

**BIO THINKING**



# 100% Sustainable Ceramics Design Data and Emotion

*From Stylists to Sustainability  
Superheroes - How Designers will  
change the world, save nature and  
reveal truth*

# Edwin Datschefski

- Consultant on Sustainable Products
- Projects for 98 clients
- Multinationals to small business
- Local and central government
- 15,000 people trained
- 20 years and still learning

# Some of Edwin's Clients

MARKS &  
SPENCER



eden project



 Tetra Pak  
*More than the package™*



City of Westminster

J Sainsbury plc



BRITISH AIRWAYS 



# My Technique

Reveal the True  
Environmental Problems



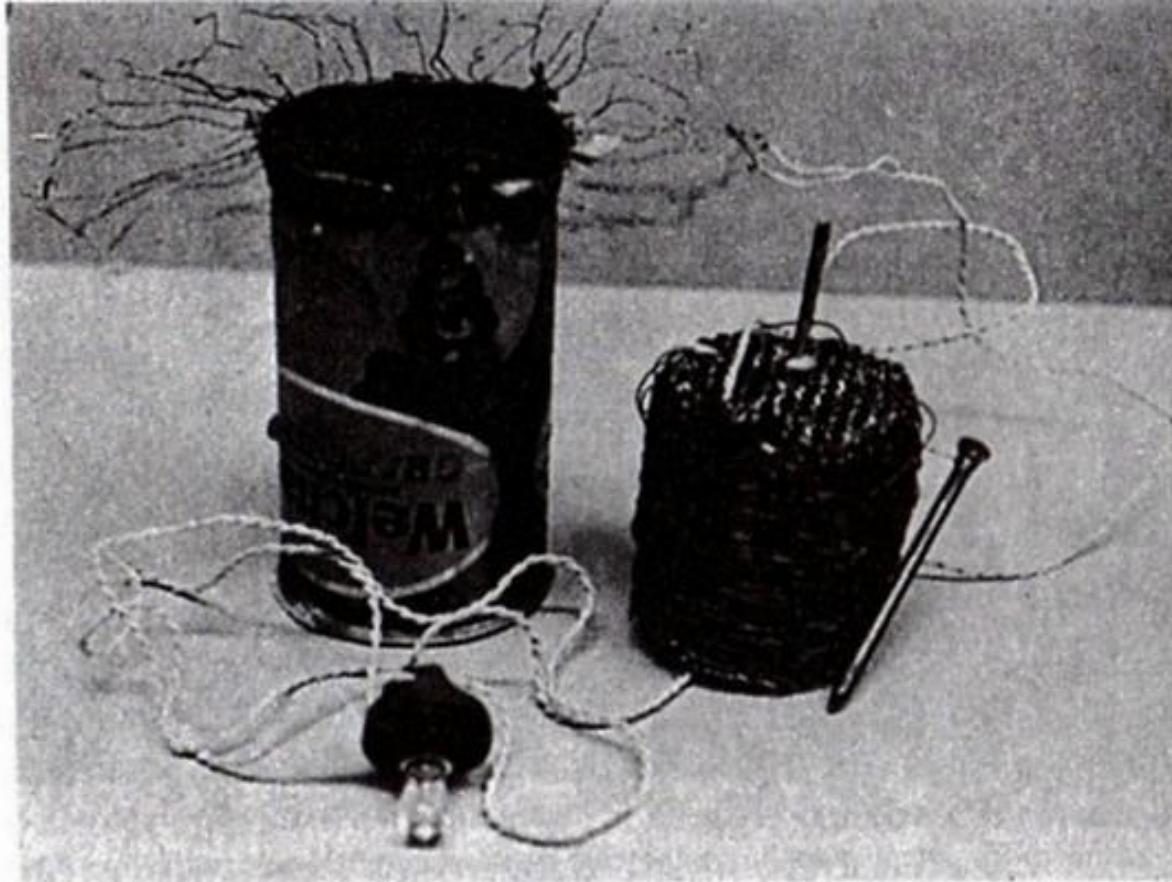
Improvise from 1000s  
of Green Products



# Top 20 Ennovative Principles

1. Biomaterials
2. Cyclic Molecular
3. Re-use and Repurposing
4. Low Carbon Energy
5. Toxics Reduction
6. Stewardship Sourcing
7. Cleaner Production
8. Materials Efficiency
9. Energy Efficiency
10. Optimal Lifetime
11. Multifunction
12. Communication
13. Fair Trade
14. Traditional Methods
15. Rental
16. Seasonal or Local
17. Embodied Energy
18. Better Agriculture
19. Muscle Power
20. Disassembly

# Victor Papanek can radio



Radio receiver designed for the Third World. It is made of a used juice can and uses parafin wax and a wick as power source. The rising heat is converted into enough energy to power this nonselective receiver. Once the wax is gone, it can be replaced by more wax, paper, dried cow dung, or anything else that will burn. Manufacturing costs on a cottage-industry basis: 9 cents. Designed by Victor Papanek and George Seeger at North Carolina State College.

# How Sustainable is the World Now?



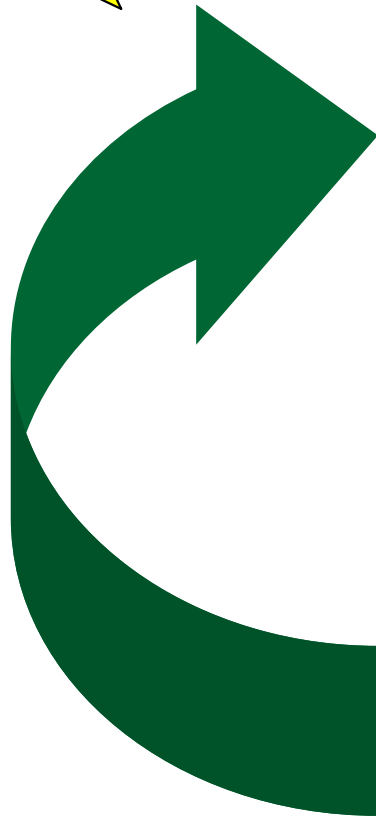
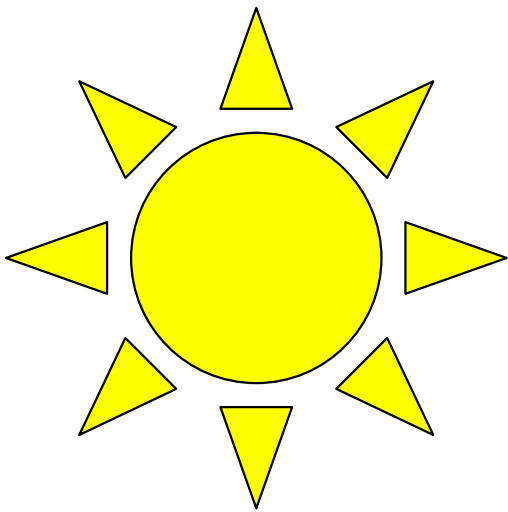


**40%**

**1000%?**

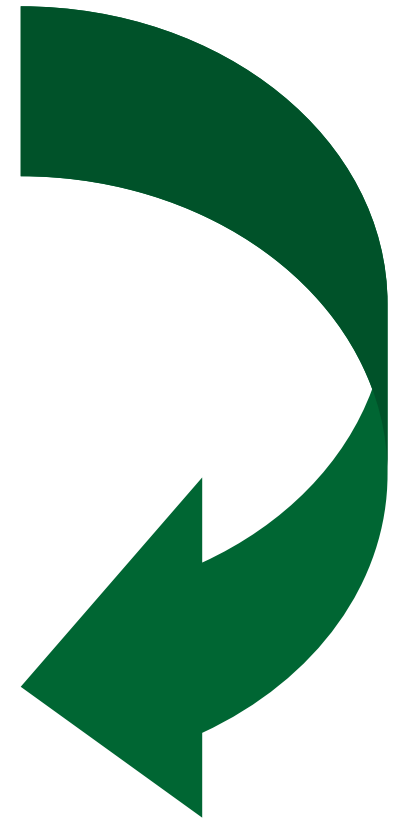
All Industrial Processes  
to become  
100% Compatible  
with Nature

