particular place and application in which they are used, no matter where in the world this may be.

Energy generating appropriate technologies have the potential to increase the quality of life for many people, providing them with safe, effective and renewable forms of electricity, heating and fuel for cooking. In countries such as New Zealand, if more of our energy was supplied through appropriate technologies we could also greatly reduce our environmental impact. Currently around 30% of our total power comes from oil, 30% from gas, 5-10% from coal and the rest from renewable sources (hydro, wind and solar power). If we each looked to implement appropriate forms of energy generation at home, perhaps we could begin to swing these figures in favour of renewable, environmentally friendly forms of power. It is not unrealistic for many of us to set up simple solar water heaters, or use micro-hydro generators, or small wind turbines to generate at least some of our electricity needs.

Research into appropriate forms of energy generation is even more urgent in communities that do not have reliable mains power. The people of Haiti for example, rely on wood charcoal as their primary cooking fuel but high demand for wood has left the island 98%

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deforested. This leads to many environmental problems, including those directly affecting the community. Amy Smith gives the example of severe flooding killing thousands of residents due to a lack of trees to stabilise the soil and prevent rain from coming down the hills into villages. Compounding the problem of unsustainable cooking fuel, burning wood is also very dangerous. Respiratory infections, caused by inhaling fumes from indoor cooking fires kill millions of children across the world every year. The residents of Haiti clearly can not continue to use wood and wood charcoal in the same way they previously have. By looking for more appropriate alternatives, lives can be saved and the environment may be able to be replenished.

Who:

Amy Smith is a mechanical engineer from the Massachusetts Institute of Technology who works to solve problems in developing nations by embracing the theories behind appropriate technology. The designs she, and her students from MIT have developed are simple, common sense solutions to health, well-being and environmental issues that are pervasive throughout these communities. Demonstrating many of the principals of appropriate technology she aims to help people help themselves, with low cost, locally resourced design solutions (TED, n.d., para.1). A few of the solutions Smith and her students have developed so far, include an incubator that stays warm without electricity, a simple grain mill and a process of converting farm waste to cleaner burning charcoal.

Project H Design, founded by Emily Pilloton is a charitable organisation that focuses on appropriate industrial design addressing social issues and delivering life improving, empowering solutions. Project H Design aims to initiate a humanitarian change within the design industry through a range of schemes including design thinking, production and distribution and funding. They see appropriate technology as a systems approach to product design requiring user participation, skills and construction to produce products that are functional, suitable for the community in which they are built and economically, socially and environmentally positive (Project H, 2008, para.13).

The Appropriate Infrastructure Development Group (AIDG) aims to break the cycle of poverty in developing countries. Through business incubation, education and outreach programmes this organisation helps people develop affordable, sustainable technologies that generate electricity, aid sanitation and provide access to clean water. Business incubation is the key to the AIDG's work. Currently working in Guatemala and Haiti, they locate local engineering talent and help them form businesses that provide these basic services to their communities. Sustainable, low cost systems are created and distributed to the people who need them the most. Micro-hydroelectric projects and solar hot water heaters are examples of appropriate technologies they have already implemented.

The Solar Electric Light Fund (SELF) is a non-profit organisation that works specifically to provide sustainable energy solutions to the developing world. SELF designs and implements solar power and wireless communications technology in rural villages in Africa, Asia and Latin America. By providing affordable, renewable power for health clinics, schools, homes, microenterprise and other initiatives SELF can improve the "health, education and economic well-being of rural communities in the developing world." (SELF, 2008, para.1)

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How:

Biodigesters

Biodigesters provide a sustainable, appropriate method of creating biogas from animal and potentially human waste. A biodigester is a waste collection chamber that intentionally promotes the controlled build up of methane (fig.1). As waste is added, methane producing bacteria and the high methane environment in the chamber cause the waste to be consumed and sterilised. The sterilised effluent is allowed to flow out of the chamber for use as fertiliser while the excess methane produced is piped away and stored for use as an alternative to natural gas, propane or firewood. Biodigesters can be easily and cheaply made, generating renewable energy to be used for heating, cooking, lighting and other utilities. They are a wonderful example of appropriate technology as they remove common waste that is potentially harmful to people and the land, while trapping poisonous methane gas and turning it into essential fuel.

Two types of biodigesters that AIDG have been developing are the "salchica" type biodigester (fig.2) and the floating dome biodigester (fig.3). The salchica biodigester consists of a flexible polyethylene tube with PVC pipes at both ends, one allowing waste to enter and the other allowing the fertiliser to exit. In the center of the tube, a flexible hose is connected which pipes the biogas created to the kitchen or wherever it will be consumed. This system is suited to small-scale use by low-income families. Floating dome biodigesters are more expensive to produce but they last longer and allow greater control over the pressure of the gas. They are therefore more suited to larger-scale use for example in pig and cow farms. There are four main components to a floating dome digester: the digester tank, the floating dome, the influent chamber (feed pit) and the effluent chamber (outlet pit). The floating dome is the storage container for the gas produced. It sits inside the digester tank, rising as gas is generated and falling as it is used. Such a system has been implemented by AIDG in La Florida, a worker-owned cooperative of 47 families in Guatemala. Here it processes waste from the communities pigs, keeping it out of the water supply and providing an alternative to firewood.

Micro hydroelectric power

Hydroelectric generation is the conversion of the kinetic energy in water into electricity. The main differences between normal hydro systems and micro-hydro are due to the scale. Normal hydro requires the damming of rivers, leading to disruption and often damage of the environment. They are also grid connected whereas micro-hydro systems are generally stand-alone, only powering one house or small communities. Micro hydro is appropriate in locations close to a continuously fast flowing water supply or a water supply dropping more than 10 metres in vertical height. Such a system can be easily constructed out of cheap, basic materials to provide sustainable electricity that has no negative effect on the environment. In micro hydro schemes a small amount of water is diverted from the water source, the flow of this water is used to turn a turbine which in turn turns a generator that produces electricity. The water is then sent back to the same river to reduce any environmental effects.

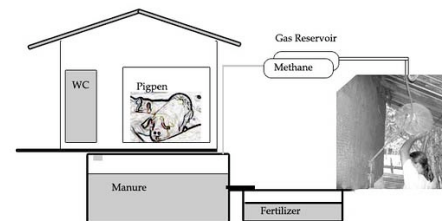


Fig.1



Fig.2



Fig.3

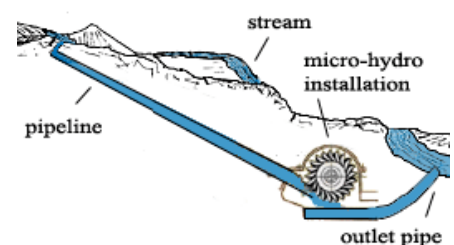


Fig.4

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AIDG has implemented a successful micro hydro system for the community of Comunidad Nueva Alianza, El Palmar, Guatemala (fig.5). This system cost \$45,000 and consists of many complex, but locally constructed components. It provides 40 families (approximately 200 people) with renewable electricity for use in their homes and other income generating projects. Another example of effective micro hydro-electric power systems are those by Eco Innovation, a New Zealand company specialising in renewable energy products and consultancy. They have created small, simple hydro-electric generators that many New Zealand citizens may be able to implement at home (fig.6).



Fig.5



Fig.6

Clean Burning Alternative Charcoals

With indoor air pollution leading to more deaths per year than malaria it is vital that cleaner burning alternatives to using wood as a cooking fuel are developed. Charcoal is a perfect solution. It is very energy efficient, has the ability to be stored indefinitely and most importantly is clean burning. As previously mentioned however high demand for wood charcoal leads to deforestation in islands such as Haiti. Amy Smith along with students at MIT is working to solve this problem by developing charcoal made from agricultural waste. Two potentials they have come up with are briquettes made from bagasse, sugar cane waste (fig.7), and corn cob charcoal. Both solutions are clean burning and bagasse briquettes can be easily produced at a small scale, in an oil drum, or the process can be scaled up as a business opportunity. The construction of bagasse charcoal briquettes consists of drying the bagasse, converting it into charcoal fines in a kiln, binding the dust with cassava porridge and finally pressing the briquettes (fig.8), either by hand or with a simple press.



Fig.7

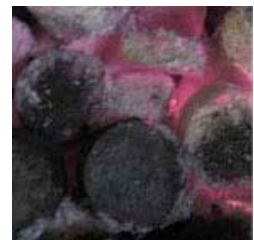


Fig.8



Fig.9

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Windmills and Wind Turbines

Wind is a fantastic source of renewable energy for people in both developing and first world communities. Wind power may not be able to meet all of a homes energy requirements but it can be very beneficial in lowering power bills or providing basic electricity for communities with unreliable, or no grid connections and low energy needs. Commercial wind power systems are still very expensive but it is possible to make simple, low cost wind turbines out of locally sourced scrap materials such as old car parts (fig.10). William Kamkwamba, for example, built his family a wind turbine with 4 blades when he was only 14 years old from materials as basic as a basket frame, pulley and plastic pipes (fig.11). This wind turbine generated enough power to run 4 lights and 2 radios around the home.



Fig.10



Fig.11

Solar Water Heating

Solar water heating is a simple and effective way to make use of the suns energy. Solar water heaters can be as simple as placing a hose on the roof or can be constructed more thoroughly with a piping system welded onto a copper sheet to trap the suns energy. They can be successfully implemented in any location that gets a fair amount of sunlight, to easily meet the hot water needs of a small family. Like several other examples shown, solar water heaters can make use of waste products to provide renewable energy, saving both the environment and reducing power costs for families.