**cyclic, solar and safe**

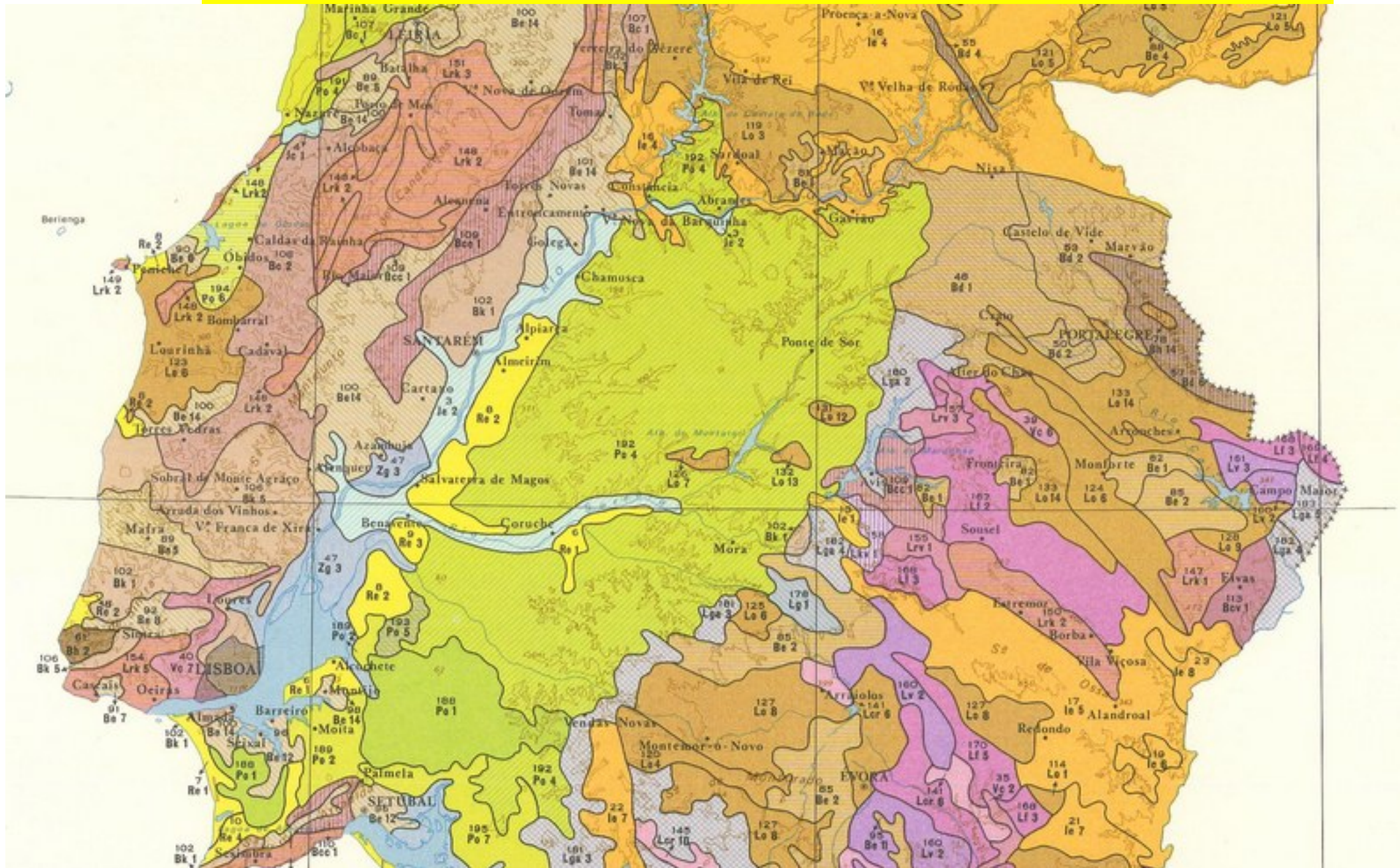


**Take Material  
From Nature**

**Use It  
Give It Back**



# Local Soil = The Foundation





**Nadine Sterk  
and Lonny  
Van Ryswyck  
from  
Atelier NL**

# Clay Samples make a Map



# Colour Range





# Earthy Earthenware



# Solve The World

- You can be more than stylists
- You can be Sustainability Superheroes



# I often work with “non-creatives”



... and get 240 Great ideas



# Designers often “non-techy”



# You Have To Be Both



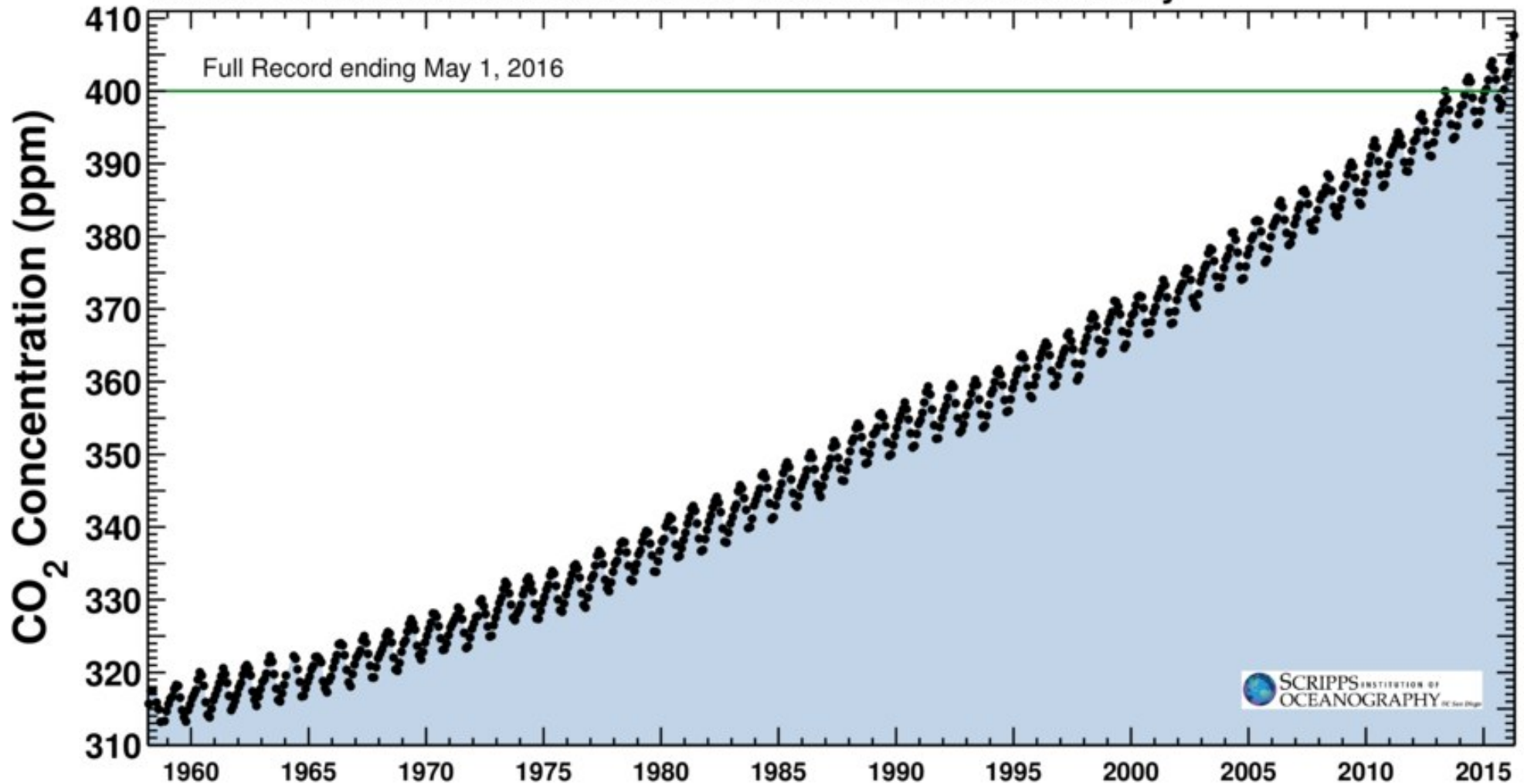