Fig.12

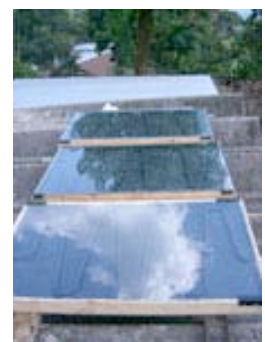


Fig.13

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WhisperGen

The WhisperGen microCHP system is a New Zealand designed solution to appropriate energy generation in the developed world (fig.14). It is a gas fired product for home use that not only provides heat as an energy efficient boiler heating system but while doing so generates electricity to supplement the grid supply. The system does rely on being grid connected and is therefore not designed as a stand-alone or back-up power generator. In cities with reliable mains power however it acts to provide a user with cheaper energy costs, it lessens their dependence on mass energy production and reduces CO2 emissions overall. The WhisperGen also requires minimal space, being designed to fit either under a bench like a dish washer or tucked away in a cupboard.



Fig.14

Smart Meters

Smart Meters (such as the Centameter) (fig.15) do not generate energy but are an appropriate solution to the energy problem in the developed world where people are extraordinarily wasteful with electricity. Smart Meters display a households total electricity costs in real time, enabling users to more closely control their power usage and save money by monitoring how much power is used at any given moment. They provide increased knowledge about how much certain appliances cost to run, allowing informed decisions to be made about power usage in the home. Understanding the cost of operating electrical appliances is the first step towards reducing energy use, electricity bills and greenhouse gas emissions.



Fig.15

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Rethinking design:

The Pedal Generator



The bicycle is one of the most efficient machines for turning human effort into energy for transport. If this energy is captured in a generator and potentially stored in a battery, it may be possible to use it to power lights and other small electrical appliances around the home. In developing countries bikes are commonly used for transport so this design utilises local materials, giving discarded bike parts a second life. A bike wheel, stripped down to the rim, and pedal system can be attached to the wall with the bike wheel connected to a generator. Any stool may be used as a seat for pedalling and if a basic wooden hand rest and book stand is also constructed, the peddler may be able to read under the light they are generating as they work. If a battery to store the energy is included in the system it would be possible to save it for later use, powering more electrical devices around the home. In this way sustainable, renewable energy can be easily created by people in developing countries to meet their own basic needs.

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Simple Solar Water Heater



Fig.16

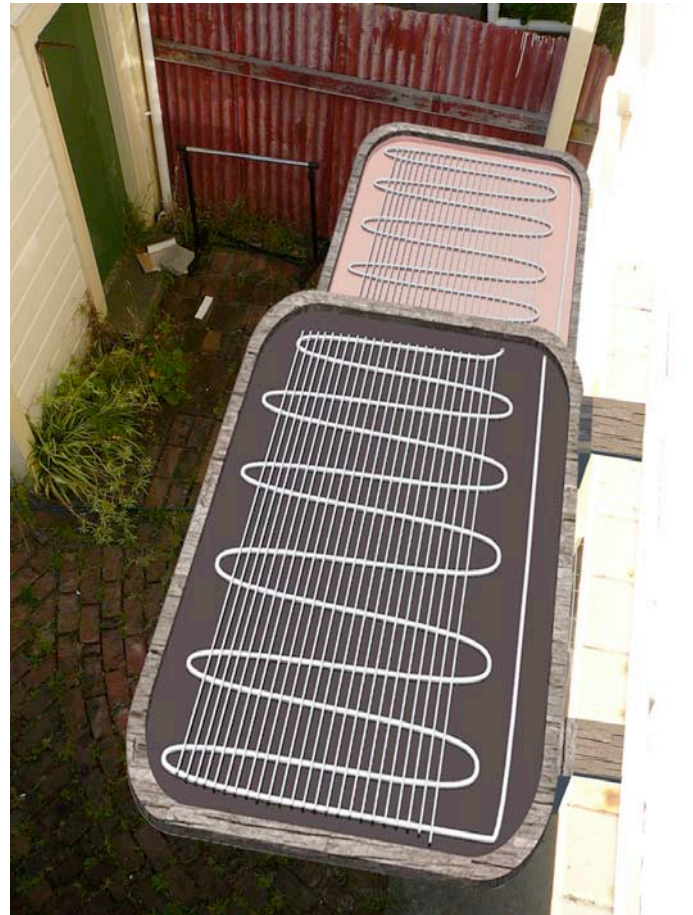


Fig.17

Effective solar water heaters are easily constructed out of scrap materials, available in both developing world and first world countries. This solar water heating system is designed using parts easily sourced in modern cities and can be built with minimal tools and construction knowledge.

It requires:

- a frame, most easily made of wood
- a backing to trap the heat, such as a copper sheet
- a metal pipe system to be attached to the backing
- two plastic pipes, attached to either end of the metal pipe system
- two buckets, one of cold water and the other for the hot water produced

The copper for the backing can potentially be sourced from an old hot water cylinder and banged into a flat sheet, while the piping system can come from the back of an old refrigerator. If the cold water bucket is placed higher than the hot bucket, the system will keep itself running, trapping heat and transferring it to the pipes and the water inside. The system should obviously be placed where it will receive the most sunlight and the panels should be at the same angle as the latitude of the location in which they are installed, to receive maximum sunlight all year round. Being situated outside, in a sunny area, these solar panels can also double as sun shades, reducing the need for extra materials to be wasted in the construction of separate shading systems. The tables on which the buckets are placed can become social areas for gathering and if desired cups of tea and other hot drinks can be made straight from the hot water produced. Solar water heating has the potential to reduce individual reliance on mass produced energy by providing a cheap, sustainable way of heating water for use around the home.

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Bibliography

- Appropriate Infrastructure Development Group. (n.d.). *About Us*. Retrieved March 21, 2009 from <http://www.aidg.org/mission.htm>
- Appropriate Infrastructure Development Group. (n.d.). *AIDG In Action*. Retrieved March 21, 2009 from <http://www.aidg.org/outreach.htm>
- Appropriate Infrastructure Development Group. (n.d.). *Technologies*. Retrieved March 21, 2009 from <http://www.aidg.org/technologies.htm>
- Centameter. (n.d.). *Save Power with the Centameter*. Retrieved March 23, 2009 from <http://www.centameter.co.nz/save-power-new-zealand/centameter-product-info.php>
- Darrow, K. & Pam, R. (1981). *Appropriate Technology Sourcebook: Volume One*. United States of America: Volunteers in Asia.
- Eco Innovation. (n.d.). Retrieved March 21, 2009 from <http://www.ecoinnovation.co.nz/>
- Flickr. (n.d.). *AIDG: Biodigesters*. Retrieved March 21, 2009 from <http://www.flickr.com/photos/aidg/sets/72157594384561305/>
- MIT: D-Lab. (n.d.). *Sugarcane Charcoal*. Retrieved March 23, 2009 from <http://web.mit.edu/d-lab/portfolio/sugarcanecharcoal.htm>
- Novolta. (n.d.). *Micro Hydro*. Retrieved March 23, 2009 from <http://www.novolta.com.au/solutions/microhydro.htm>
- Private Interview with Professor Ralph Sims from Massey University, conducted March 22, 2009.
- Project H Design. (2008). *Project H Design (Anti)Manifesto*. Retrieved March 28, 2009, from <http://projecthdesign.com/manifesto>
- Solar Electric Light Fund. (2008). Retrieved March 30, 2009, from <http://www.self.org/index.asp>
- TED. (n.d.). *Amy Smith: Inventor, Engineer*. Retrieved March 21, 2009 from http://www.ted.com/index.php/speakers/amy_smith.html
- TED. (2006). *Amy Smith: Simple Designs that could Save Millions of Childrens' Lives*. Retrieved March 21, 2009 from http://www.ted.com/index.php/talks/amy_smith_shares_simple_lifesaving_design.html
- TED. (2007). *William Kamkwamba: How I Built my Family a Windmill*. Retrieved March 21, 2009 from http://www.ted.com/index.php/talks/william_kamkwamba_on_building_a_windmill.html
- Village Earth. (n.d.). *Appropriate Technology*. Retrieved March 13, 2009 from http://www.villageearth.org/web/pages/Appropriate_Technology/index.php
- WhisperGen. (n.d.). *Products: On-grid*. Retrieved March 21, 2009 from <http://www.whispergen.com/main/acwhispergen/>

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- Instructables. (n.d.). *Solar Thermal Water Heater for less than Five Dollars*. Retrieved March 20, 2009 from <http://www.redferret.net/wp-content/uploads/2008/12/microchp.jpg>

Image List

- Fig. 1. Biodigester system. Flickr. (n.d.). *AIDG: Biodigesters*. Retrieved March 21, 2009 from <http://www.flickr.com/photos/aidg/sets/72157594384561305/>
- Fig. 2. Salchica Biodigester. Flickr. (n.d.). *AIDG: Biodigesters*. Retrieved March 21, 2009 from <http://www.flickr.com/photos/aidg/sets/72157594384561305/>
- Fig. 3. Floating Dome Biodigester being constructed for La Florida. Flickr. (n.d.). *AIDG: Biodigesters*. Retrieved March 21, 2009 from <http://www.flickr.com/photos/aidg/sets/72157594384561305/>
- Fig. 4. Micro Hydro-Electric Generation System. Appropriate Infrastructure Development Group. (n.d.). *Technologies*. Retrieved March 21, 2009 from <http://www.aidg.org/hydro.htm>
- Fig. 5. Micro Hydro System in Comunidad Nueva Alianza. Appropriate Infrastructure Development Group. (n.d.). *Featured Projects*. Retrieved March 21, 2009 from http://www.aidg.org/outreach/featured_projects.htm
- Fig. 6. Micro Hydro System by Eco Innovation. Eco Innovation. (n.d.). Retrieved March 21, 2009 from <http://www.ecoinnovation.co.nz/>
- Fig. 7. Bagasse. MIT: D-Lab. (n.d.). *Sugarcane Charcoal*. Retrieved March 23, 2009 from <http://web.mit.edu/d-lab/portfolio/sugarcanecharcoal.htm>
- Fig. 8. Charcoal Briquettes. MIT: D-Lab. (n.d.). *Sugarcane Charcoal*. Retrieved March 23, 2009 from <http://web.mit.edu/d-lab/portfolio/sugarcanecharcoal.htm>
- Fig. 9. Pressing Charcoal Briquettes. MIT: D-Lab. (n.d.). *Sugarcane Charcoal*. Retrieved March 23, 2009 from <http://web.mit.edu/d-lab/portfolio/sugarcanecharcoal.htm>
- Fig. 10. Windmill made of Old Car Parts. Village Earth. (n.d.). *Wind Energy*. Retrieved March 13, 2009 from http://www.villageearth.org/pages/Appropriate_Technology/ATSourcebook/Energywind.php
- Fig. 11. William Kamkwamba's Windmill. Retrieved March 30, 2009 from <http://www.flickr.com/photos/9278648@N04/614968682>
- Fig. 12. Solar Water Heating System. Appropriate Infrastructure Development Group. (n.d.). *Technologies*. Retrieved March 21, 2009 from <http://www.aidg.org/water.htm>
- Fig. 13. Solar Water Heating System. Appropriate Infrastructure Development Group. (n.d.). *Technologies*. Retrieved March 21, 2009 from <http://www.aidg.org/water.htm>
- Fig. 14. WhisperGen micro CHP system. WhisperGen. (n.d.). *Products: On-grid*. Retrieved March 21, 2009 from <http://www.whispergen.com/main/acwhispergen/>
- Fig. 15. Centameter. <http://www.redferret.net/wp-content/uploads/2008/12/microchp.jpg>

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- Fig. 16. The Pedal Generator. Catherine Keys. (2009).
- Fig. 17. Simple Solar Water Heater. Catherine Keys. (2009).
- Fig.18. Simple Solar Water Heater from above. Catherine Keys. (2009).

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Appro-tech:

Design of water collection or treatment systems or water using systems

Jackson, Scott

What/Why:

Water supply, Water storage and Water quality pose the greatest challenge to developing countries. As urban density's rise rapidly developing communities become unable to provide the necessary infrastructure to provide clean water and adequate sewage systems. This results in the dumping of sewage and waste into local rivers or streams. These practices create immediate sanitation, health and hygiene issues alongside other long term health and ecological hazards that are commonly unknown to the local communities.

High tech solutions are not feasible within this situation. Resources that are commonplace throughout the western world are often not available or appropriate with in these countries. The solution relies on a design process that will respond to the communities' unique cultural and environmental surroundings.

Appropriate technology as stated by Project H is a field of engineering that produces solutions based on local technologies, materials, and contexts. Appropriate technologies relates well to third world issues because of its ability to find the most functional solution to the problem. Appropriate technologies often result in a simplistic response to the problem at hand that encourages user understanding and involvement throughout the whole design process. Creating a solution that is supported by the community instead of feared.

Who:

Products

Lifestraw:

Torben Vestergaard Frandsen

<http://www.vestergaard-frandsen.com/lifestraw.htm>

Life Saver Bottle:

Micheal Pritchard

<http://www.lifesaverusa.com/>

Q-drum:

The rollable water container for developing countries

<http://www.qdrum.co.za>

Hippo Roller

Water transporting device

<http://www.hipporoller.org>

Sodis

Solar Water Disinfection

<http://www.sodis.ch/>

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Websites:

Worldchanging:change your thinking
<http://www.worldchanging.com>

Design for the other 90%
<http://other90.cooperhewitt.org>

International Network of institutions and experts on Traditional Knowledge:
<http://www.itknet.org>

ProjectH:
Product Design Initiatives for Humanity, Habitats, Health, Happiness.
<http://projecthdesign.com/>

Index:
Design to improve Life
<http://www.indexaward.dk/>

Lowtech Magazine:
<http://www.lowtechmagazine.com/>

Treehugger
<http://www.treehugger.com/>

Inhabitat
<http://www.inhabitat.com/>

How:

With over one billion that is one sixth of the world population not having access to clean water the risk of water born disease is imminent resulting in over 6000 deaths a day from the drinking of unsafe water.

(Good Thinking, *The LifeStraw makes dirty water clean*: <http://www.gizmag.com/go/4418/4>)



"Pic 1"

A device to clean this water is the obvious response to this problem but the issue is that often countries which don't have access to clean water also don't have access to electricity or the complex technology's that until recently was a must to purify water.

The invention of the LifeStraw® and similar products like the LIFESAVER® bottle have designed a portable water filtration device.

The lifesaver is a 31 cm long, 29 mm diameter, plastic tube filter. The device works by passing the water through a series of iodine chambers within the straw. The user powers the process as he sucks the water through the straw into his mouth.

The Lifestraw is a remarkable product which has the ability to save millions of lives but with a cost of around \$3.00, a spokesman for the UK's WaterAid emphasized that on a daily income of less than \$1 per day, \$3.00 is not a reasonable price,
(Rich, S. *LifeStraw Update*: <http://www.worldchanging.com/archives/004389.html>)

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This issue of cost is could possibly be solved with a release of the product on the western world. The cost of the product could be set at around a price more than \$3.00 and all profits could go towards reducing the price of lifestraws where they are most needed.

Q drum and Hippo Roller

Water collection is a demanding and physical task that is a daily part of life of many individuals living in poverty stricken parts of the world.

"Pic 2"



Products like the Q drum and the hippo roller are a response to this issue. Both these products use minimal materials and only rely on the most basic technology making the manufacturing process as cheap as possible.

The Q drum is particularly well designed. Its use of a low-density polyethylene means that this product is pretty much indestructible. Its unique and extremely basic design consisting of a cylindrical vessel with a hole through the center to where a "piece of rope or any other appropriate material can be tied too allowing the vessel to be pulled or

rolled along. This simplistic design results in a 50-liter water container that can be pulled from the water source to ones home with very little strain.

Bamboo Treadle Pump

The bamboo treadle pump is another appro-tech driven response to the issue of extracting groundwater during the dry season for poor farmers in India of which the traditional processes for groundwater extraction are too expensive.



The treadles and supporting structure is made of bamboo or any other appropriate material while the pump itself is made of steel, this part of the structure can be purchased for around 10 dollars US and is able to be manufactured locally and installed by the farmer himself.

The pumping mechanism is fairly tireless of which all it requires is a walking motion on two treadles. The pump allows the farmer to have control over his supply of irrigation water allowing him to invest in a wider and more desired range of crops producing a larger profit for the farmer.

"Pic 3"

The pumps have been proven to at least double the income of the farmers. This increases production and distribution of the vegetables creating more work within the community.

(Transfer of Technology Models (TOTEMs):

<http://www.inbar.int/TOTEM/totemdetail.asp?id=17&codeid=5>)

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Low-tech Solar Water Purification

Solar Water Purification is a simple technology used to improve the quality of drinking water. The process is extremely basic and all that is needed is a transparent plastic bottle full of contaminated water and six hours of sunlight. The process works through solar UV-A radiation and a temperature increase which deactivates the pathogens within the water, which are the cause of diarrhea. Diarrhea is directly responsible for 2.5 million deaths a year of which most are children under 5.



"Pic 4"



"Pic 5"

Solar water purification is a remarkable use of appropriate technology but is limited because of its inability to treat large volumes of water and its inability to clean particularly murky water.

(Sodis. *Solar Water Disinfection - The method:*
<http://www.sodis.ch/Text2002/T-TheMethod.htm>)

John Todd A Living Machine

John Todd's solution to the treatment of large amounts of wastewater is remarkable to say the least. His method is an eco-conscious process of which he re-organizes natural resources to treat water from dirty to clean. This is achieved by sending water through various unique ecological systems that filter and treat the wastewater until it is completely clean.



"pic 6"

This living machine is comprised of interrelated ecologies which all work together to break down pollutants within the wastewater. The machine uses "helpful bacteria, fungi, plants, snails, clams and fish" all organized in a specific way to clean the water.

(Chen, O. (2008). *Living Machines: Clean, Green Waste-Water Recycling.*

<http://www.inhabitat.com/2008/08/06/living-machines-turning-wastewater-clean-with-plants/>)

"pic 7"



This process was tested recently in Fuzhou. A city of 6 million people in China. Fuzhou has 80 kilometers of canals that run throughout the city. Fuzhou is not equipped with a wastewater treatment infrastructure so all the wastewater is dumped straight into the canals.

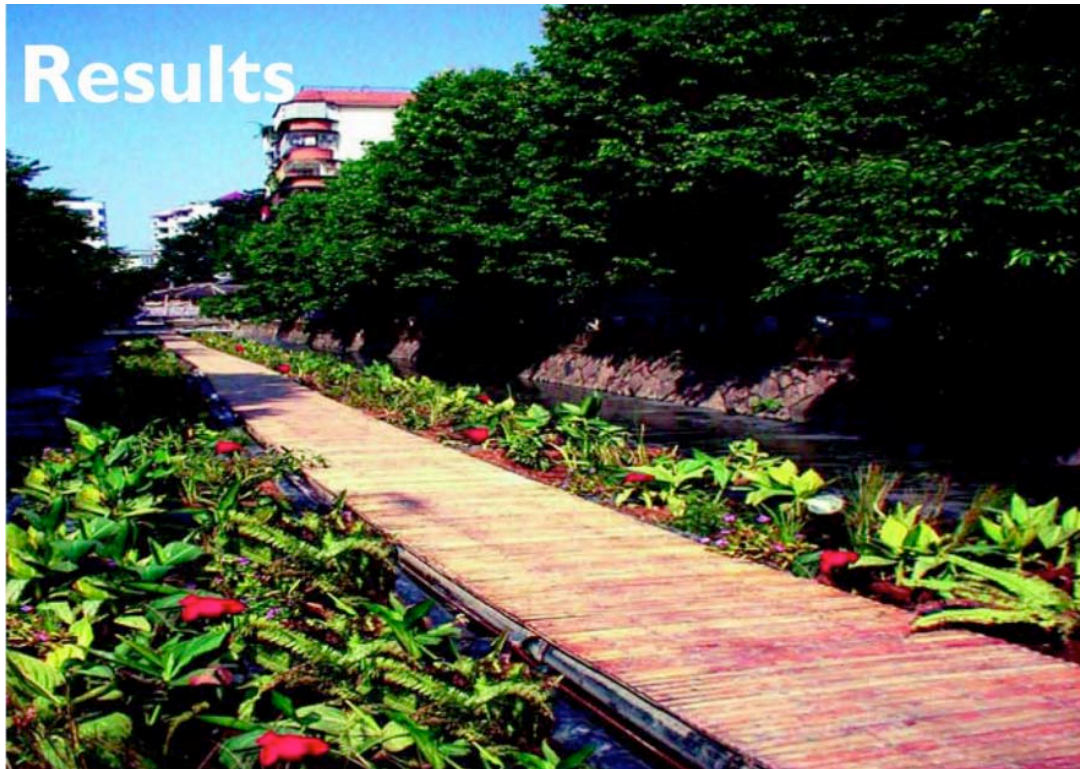
The canals came to a point where they had become a health risk for the city's inhabitants and the aquatic ecosystems downstream.