**data  
AND  
emotion**

# Data Causes Action

Latest CO<sub>2</sub> reading  
May 01, 2016

407.83 ppm

Carbon dioxide concentration at Mauna Loa Observatory





# Emotion: How We Touch Nature



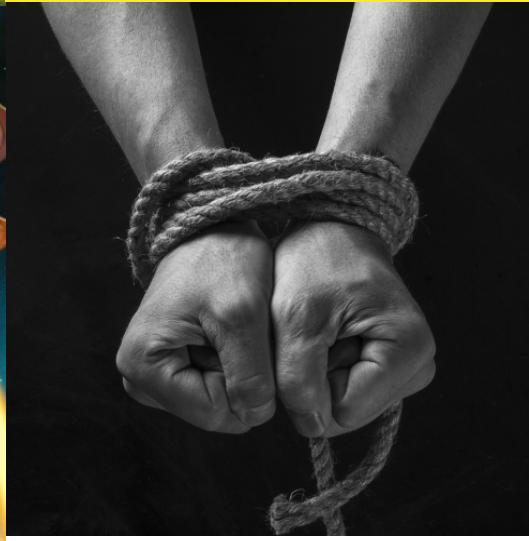
# How We Touch Nature

**Fire**



**Poison**

**Aliens**



**Kidnap**



**THE DESIGNED**

versus

**THE UNDESIGNED**



# Products have Consequences

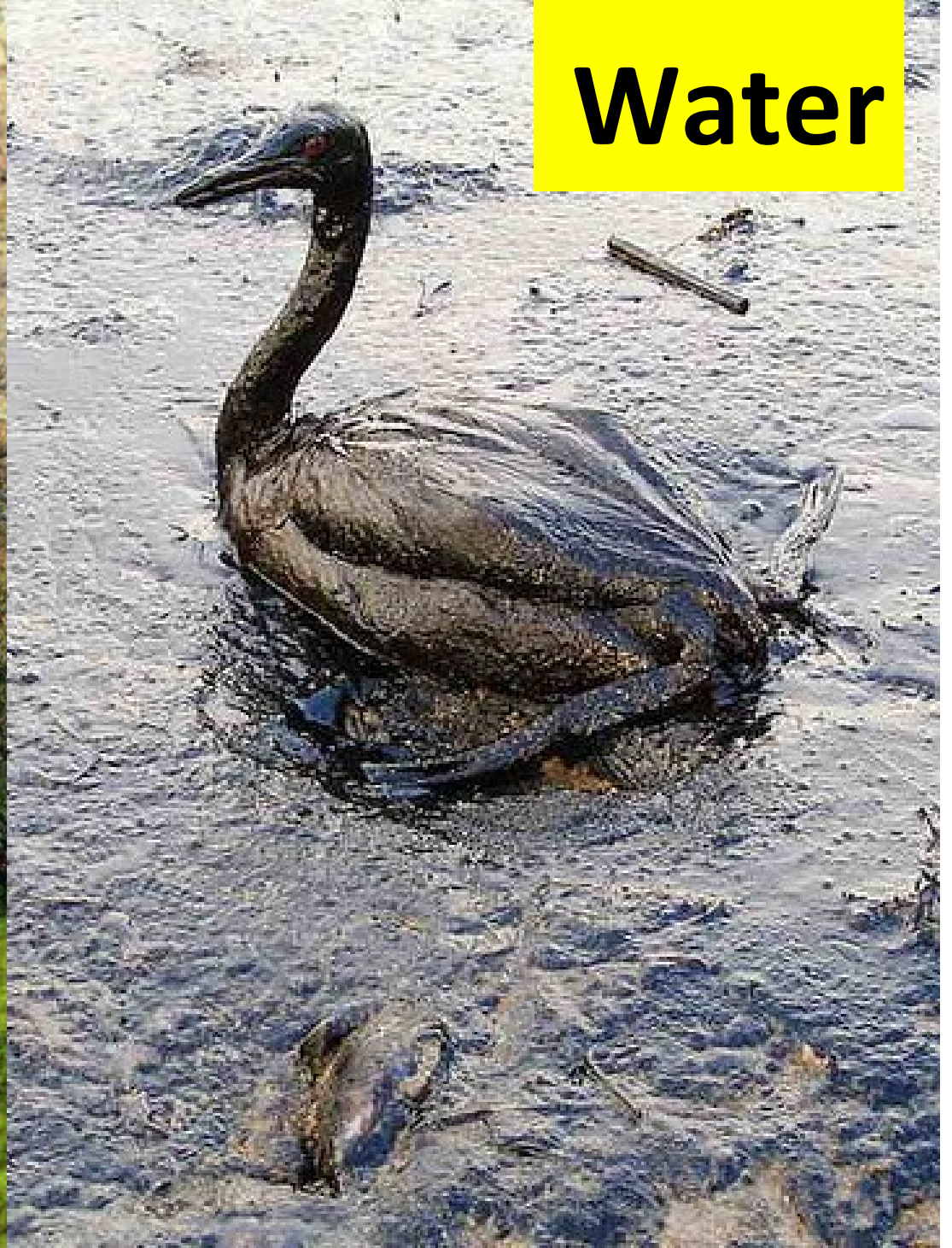
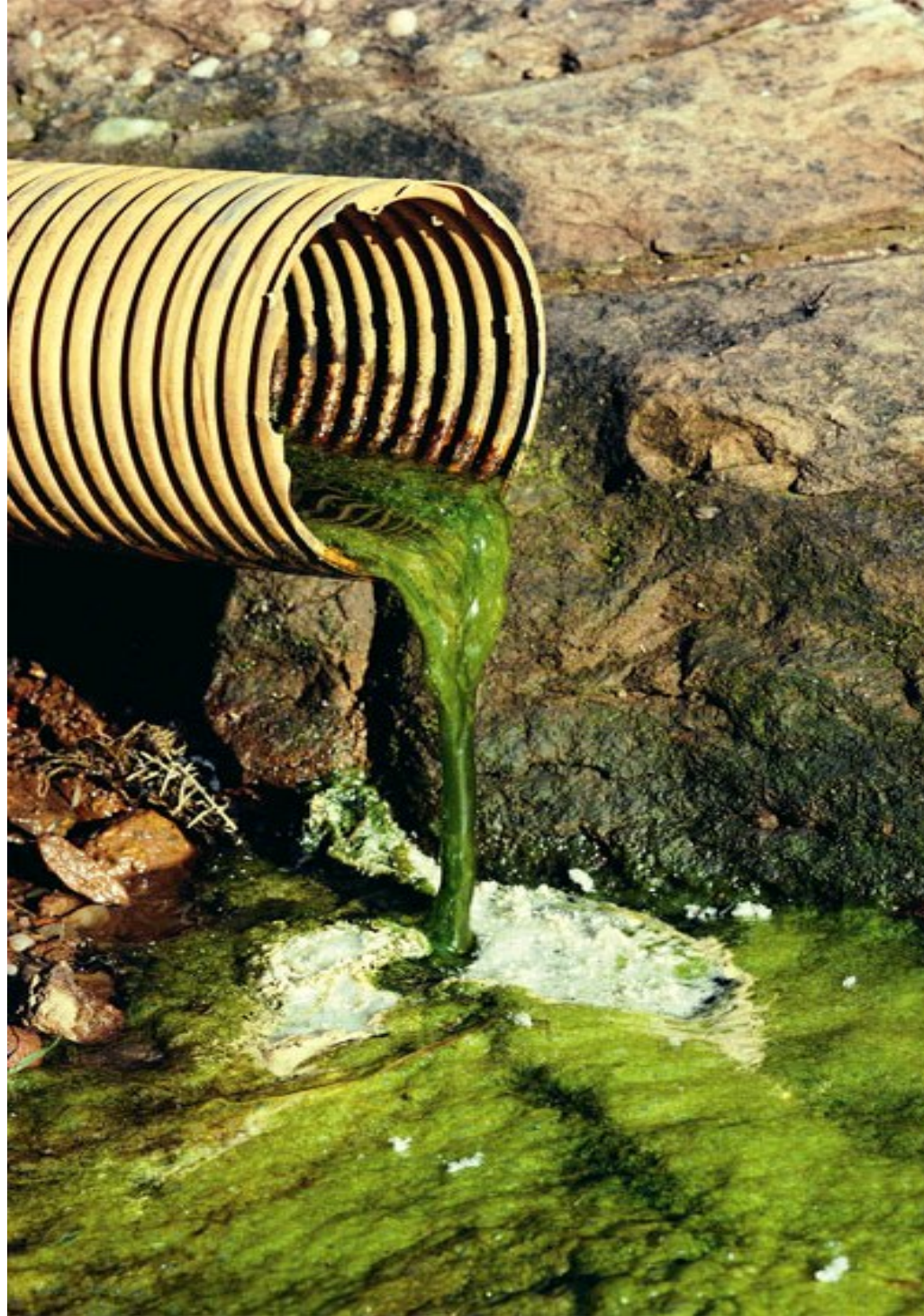