In 2002 John Todd applied his principles behind the living machine to design a restorer for the Fuzhou canals using 12,000 plants composed of native species.

rethinking design

The restorer system was a complete success meeting in all the goals set by the city of Fuzhou in regards to water quality while also becoming a desirable recreation area for the habitants of Fuzhou something that a traditional waste water treatment process would never achieve.

(Todd, J. *Living Technologies*, <http://www.bioneers.org/node/1446>)



"Pic 8"

rethinking design

Design Response:

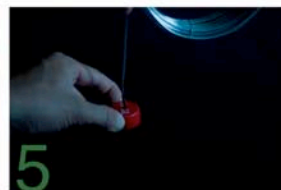
Most of the research taken place for this report has been based within developing countries though my design below is a response to the issue of water conservation within relation into how we in the western world can be more sustainable with our personal water consumption.

The design below follows the ideas behind appropriate technology design using only found materials and in such a simplistic manner next to anyone could build this with minimal equipment. The plant watering process is done by filling up the bottom bottle with water and allowing the plant to suck up the water into its roots through the thread running up through the soil. This results in there being no water wasted from over watering.

This design is small and simple but with a little bit of time and creativity one could set up a system based on the same principal's inside there apartment that could provide the user with a wide range of herbs and vegetables.

Design Response:

- 1- Score yourself some plastic bottles (recycled)
- 2- Cut the top of the bottle off.
- 3- Place the top of the bottle upside down on the bottom of the bottle
- 4- Heat up some wire
- 5- Put the hot wire through the top of the bottle cap creating a hole
- 6- Find yourself some cotton thread (In my case an old shoelace)
- 7- Place the thread through the hole in the bottle cap
- 8- Put some water in the bottom of the bottle. Then place the top of the bottle into the bottom with the thread going into the water. (Don't let the top bottle get wet though otherwise you might get some algae growing in your bottle.)
- 9- Place your desired seeds into the top bottle with the thread going to the top of the soil. Watch it grow



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Reference List:

Chen, O. (2008). *Living Machines: Clean, Green Waste-Water Recycling*. Retrieved March 10, 2009, from <http://www.inhabitat.com/2008/08/06/living-machines-turning-wastewater-clean-with-plants/>

Good Thinking. *The LifeStraw makes dirty water clean*: Retrieved March 25, 2009, from <http://www.gizmag.com/go/4418/4/>

Q Drum. *About the Q Drum*: Retrieved March 15, 2009, from <http://www.qdrum.co.za/index.php/about>

Rich, S. (2006). *LifeStraw Update*: Retrieved March 15 2009, from <http://www.worldchanging.com/archives/004389.html>

Sodis. *Solar Water Disinfection - The method*: Retrieved March 26, 2009, from <http://www.sodis.ch/Text2002/T-TheMethod.htm>

Todd, J. (2009). *Living Technologies*. Retrieved March 10, 2009, from <http://www.bioneers.org/node/1446>

Transfer of Technology Models (TOTEMs): Retrieved March 25, 2009, from <http://www.inbar.int/TOTEM/totemdetail.asp?id=17&codeid=5>

rethinking design

Image List

Pic 1: <http://www.vestergaard-frandsen.com/lifestraw.htm>

Pic 2: <http://www.qdrum.co.za/index.php/media-gallery>

Pic 3: <http://other90.cooperhewitt.org/Design/bamboo-treadle-pump>

Pic 4: <http://www.sodis.ch/index.htm>

Pic 5: <http://www.sodis.ch/index.htm>

Pic 6: <http://www.inhabitat.com/2008/08/06/living-machines-turning-wastewater-clean-with-plants/>

Pic 7: <http://www.bioneers.org/node/1446>

Pic 8: <http://www.bioneers.org/node/1446>

appro-tech: furniture/appliances

Sinead Satherley

What/Why:

Appropriate technology, or appro-tech, is a form of green design which considers the ways in which something is designed and then produced, in relation to its immediate environmental, economical and cultural surroundings. The most significant considerations are:

- Minimal capital investment (how the object of project can be most economic, and make the most out of the money that is inserted into it)
- Spread of knowledge (how a design solution can be spread coherently among individuals so as many people and communities as possible can make the most of this knowledge)
- Low technology (how the object or project can be produced with minimal technology and machinery and operate with minimal technology and power usage- effectively making it available to a wider range of people)
- Local materials and labour (using materials that are locally available- whether it is a natural resource or a stock of recyclable matter- and using local labour and local customs to bring the project into the community on every level)
- Minimal resources and maintenance
- Site specificity (working with the site in question to work out how the design can be most efficient and beneficial), considering:

latitude	insulation
sun path	heating
humidity	temperature
breezes	vegetation
land contour	obstructions

It seems that the area where appro-tech is most useful in today's society is in disaster and crisis relief situations, mostly in third world countries but also in western countries that are hit by natural disasters. From researching on the net, and from my own personal experience, employing appropriate technologies is second nature, at least to individuals in one off situations, and it is the large scale societal situations where the skill of employing appro-tech needs to be considered to a deeper degree.

In the design areas of furniture and appliances, appro-tech could be in the use of re-cycled furniture and materials, locally available resources, utilising the local community for labour of making and running devices, salvaging from city dumps, producing appliances and devices that are off-the-grid, or at the least use a renewable energy source e.g. solar, wind or kinetic. The overall factor to be considered is the item's ability to be used to help people meet their needs without compromising future generation's ability to do the same.

Who & How:

There are people who design by this discipline for disaster relief and for developing nations, and there are also designers in western culture who are creating consumer goods along these codes. The two areas might seem quite separate, but when it comes down to it they both use local cultures, resources and economies to inform their processes. The following is a selection of designers who are working to create furniture or appliances using the appropriate technologies and resources available to them.



fig. 1

poured into two simple fiberglass molds, some metal parts, one wrench and a hammer. If necessary, adjustment is quickly and easily done. It is estimated that one Universal Nut Sheller will serve the needs of a village of 2,000 people. The life expectancy of the machine is around 25 years. **Full Belly Project** has shipped these simple tools to communities in need in over 100 countries, to increase the cost effectiveness of peanut agriculture as a means of sustainable development in those countries.

The **Fully Belly Project**- a non-profit organization based out of Wilmington, North Carolina.

F.B.P. designs labour-saving devices to improve the lives of people in developing countries. They aim to establish local, sustainable businesses in developing nations.

The Universal Nut Sheller machine based on a Bulgarian Peanut sheller, capable of shelling 50 kilograms (110 lb) of raw, sun-dried peanuts per hour. It requires less than US\$50 in materials to make, and is made of concrete

The **BASIC Initiative** is a collaboration of faculty and students from the University of Texas at Austin, School of Architecture. They support community partnerships through: housing solutions for Native Americans, housing and community services for migrant farm workers, schools and health clinics in central Mexico, etc. Each program draws upon the unique relationship of communities to their environment, finding solutions that embrace appropriate technologies while reinforcing local values to spur self-initiated development.



fig. 2



fig. 3

Architect **Sergio Palleroni** is a co-founder of the **BASIC initiative**. One of his most successful appro-tech solutions is a solar-powered kitchen for a school in a squatter community in the municipality of Jiutepec, Mexico. The self-sustained kitchen has a solar dish made from recycled vanity mirrors and bicycle parts. The dish radiates the sun's rays onto the Kitchen's hearth, heating the ovens.

One of **Sergio Palleroni's** most ambitious undertakings has been the **Katrina Furniture Project** to



Fig. 5

This pew is made of 19th-century cypress reclaimed from a home in New Orleans' Lower Ninth Ward after Hurricane Katrina. The project includes making community workshops where people can learn basic carpentry skills and learn to make their own furniture in case another natural disaster occurs.



Fig. 4

salvage and reuse the destroyed building stock of New Orleans. **BASIC Initiative** are designing prototypes for simple furniture and building it with old-growth cypress, long-leaf pine, and other materials previously destined for the landfill.

The zeer pot- invented by a Nigerian, **Mohammed Bah Abba**, is a small pot fitted inside a larger pot, with the space in-between being filled with sand which is wetted regularly to cool the inner pot. Each zeer can contain 12 kg of vegetables, and costs less than US\$2 to produce. Bah Abba passed his idea to the

Intermediate Technology Development Group (ITDG), which, with the assistance of researchers at the University of Al Fashir, carried out experiments to measure its value in maintaining nutrient content and extending the shelf life of vegetables. As a result, *fig. 6*



the **Women's Association for Earthenware Manufacturing** in Darfur, with the support of ITDG, is now producing and selling zeers for food preservation in the Al Fashir area. It is simple

and appropriate technology, and both producer and consumer benefit. For the farmer, the zeer increases sales opportunities and for the consumer the result is an increased supply of vegetables and fruits in marketplace.

Skate Study House

Skate Study House is collaboration between **Pierre Andre Senizergues** and **Gille Bon De Lapointe**. They use recycled, second-hand and custom-ordered resources to create furniture. As California is the home of skateboarding, there is ample supply of unwanted decks and wheels, which Skate Study House uses to produce their line of Modernism-inspired, Californian-style originals.



fig. 7



fig. 8

Ben Mickus is a practicing architect and designer who started **Mickus Projects** in 2006, which is based out of New York. He creates chairs and other similar items of furniture using the process of digital fabrication and consisting of rapidly renewable materials



such as in the following examples of the felt collection.

Chair and footrest are composites of: natural wool felt, water-based adhesives and recyclable aluminum.

-fig. 10



fig. 9

David Stovell is a U.K. based designer who in the case of this series has produced items of furniture from discarded, unused rolls of newspaper which he has gleaned off the city streets outside shops. The series examines the different values given to a product- having clear value one day and the next no value whatsoever. He has tried to prolong the life of the material.



fig. 11



Fig. 12

Santiago Morahan

is an Argentina-based designer who has produces the Diseno Cartonero (garbage collector) series. The project creates functional and elegant pieces of furniture from cast-off cardboard scavenged by garbage collectors.



fig. 13-

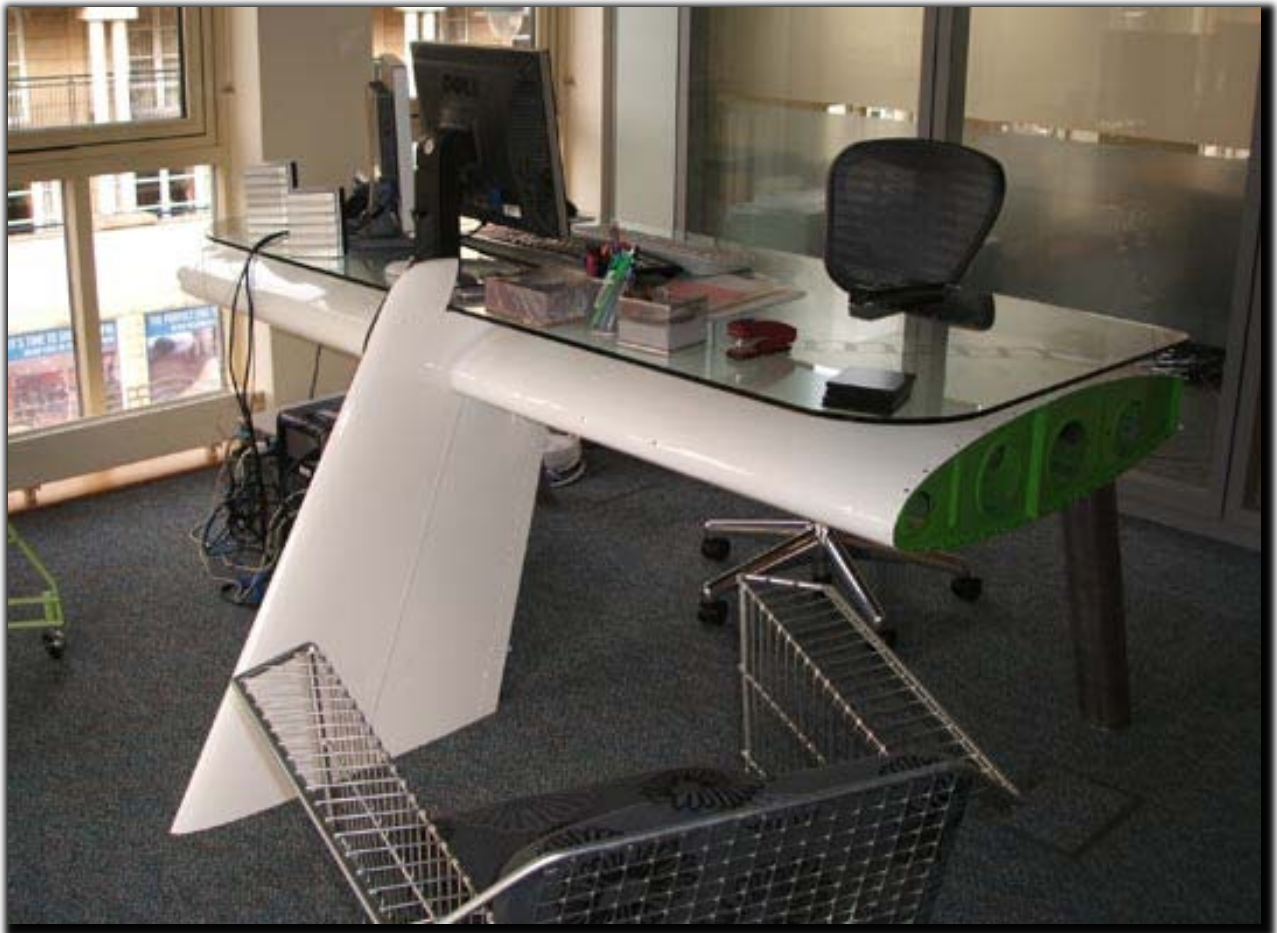


fig. 14

Reestore, a U.K. based design firm, takes miscellaneous discarded items and up-cycles them into unique pieces of furniture, like the airplane wing turned office desk, Deborah (pictured). Their furniture is partly made from new material, but the idea is that they can be recycled in turn.

Rethinking design:

An example of a device that unnecessarily uses non-renewable energy for an action that simply does not need electricity: the Suima electric cradle, which rocks babies to sleep in the pace of the mum's heartbeat. Most people will think this is ridiculous and unnecessary, which leads back to my point that using appropriate technology is second nature to us and simple ways of life that have been around for hundreds of years really are the best way to do things in order to maintain the environment. Common sense- does an exercise or action need electricity or can kinetic energy in the form of human engagement do the job?



fig. 15

Testing design ideas

Recently I have taken the task of re-fitting a caravan for self-sustainable use. An example of using appropriate resources is the Rimu bench tops and shelves- the Rimu boards are in fact old bed headboards which I salvaged from the local recycle centre... pro-longing the life of the timber, using an already cut resource, taking one piece of furniture to create another.



fig. 16



fig. 17

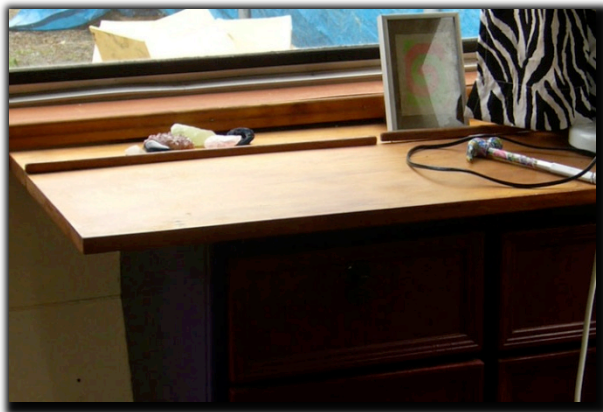


fig. 18



fig. 19

A material that is in excess at council landfills is rubber vehicle tyres. There are people out there who are already exploring ways to recycle this valuable material, other than crumbing to make insulation and matting.



fig. 20

Metzli Mancilla Hernandez, a Mexican designer, has created a collection of furniture made from recycled tyres, which she has cut into straps, patterned into products and then polished. The collection is called 'In Route'.

Tyres are made from vulcanised rubber, which is a very tough chemically-enhanced rubber. There is a way to de-vulcanise tyres and convert them back into rubber, which can be used to make new rubber products.

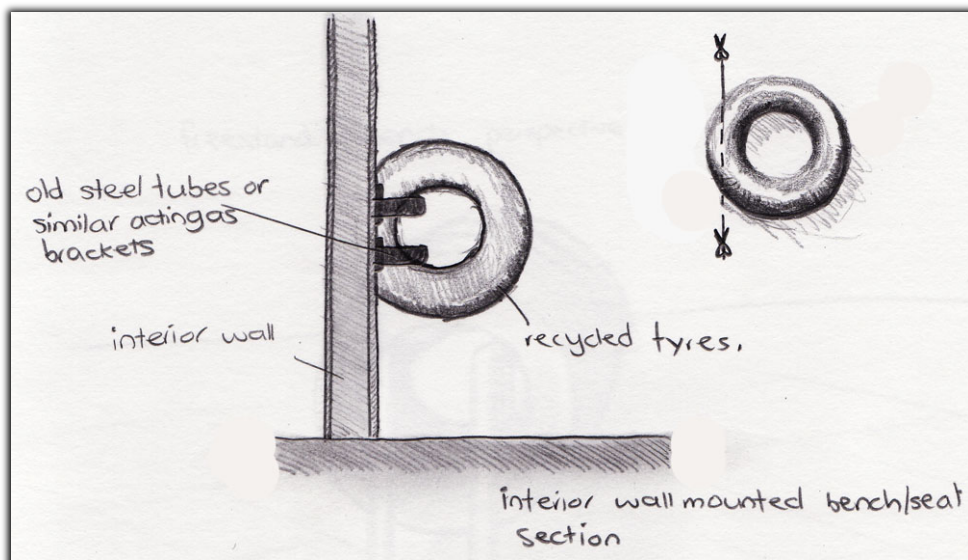
I am looking for an in-expensive way to make the most out of this wide-spread resource, and the easiest way for it to be utilised by as many peoples as possible is to use the tyres whole, as **Metzli Mancilla Hernandez** has done.



fig. 21

ProjectH designers **Heleen De Goey** and **Dan Grossman** have effectively used salvaged whole tyres to create a mathematical 'toy' for the students of Kutamba AIDs Orphans School in Uganda. The playground can also be used for an assembly space with the inclusion of benches over each tyre. The project is part of **Architecture For Humanity's** redesign for the school.

The following two designs concepts would take used tyres from local landfills, sterilised and polished, and join them together into modular units using recycled pieces of steel tubing or similar material that is available.