**Air**



# Land





**Water**

# Easy if Bad Guy is Obvious ...





**... but Damage is  
Often Invisible**





**HIDDEN**

**UGLINESS**

**Where Do You  
Touch Nature?**

# A Bowl's Story



# An Ikea Classic



Deixe o amor entrar

Procurar



Apoio ao Cliente

Escolha a sua loja IKEA  
IKEA BUSINESS  
IKEA FAMILY

Área p  
Trabal  
Lista c

Todos os produtos

Novidades

Ideias

Loja online

Sala

Quarto

Espaços de Refeição

Cozinhas

IKEA das Crianças

Escritório

Tod

[Início](#) / [À mesa](#) / [Pratos e tigelas](#) / [Tigelas](#)

Ver mais imagens



## DINERA

Tigela, bege

**1,75€** / ud

*IVA incluído no preço.*

Referência: 200.570.57

O serviço de loiça dá um toque rústico à sua mesa, com as suas formas simples, cores suaves e aspeto mate. [Ler mais](#)

**Tamanho**

14 cm

Adicionar à lista

### Produtos complementares



[Ver todos os produtos complementares](#)

### Consulte o stock da sua loja IKEA

Escolher  OK

*O preço exposto é o preço recomendado pela IKEA, podendo contudo variar dependendo da Loja escolhida.*

# DIG

# Extract the Clay

**DIG** FORM FIRE MOVE USE DISPOSE

BIOTHINKING

# Dug in China



**DIG FORM FIRE MOVE USE DISPOSE**

# A Big Mess



DIG FORM FIRE MOVE USE DISPOSE

**BIOTHINKING**



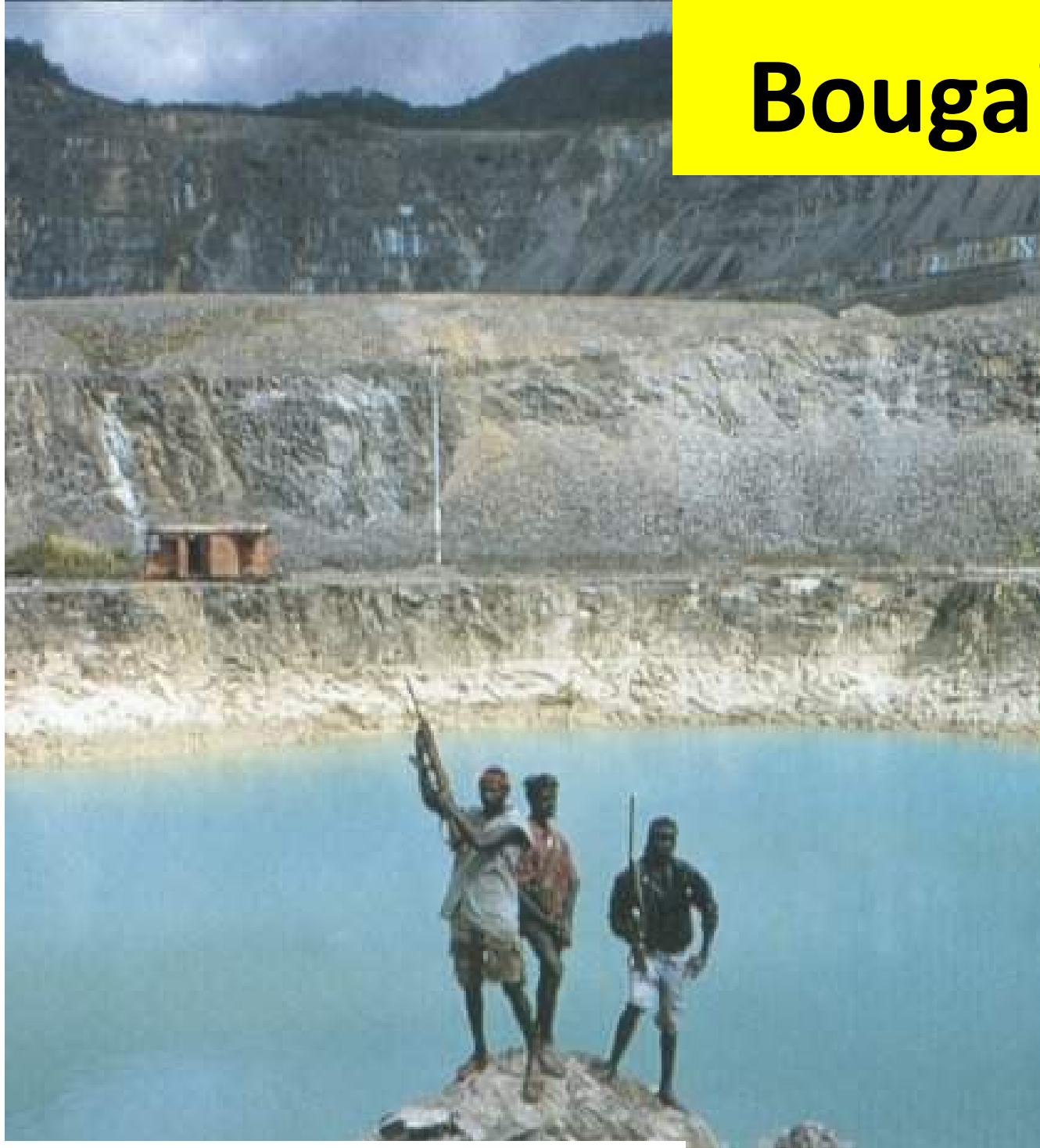
# Digging Destroys Habitats



**DIG** FORM FIRE MOVE USE DISPOSE

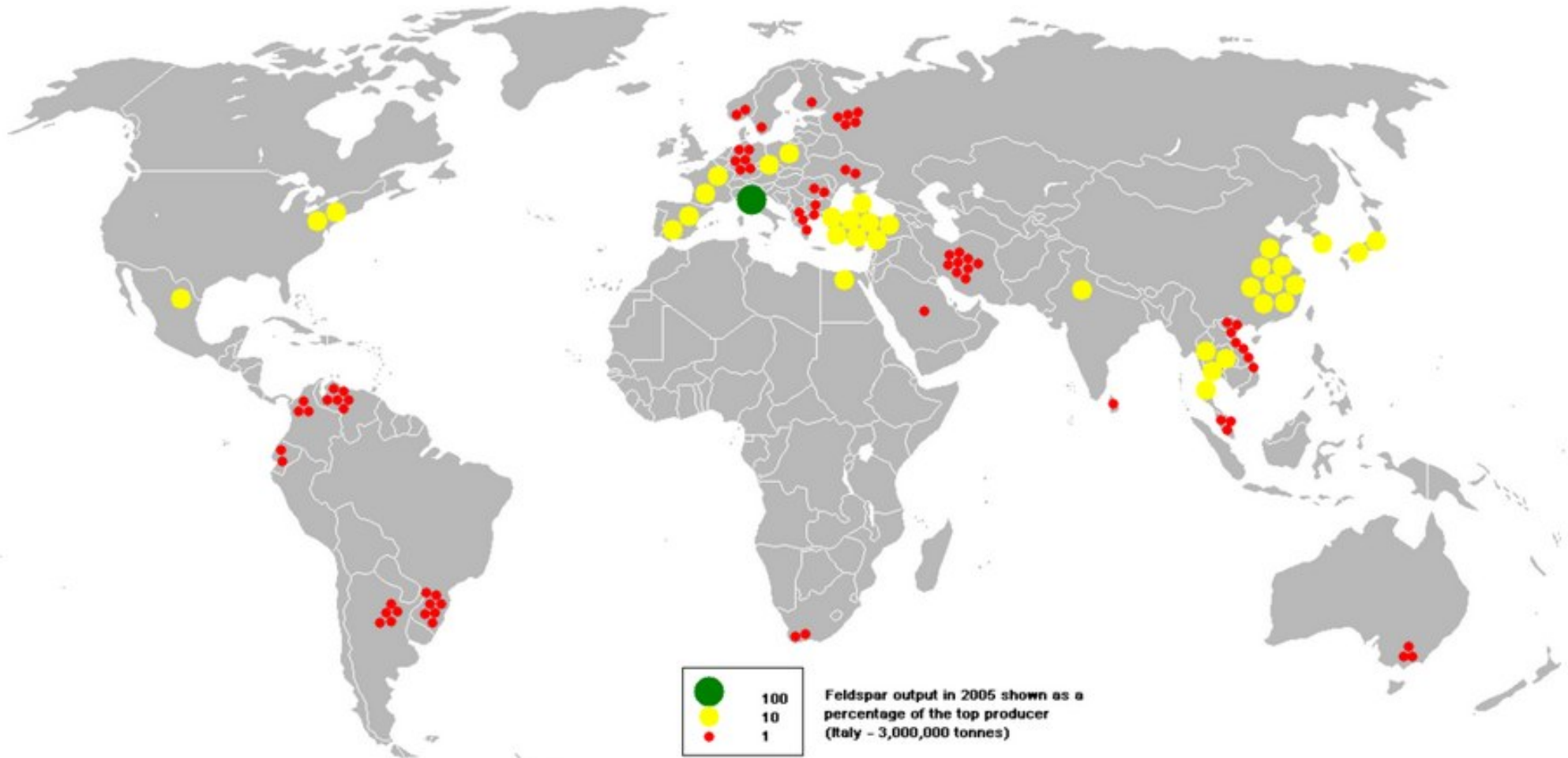
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# Bougainville



**DIG** FORM FIRE MOVE USE DISPOSE

# Feldspar



DIG FORM FIRE MOVE USE DISPOSE

# We Don't Know Yet!

- Exact sources?
- Impact on habitat, plants, animals, people?
- Kaolinite?
- Feldspar?
- Quartz?
- Pigments, Iron Oxide etc etc?
- ?????

# FORM

## Design and Mould

# Factory Conditions OK?



DIG FORM FIRE MOVE USE DISPOSE

# Factory Conditions OK?



DIG FORM FIRE MOVE USE DISPOSE

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# Factory Conditions OK?



DIG FORM FIRE MOVE USE DISPOSE

**BIOTHINKING**



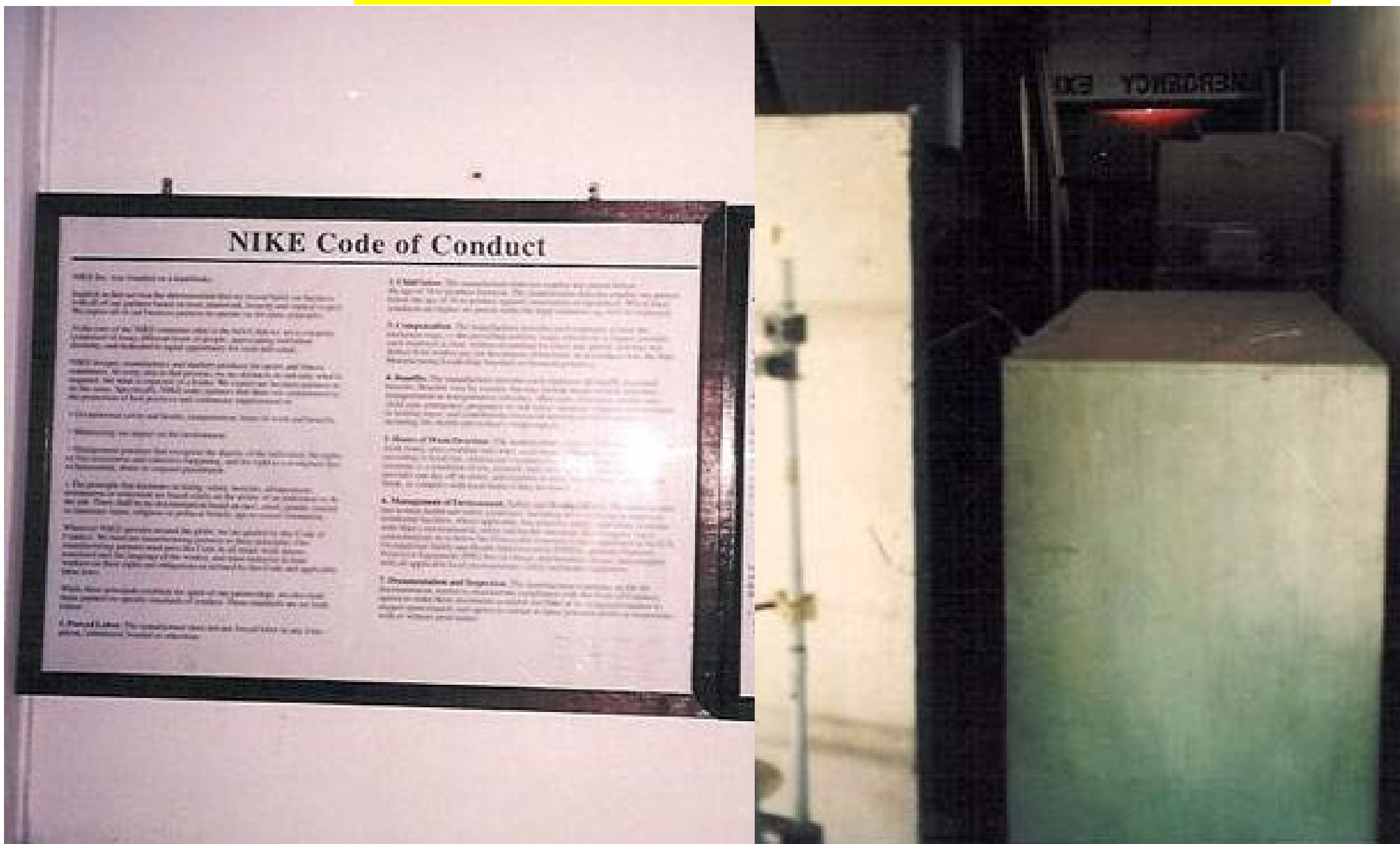
# Factory Conditions OK?