-fig. 22

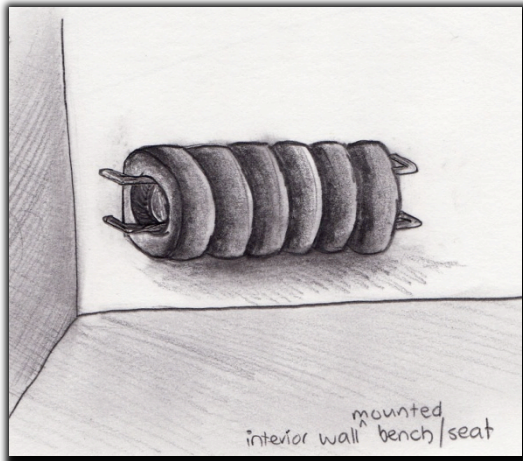


fig. 23

Pros:

I think these designs would be easy to make almost anywhere in the world as most of the world has excess tyre and rubber waste.

They would have a low capital investment.

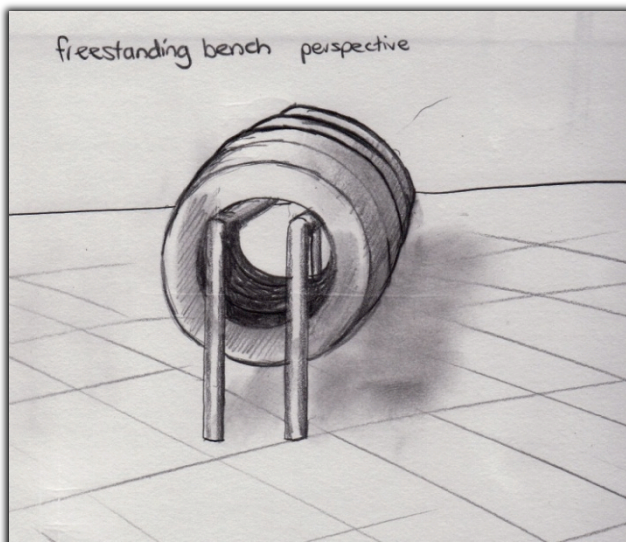
They could be implemented in third world or western cultures, either publically or privately.

They won't break down over time- at least they will take a very long time to do so, and will need little maintenance.

All you will need to make them is a tool to cut the rubber and a tool to bend the tubing.

Cons:

I am not sure how safe it is to sit on vulcanised rubber for prolonged amounts of time- it is toxic. For some places tyres or steel tubing may not be accessible.



-fig. 24

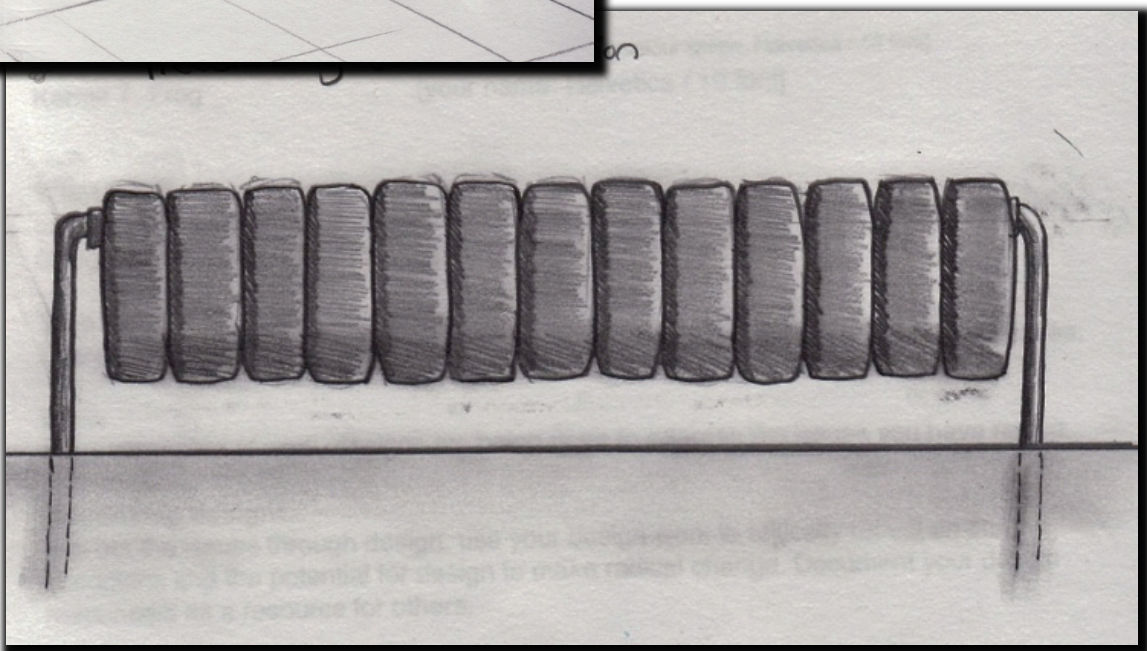


fig. 25

Image sources

- Fig.1 www.wikipedia.org
Fig.2 *Design like you give a damn*, Anderson, M. & Anderson, P. (2007).
Fig.3 *Design like you give a damn*, Anderson, M. & Anderson, P. (2007).
Fig.4 www.interiordesign.net
Fig.5 www.basicinitiative.org
Fig.6 www.goselfsufficient.co.uk
Fig.7 www.skatestudyhouse.com
Fig.8 www.skatestudyhouse.com
Fig.9 www.inhabitat.com
Fig.10 www.inhabitat.com
Fig.11 www.stovelldesign.co.uk
Fig.12 www.inhabitat.com
Fig.13 www.inhabitat.com
Fig.14 www.inhabitat.com
Fig.15 www.treehugger.com
Fig.16, 17, 18 & 19 sourced from private collection
Fig.20 www.treehugger.com
Fig.21 www.projecthdesign.com
Fig.22, 23, 24 & 25 sourced from private collection

Bibliography

Hutching, C. (2006). *Statistics N.Z. building*, ProDesign Magazine, Feb/March 2006.

Anderson, M. & Anderson, P. (2007). *Design like you give a damn*. New York, U.S.A: Princeton Architectural Press.

Smith, C. E. (2007). *Design for the other 90%*, New York, U.S.A: Cooper-Hewitt, National Design Museum, Smithsonian Institution.

Papanek. V. (1995). *The green imperative: ecology and ethics in architecture*. London, U.K: Thames and Hudson.

www.treehugger.com
www.betterdesign.org
www.appropriatebuildingdesign.com
www.skatestudyhouse.com
www.architectureforhumanity.org.
www.onlineopinion.com.au
www.inhabitat.com
www.basicinitiative.org
www.stovelldesign.co.uk
www.goselfsufficient.co.uk
www.interiordesign.net
www.projecthdesign.com
www.tyrerecyclingsuccess.com
www.keetsa.com/blog
www.ted.com

Rethinking Design

Appro- tech: Lighting Design

Sophie J. Norris

What/why:

Environmental, ethnical, cultural, social and economical aspects are the major factors influencing the design of appropriate technology, providing designs that require fewer resources, easier maintenance, and lower overall costs as well as far less significant impact on the environment compared with industrialized practices. It is important that the design evaluates a material or products composition and the human and environmental health impacts throughout its life cycle. (Poole, B (2006) p181)

The environmental aspect of appropriate technology should minimize depletion and pollution by using renewable resources, through built in waste minimization. Appropriate technology is strongly focused around designing technologies that will require minimal materials so in the end minimal waste. In William McDonough and Michael Braungarts book cradle to cradle the notions of waste and a products 'end life' are keenly challenged. This concept revolves around a design solution that addresses issues of maintainability and serviceability of products as means to encourage recycling materials. (Braungart, M, McDonough, W (2002) p 69) . Appropriate technology focuses on being site specific considering local circumstances and conditions as a means to create locally controlable solutions which require locally available resources Relying heavily on on-site, local assembly and materials means the design that goes into appropriate technology is less materials driven and more results driven. (www.projecthdesign)

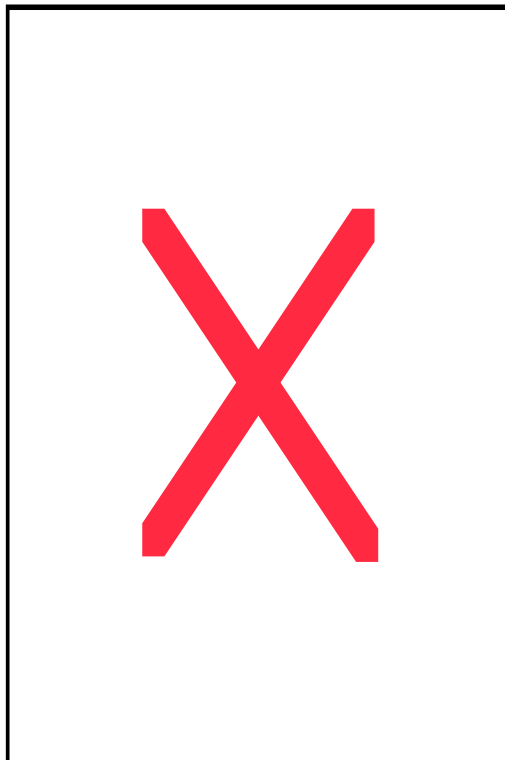
Harnessing indigenous sources of energy is an important element in the social and economic development of developing countries. Renewable energy has the advantage of being used at the point of source, and there is little or no environmental damage in harnessing the energy if managed sensibly. (Wilkins, G (2002) p32)Renewable energy technology can also provide additional benefits such as increased employment, power for income generating activities and a reduction in the use of fossil fuels. (Wilkins, G (2002) p1).