DIG FORM FIRE MOVE USE DISPOSE

BIOTHINKING

# Factory Conditions OK?



DIG FORM FIRE MOVE USE DISPOSE

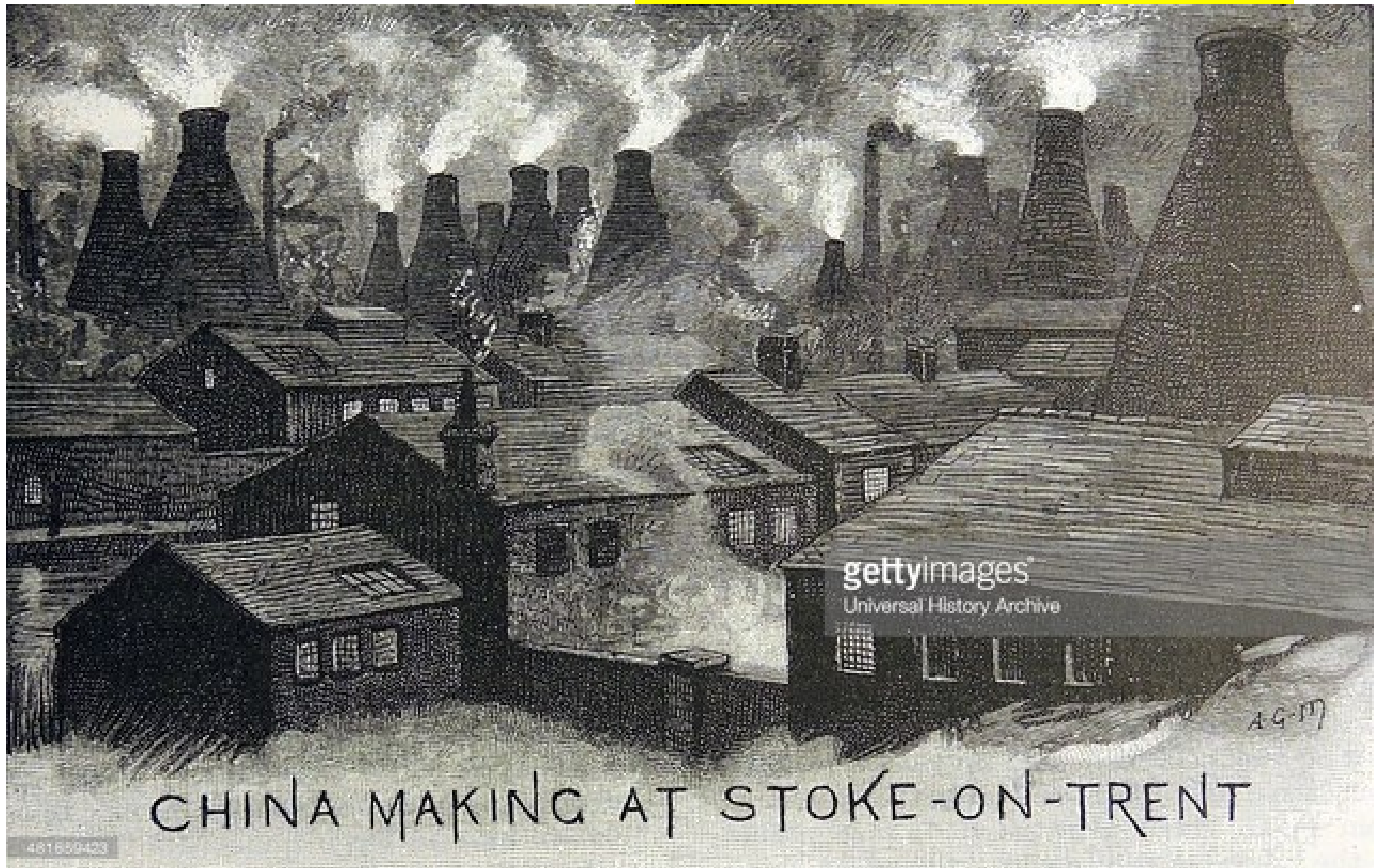
# FIRE

# Kiln and Factory

DIG FORM **FIRE** MOVE USE DISPOSE

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# Stoke on Trent



DIG FORM FIRE MOVE USE DISPOSE

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# China Pollution



DIG FORM **FIRE** MOVE USE DISPOSE

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# Poisoned Flowers



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# MOVE

# Pack and Transport

DIG FORM FIRE **MOVE** USE DISPOSE

BIOTHINKING

# Ship Smoke



DIG FORM FIRE **MOVE** USE DISPOSE

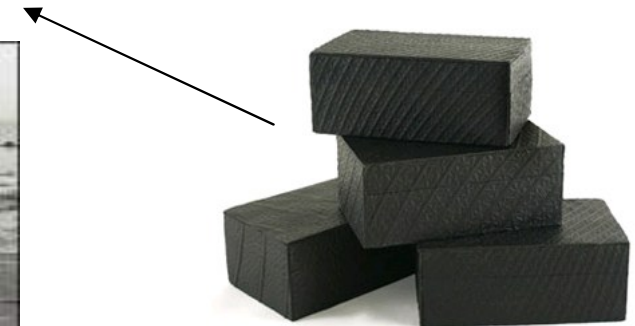


# Truck Smoke



DIG FORM FIRE **MOVE** USE DISPOSE

# Oil Extraction



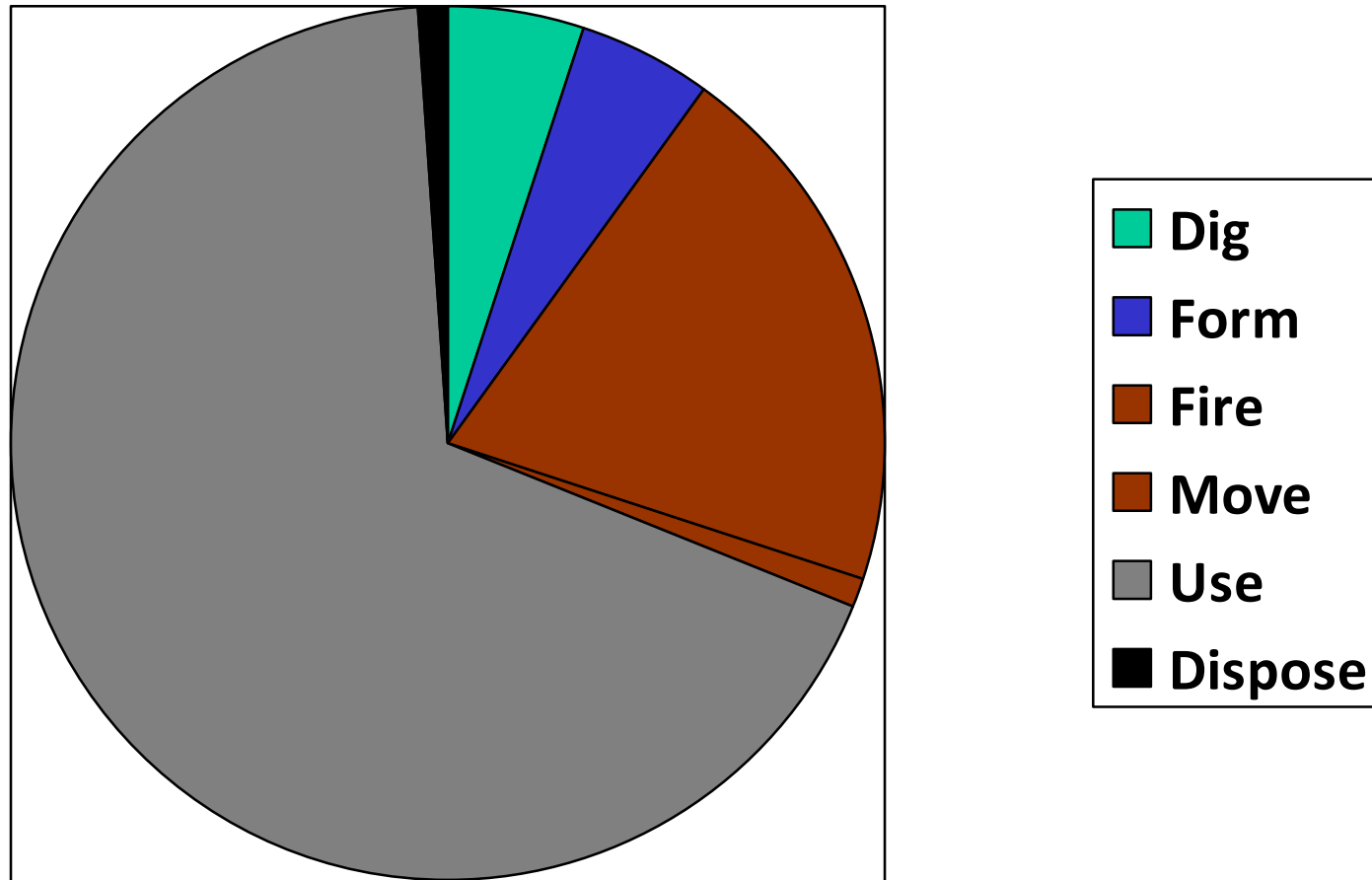
# USE

# Using and Wash

DIG FORM FIRE MOVE **USE** DISPOSE

BIOTHINKING

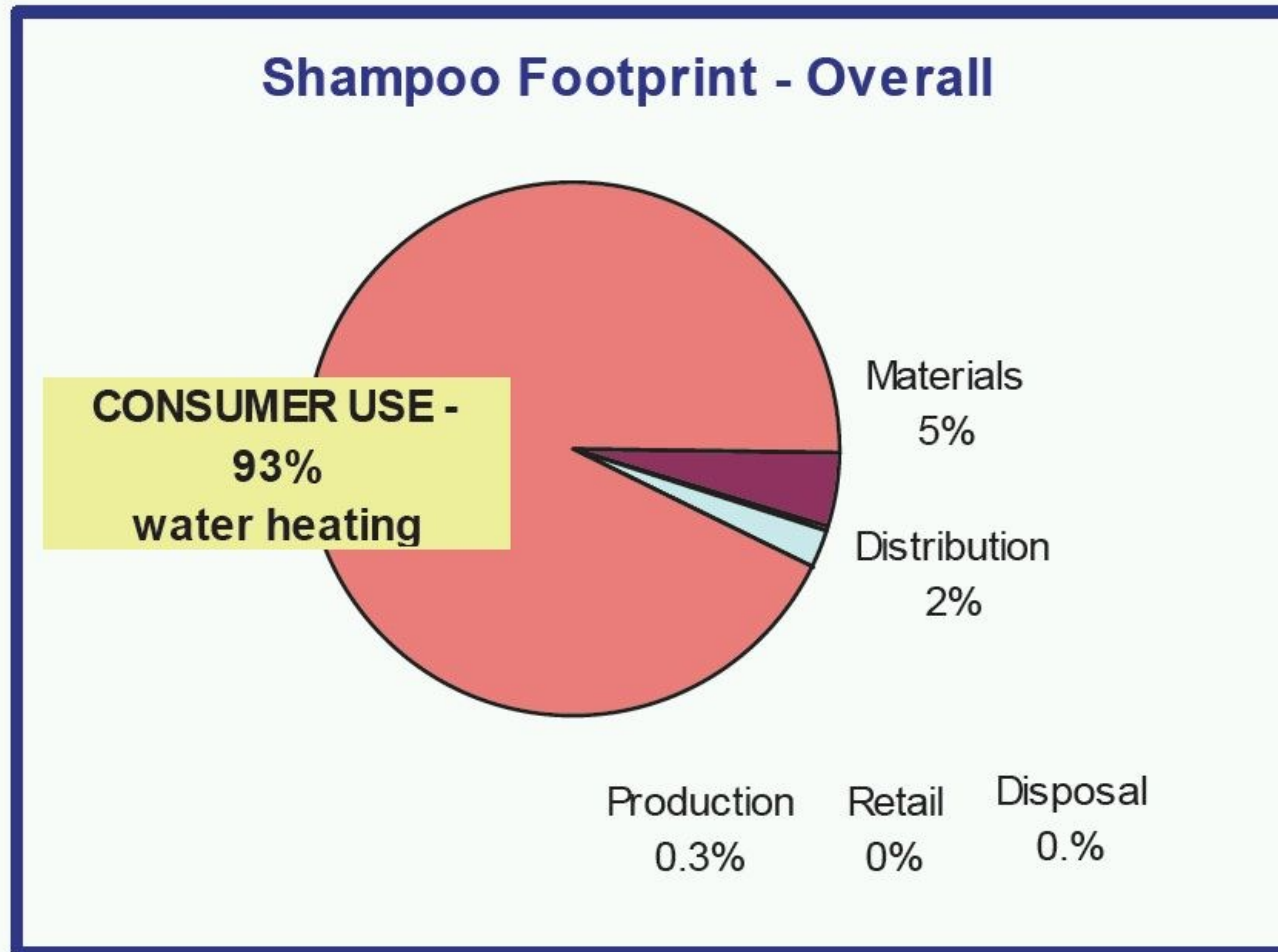
# 70% of energy used in washing?