Appropriate technology is also heavily based on creating satisfaction of basic needs. In the book 'Aspects of essential design' Mel Byars questions "why is it so difficult to conjure simple solutions, solutions that capture and convey the essence of an idea? (Gelman, A (2004) p12) This theory challenges the idea of technology contributing directly, or indirectly, immediately or in the near future to a design or product that essentially satisfies the users basic needs. Appropriate technology is usually applied to developing countries, where the simplest technology can achieve the purpose of which it is intended for. It is important to understand the local situation in developing countries and meet the specific energy service demands with appropriate technologies(Wilkins, G (2002) p2). The technology should create appropriate solutions for basic problems such as power, water and healthcare. Shumacher argued for the need for a conscious search for intermediate technology designs, which would be appropriate to developing societies, the technologies designs would be cheaper and simpler than developed countries, but more productive, and appropriate because it should meet the basic needs for poor people living in developing countries.

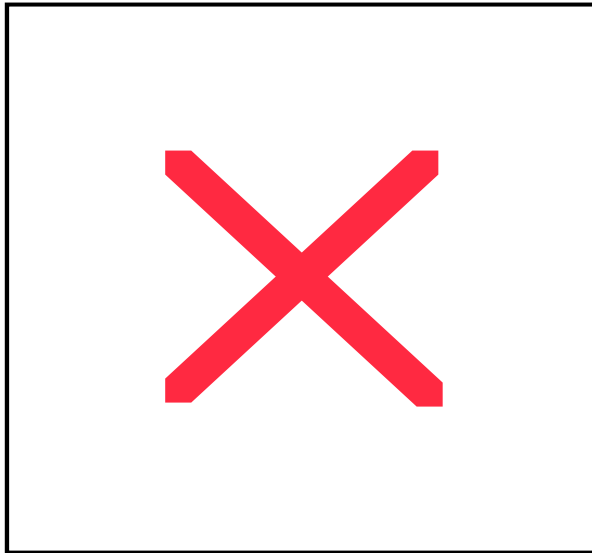
Social development is a vital feature of appropriate technology, encouraging 'self reliance' at a local level, enabling the society to follow its own path of development. This is achieved through using technology that focuses on small scale, locally controlable solutions, which require locally available resources, in turn this creates the opportunity for ends users to become co designers, making participation a key aspect in the success of the object. (www.projecthdesign). The technology should additionally contribute to cultural development, making use of indigenous and technical traditions, "developing countries must be offered the technology which they can manage and also assimilate and diffuse. This requires consideration of historic, social and cultural conditions in those countries". (Galli, R (1978) p228)

Who:

Sheila Kennedy creates designs for flexible photovoltaic materials that may change the way buildings receive and distribute energy. Her current research focuses on energy efficiency and architecture, with her designs pushing the boundaries in these areas. Kennedy works with new materials known as solar textiles made of semiconductor materials, which can absorb sunlight and convert it into electricity, expanding the advantages of lighting to some of the 1.7 billion people worldwide without access to electric power. Each portable light unit consists of a 17- by- 17 inch fabric panel, two flexible solar panels are sewn on one side, these power a lithium cell phone battery, incorporated into a small pocket on the corner. A shiny aluminium film coats the fabric, reflecting the light emitted by LEDs. Kennedy has applied this technology to a project called 'portable light' which enables people in the developing world to create and own energy harvesting textile products, using local materials and the use of indigenous technical traditions.



The portable light is successfully adaptable to meet the needs of people in different cultures and global region, considering how existing technologies can be adapted and be used to benefit daily life in the "third world". The portable light is the result of a project named 'nomads and nano-materials', the project addressed the needs of the Huichol people in the Sierra Madre mountains of Mexico, responding to their lack of access to infrastructure for the provision of electricity and lighting. Kennedy addresses the needs for affordable electrical lighting that requires no fixed installation in the region. The project promotes adaption and use by a different culture, examining their need for light in conjunction with their traditional culture and practices, especially textile weaving. The end result of the portable light provides sufficient light to read and work beyond daylight hours. The nomads and nanomaterials project is an innovative way of providing light that draws upon the knowledge of the Huichol people, incorporating aspects of their traditional culture. The end result of the portable light provides sufficient light to read and work beyond daylight hours, offering the opportunity to improve education, community literacy and health, as well as increasing the daily household economic production.



The portable light has been integrated into the design of a luminous reading mat. The reading mat incorporates high brightness solid state lighting and flexible photovoltaic technology in a textile medium. The mat weighs less than 8 ounces making it easily folded for shipping or transport and is easily carried by the user in the form of clothing or equipment. The lightweight design makes the mat adaptable for the different intended needs of the user, reading, writing and work tasks. At night the mat emits up to four hours of white digital light.

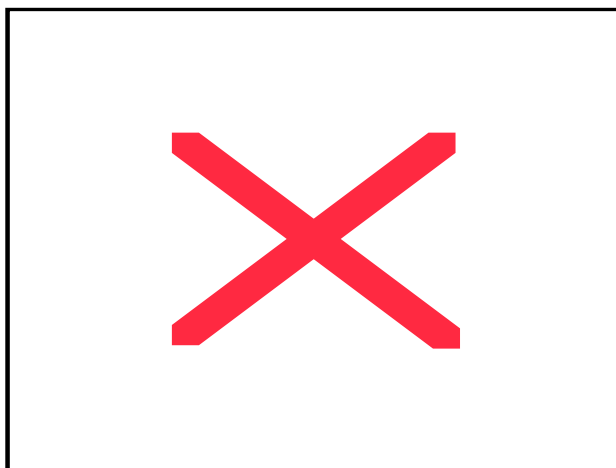
http://www.boston.com/news/globe/ideas/bainiac/read_mat.jpg

The portable light project has now developed a design to provide energy harvesting blankets as part of a home care treatment program. The blanket enables patients to generate power and light for their families during treatment. Patients who are outdoors during the day are kept warm, and are also able to harvest sunlight to charge an attached LED lantern and other small devices such as cell phones.

The sun charges the flexible portable light solar panels in three hours creating 4 watts of power, which is stored in a rechargeable battery. The portable light requires self-reliance of the patients who then recharge the blanket themselves the following day.

A portable light blanket brings patients the advantage of solar power, so while they are using them during the day they are simultaneously charging so they can serve as a light source or heated blanket at night.

The Light Up the World Foundation, in Canada, have also been designing lighting solutions that deal with the same issues as that of the Portable Light Group. The Light Up the World Foundation has responded by distributing LED lanterns to villagers in Nepal, and have been doing so for years. The foundation is dedicated to providing lighting to poor people in remote areas who currently rely on kerosene lamps and wood fires. By utilizing renewable energy and solid-state lighting technologies the Light Up the World Foundation have provided affordable, safe, healthy, efficient and environmentally responsive illumination to people who do not have access to power for adequate lighting. Efficiency, durability and minimal cost have all been taken into account by using technologies such as LED lighting. The



project has brought tangible social, environmental and economic gains to communities by protecting the physical environment by reducing the amount of carbon-based fuels for lighting.

(<http://lutw.org/home.htm>) Burning wood or dung, kerosene lanterns, candles and so on pollutes the air in people's homes, producing greenhouse gases and demands time and money spent getting fuel. Relying on these traditional technologies causing localized air pollution is a hardship that keeps a large fraction of humanity—particularly women locked into cycles of poverty, ill-health, and deprivation

Reference

- Pavitt, J. (2004) *Brilliant lights and lighting*. V&A publications. London.
- Bavery, M. (2003) *Less and more*. France
- Bhalla, S. (1979) *Towards global action for appropriate technology*. William Clones & Sons limited. London.
- Bernhardt, J (2008) *A deeper shade of green*. Balasoglou books. Auckland.
- Bongiorno, L (2008) *Green, green, greenest*. Penguin group. New York.
- Braungart, M, McDonough, W (2002) *Cradle to Cradle*. North point press. New York.
- Byars, M (1997) *50 Lights: innovations in design and materials*. Mel Byars. Singapore.
- Crosbie, N (2003) *I'll keep thinking*. Black dog publishing limited. Italy.
- Cuttle, C (2003) *Lighting by design*. Architectural press. Great Britain.
- Davidson, C (2001) *Anything*. Anyone corporation. United states of America.
- Davidson, J (1988) *Women and the environment in the third world: alliance for the future*. Earthscan publications. London.
- Dedelley, F (2008) *Design detective*. Lars Muller publishers. Germany,
- Eicker, U (2003) *Solar technologies for buildings*. John Wiley & Sons. Germany.
- Galli, R (1978) *Beyond the age of waste*. Pergamon press. England.
- Gelman, A (2004) *Aspects of essential design*. New york
- Goad, P (2005) *Troppo architects*. Pesaro publishing. Australia.
- Habermann, K (2006) *Energy efficient architecture*. Birkhauaser. Germany.
- Hawthorne, C, Stang, A (2005) *The green house*. Princeton architectural press. New York.
- Hermannsdorfer, I (2005) *Solar design*.
- Hill, M (2007) *Earth to earth*. Printing international limited. China
- Joris, Y (1999) *Wanders wonders: design for a new age*. Rotterdam publishers. Netherlands.
- Kress (2003) *Light spaces*. Birkhauser. Berlin
- Kronenburg, R (2007) *Flexible: architecture that responds to change*. Laurence King publishing.London.
- Monument issue 88 architecture and design. *The light issue*.
- Papanek, V (1995) *The green imperative*. Thames and Hudson. Singapore.
- Poole, B (2006) *Green design*. Mark Batty publisher. China.
- Reiwooldt, O (2000) *Light years*. Zumtobel. Netherlands.

Richardson, P (2007) *XS green: big ideas, small buildings*. Thames and Hudson. London.

Steffy, G. (2002) *Architectural lighting design*. John Wiley and sons. United states of America.

Waddington, P (2008) *Shades of green*. Eden project books. Great Britain.

Wines, J (2008) *Green architecture*. Taschen. China.

Wilkins, G (2002) *Technology transfer for renewable energy: overcoming barriers in developing countries*. The royal institute of international affairs. Unite Kingdom.

rethinking design

appro-tech: design of food generation systems

Marie Swanson

What/Why:

Operations relative to appropriate-technology food systems often rely on community-based networks as a secure and efficient means of production, particularly in food preparation, such as the growing of crops. Some of these include urban farming, Hydroponics and Permaculture. Often too, consideration is given to tools whilst harvesting food crops. These are kept relatively simple as to avoid high costs, up keep and any risk of unnecessary pollutants often associated with motorized machinery used in the fields. Cooking methods too are a concern in developing countries and appro-technology continues to develop systems which are not only site specific, but specific to varying cultures based on existing methods already in use. These too are usually cost effective low-effort systems always with things such as people's general health and well being, including the surrounding environment in mind, and avoiding problems like harmful emissions and deforestation. Such technologies already in use include solar cookers, hot plates and wood conserving stoves.

The world over, our 'food system' in general is seen not as one of environmental or municipal efficiency but often economic. Small farm agriculture is often in competition with larger food company providers, even in the developing world. While the western world often sees this as an 'advantage' to supply modern, efficient and cheap produce in large quantities the cost of the system and its wider implications are usually highly unsustainable. Already environmental costs include eroded soils, polluted water, loss of habitat and threats to wildlife. Social disadvantages are also likely to cause damage seen in loss of family farms, of farming jobs, and the decline of rural communities concluding often in overgrowing cities and ever-growing city slums.

"If we are to make the transition to a food system based on sustainable farms, vibrant rural communities, and safe, healthful food, we need a new awareness, training and education, flowing into changed policies and actions." (USDA Report on Small Farms, 1998: Peter Rosset article, 1999)

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Who: [Envirofit International](#) is a non-profit organization in the USA whose goal is to *develop and distribute well-engineered energy products for low-income markets that traditionally have been overlooked*. The company's focus lies primarily on the developing world and has provided numerous solutions to existing environmental issues including the Envirofit Cookstove. Teams based in India work to allocate these throughout the country, particularly in rural areas, in an effort to further prevent the harmful emissions produced by traditional indoor cookers. The company's aims are to improve family health and living conditions. It is estimated the harmful fumes radiated throughout the home created by traditional wood burners, cause 1.5 million premature deaths each year, more than half of which are children under the age of five years old. Envirofit is sponsored and supported by private companies but at large by the [Shell Foundation Breathing Spaces program](#). Their involvement is to help Envirofit find commercial companies to manufacture and distribute these stoves with hopes to see 10 million Envirofit Cookers in five countries over the next five years. [Colorado State University's Engines and Energy Conversion Laboratory](#) are the brains behind this innovation. Their mission is to produce fresh and innovative new approaches to the modern day Energy crises, effectively creating solutions that will improve the human condition and accomplish global impact.

How: Envirofit's challenge is to distribute their stoves that emit fewer fumes, use less fuel and meet the demands of users, and then find a sustainable way to get this technology in to hundreds of millions of developing world homes. These stoves produce a high heat output providing fast and efficient cooking. They are small and simple to use on a scale that imitates traditional cooking methods in India, and are available in a number of sizes and colours. With great focus on the developing world alone, such a product has kept not only the environmental implications of it in mind, but the end cost as well. This would ensure that the cookers are not only environmentally effective but cost effective long term and readily affordable also. Over half the worlds population rely still on biomass fuel including animal bi-products, which leads to severe health problems and often death. Through rigorous emissions testing, including emissions demonstrations on site in India, these cookers use 65% less fuel and create 75% less smoke pollution within the home. Envirofit with Colorado State University have set up facilities in India, which not only distribute these cookers but also provide education and training alongside local medical and health organizations particularly with that of woman and children. Distribution and sales training are also given to the woman where by they are allowed the opportunity to earn an income thru positive sales within their rural districts. (Ref fig 1)

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Fig 1. Envirofit cook stoves in use in India.

Who: F.A.S.T. (Faith and Sustainable Technologies) are a non-profit organization whose goal is to establish and maintain forward thinking appropriate technologies in the developing world. F.A.S.T take a unique 'biblical' approach to all objectives that include working along side community leaders to resolve local problems. These vary from working with woman and orphaned children, youth training in a range of trade skills, money and business handling seminars, and most importantly, eco and environmental management. Everything from water purification systems, renewable energy sources and integrated farming techniques are demonstrated and taught In a bid to help alleviate current living standards and conditions. F.A.S.T hope to steer people toward self-suffiancy and self-reliance resulting in employment and better financial positioning within the average household. Some of the agricultural techniques taught include Beekeeping, Re-forestation Planning, Waste Management, Animal Husbandry and Aquaponics.

How: Travis Hughy is a member of F.A.S.T who has developed 'Barrel-Ponics'. Based on Aquaponics Hughy has created a low cost system suitable to the conditions of most developing world countries. Aquaponics is a cross between aquaculture (fish farming) and hydroponics (soil free plantations). This system uses little to no pesticides as the complete nutritional cycle is covered by the fishes own ammonia releases which in turn feed the plantation, which feed the fish and so on Generally aquaponics, whether it be on a large commercial or small domestic scale requires electricity and substantial material costs (i.e. pump operations) Hugy's version however runs on very little electricity. Designed primarily as an educative tool, due to its small size, Hughy has taken this technology with F.A.S.T to Africa. Aquaponics has the ability, when understood and operated adequately, to produce many fish species for consumption alongside a range of vegetation including fresh herbs, potatoes, tomatoes, capsicum, green leafy vegetables, fruit etc... Aquaponics is a simple, efficient and effective environmental cycle with potential to be applied in developing nations to sustain hunger and provide work and income. (Ref fig 2 and 3)

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(fig2.) Papayas



(fig3). Complete Aquaponic System.

Who: The Path to Freedom is a project headed by the Dervaes Family of Pasadena, California. The Families Homestead is a dedicated example of locally grown produce. They are apart of a movement called 'Localvores' who in general are people who strive to buy and or grow locally. Locally being in your backyard, town, city or region.

How: In an effort to reduce our carbon footprint the Derves family use their homestead as an educative device for surrounding neighbors and schoolchildren in hopes that more people will commit to integrating sustainable living practices, at any scale. Main focuses include permaculture, solar cooking, composting and other low tech operations such as the use of hand tools, grey water usage, bio diesel for fuel etc.. The Derves Family is a shining example of the kind of lifestyle that can still be achieved in western urban densities, such as their average 1/5-acre property. Through their "thinking globally, acting locally" campaign the Family not only provide food for themselves but for others to. Their income is their lifestyle and the homestead grows over 3 tones of produce annually with over 350 varieties of edible plants. The business minded family bring educative material, friendly farming equipment and energy efficient technologies to a substantial website well worth a look to see just how such appropriate technologies are so very well suited to our western lifestyle and small city land capacities. (Ref fig4)

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(fig 4.) Path to Freedom Homestead

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"The earth was not given to us by our parents, it was loaned to us by our children." -- Kenyan proverb

In the Cite Soleil of the Caribbean Island Haiti there is a state of food crisis. Caused by a number of things such as drought, high oil prices, low grain stocks etc. This once self-sufficient province of Port-au-Prince at the waters edge is now a shanty city home to some of the worlds poorest. What little food they do have, if they can afford it, is imported. Even their eggs. The staple diet is otherwise 'Pica'; quite literally mud cakes made on the schoolyard basketball court and then sold...yes-even mud has its worth in Soleil. (Ref fig 5)

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(Fig 5)



girl walking through city spoils, Cite Soliel.

Making 'Pica' Mud cakes

The food prices are still rising and they're running out of land due to the growing demand for bio-fuels. Over 60% of the average families income is spent on food alone when afforded at all, and the basic farming goods that were once available are out of the cities reach. In here of course lies another problem. While the cities landscape itself is rendered non-useable due to it being covered in sewage and trash, farmers outside the city with ideal soils for cultivation, not through want of trying, cannot produce crops due to little to no government support. With no infrastructure already in place with lack of support and funds means an inability to grow produce. There are indeed some massive policy changes needed to get the city turning back time, to become self-reliant and self-productive once again. The UNEP (The United Nations Environment Program) noted a need for a "Green revolution in a Green Economy but one with a capital G; we need to deal with not only the way the world produces food but the way it is distributed, sold and consumed, and we need a revolution that can boost yields by working with rather than against nature." Fortunately organizations such as UNEP and WFP (World Food Program) do recognize the importance of local and regional food production and purchase and are trying to implement a mixed system of providing food aid in order to boost local economies providing, eventually, greater self sufficiency and income. With an urgent need for agricultural revitalization, education and training is surely at the forefront for there to be any success. Starting from scratch with small enterprises which have potential to yield growth are important particularly for the children of Haiti, the most effected who will undoubtedly be left to deal with this situation over the next decade. A simple approach to technology is needed in communities, homes and schools. The 'plantation tyre' is a low-tech devise easily constructed from local waste materials which sees through the cultivating of your dried seeds from already bought produce, overlooking the

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germinating process to the growth of small plants ready to be transferred to larger beds, to be traded, or to be sold to farmers, but most importantly to demonstrate the invaluable outcome of such a simple and natural process of time. While it is one thing to give instant food aid it is quite another to educate the people so that they might better help themselves in the future.



REFERENCES

<http://csdngo.igc.org/agriculture>

<http://www.verticalfarm.com/>

<http://www.envirofit.org/>

<http://www.eecl.colostate.edu/>

http://www.shellfoundation.org/pages/core_lines.php?p=corelines_content&page=breathing

<http://www.irinnews.org>

<http://www.haitiinnovation.org>

<http://www.cabi.org/>

<http://www.worldfishcenter.org>

<http://www.pbs.org/>

<http://www.fastonline.org>

<http://www.fao.org/newsroom/en/news/2005/102401/>

<http://www.treehugger.com/>

<http://www.inhabitat.com>