DIG FORM FIRE MOVE **USE** DISPOSE

# Shampoo

## Carbon Footprinting



# Hot Water → Global Warming



DIG FORM FIRE MOVE **USE** DISPOSE

Renewable  
energy

## Portugal runs for four days straight on renewable energy alone

Zero emission milestone reached as country is powered by just wind, solar and hydro-generated electricity for 107 hours

Arthur Neslen

Wednesday 18 May 2016  
14.59 BST



Shares 139k  
Comments 1,867



As recently as 2013, renewables provided only about 23% of Portugal's electricity. By 2015 that figure had risen to 48%. Photograph: Pete Titmuss/Alamy Stock Photo

# But Still 50% Oil Coal & Gas



DIG FORM FIRE MOVE **USE** DISPOSE

**BIOTHINKING**



# Pelamis Wave Energy



DIG FORM FIRE MOVE **USE** DISPOSE

# DISPOSE

## End Of Life

DIG FORM FIRE MOVE USE **DISPOSE**

BIOTHINKING



DIG FORM FIRE MOVE USE **DISPOSE**

# Bury for 5,000 Years



DIG FORM FIRE MOVE USE **DISPOSE**

# 5000 Year Old Ceramics



=



DIG FORM FIRE MOVE USE **DISPOSE**

# Are You Depressed Yet?



**Let's  
DO  
Something**

# FoE Schwepps 1971





**REDESIGN  
EVERYTHING**

# Which is the better design?



# Nature don't care about style



Sue Pryke, Dinera Bowl

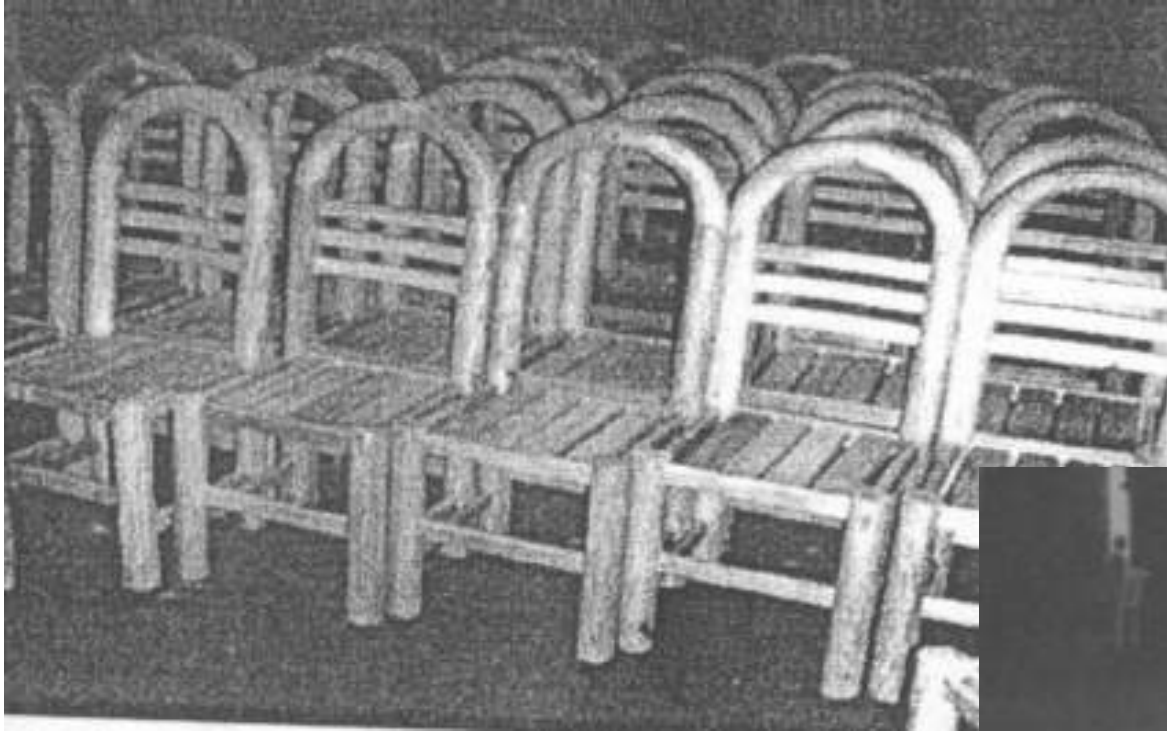


Prue Venables, White large oval bowl, 2012

**... even if we do**



# Diego Maserà, PhD



# Ceramics: Best we Have Today

- Heath Ceramics?
- Churchill Hotelware UK
- ...?
  
- Not many examples of Sustainable Ceramic Design!
- No Lifecycle Analyses
- Not even an Eco-label
- Unlike packaging, cars, electronics etc etc

# 1/465 EcoLabels



# Heath Ceramics in San Francisco





# Heath



# Churchill UK HotelWare

- 40% of their products are “Once-fired”, reducing energy by 40% per piece
- 90% of clay sourced locally from Devon and Cornwall
- 80% waste recycling
- ISO14001:2004 Environment Management System



# Churchill EcoGlaze

- Reduces firing temperatures



# Churchill New Kiln

- Tunstall in Stoke on Trent
- 35% per piece reduction in energy



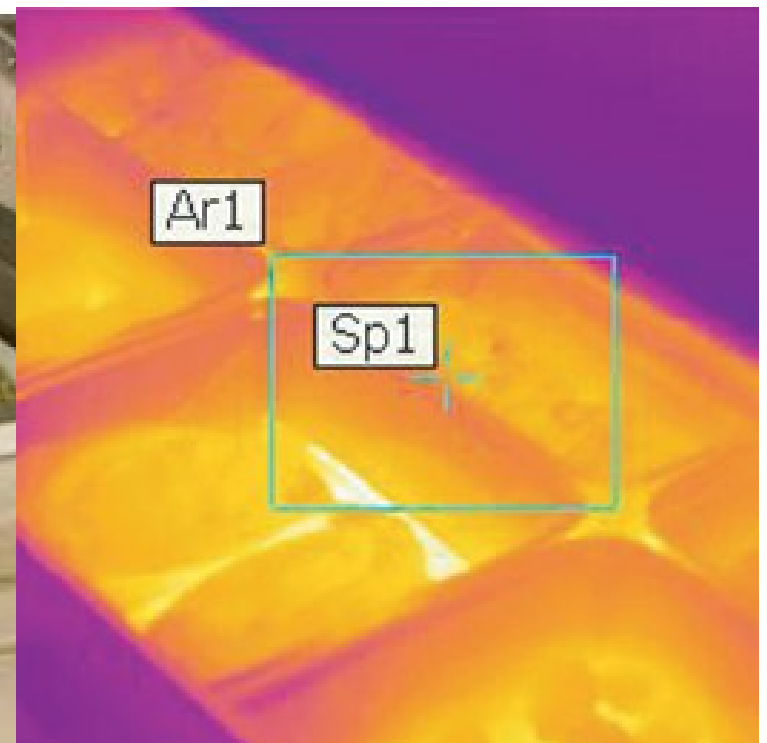
# Churchill Durability

- 5 year chip warranty
- 5000 dishwasher cycles



# Churchill Product Innovation

- Counter Serve product reduces energy needed to keep food warm



# Solutions

Dig

Form

Fire

Move

Use

Dispose



# Life Cycle Analysis (LCA)

∅ Functional Unit

∅ Mass Balance

∅ System Boundaries

∅ ISO14040/1/2/3/9

∅ Embergy



# LCA Parameters

∅ Water Use

∅ Fossil Fuel use

∅ Mineral use

∅ Biomass

∅ Land use

∅ Acidification

∅ Global Warming

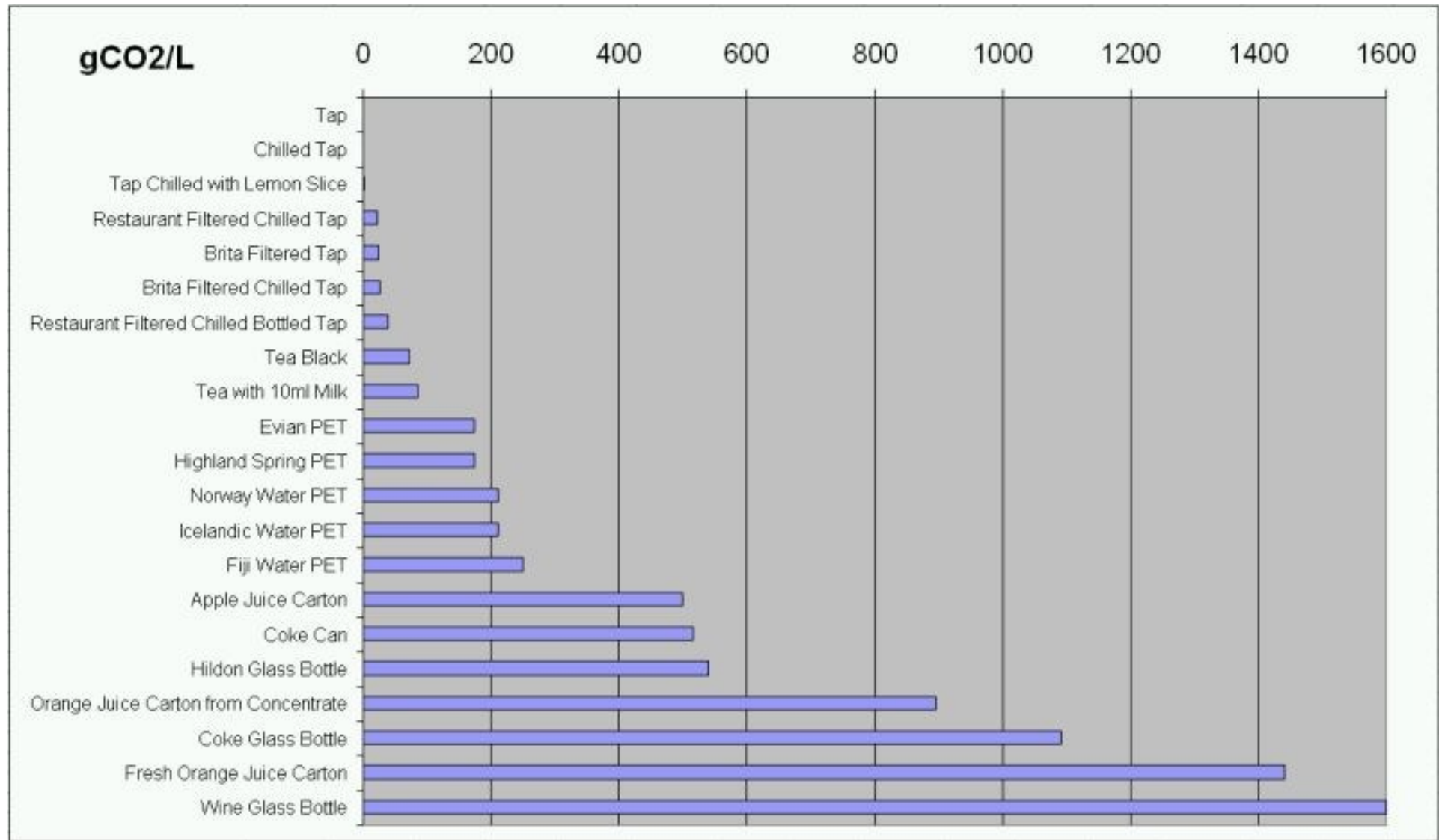
∅ Ozone

∅ Eutrophication

∅ Human Health

∅ Ecotoxicity

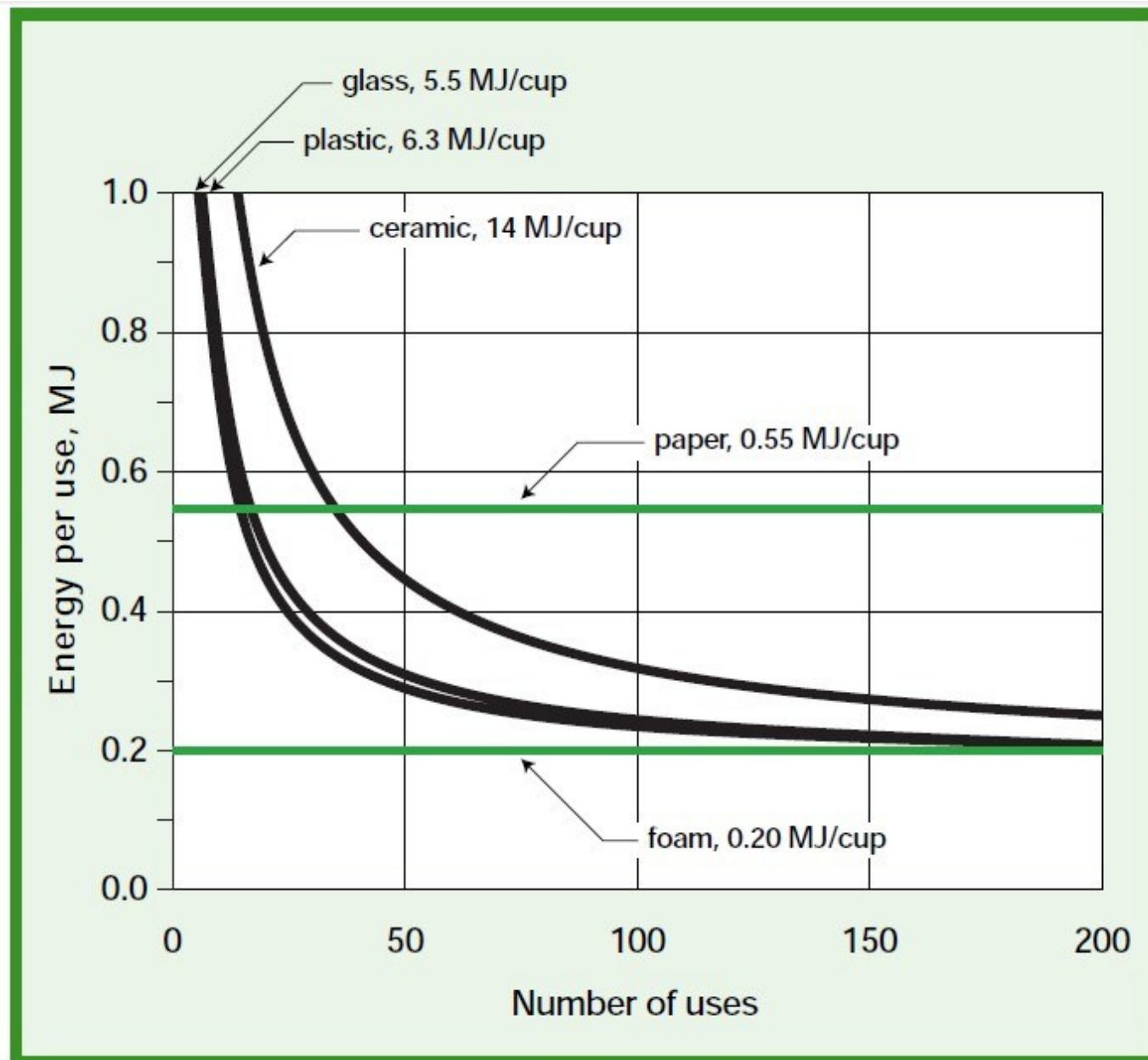
# Drinks CO<sub>2</sub>



# Disposable or Ceramic?



# Coffee Cups



... or make it in Porcelain



# Turbine Blades



# Solutions

Dig

Form

Fire

Move

Use

Dispose



# DIG

## Extract the Clay

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# Local Kaolin

Monte Suimo Mine, Belas, Sintra, Lisbon District, Portugal



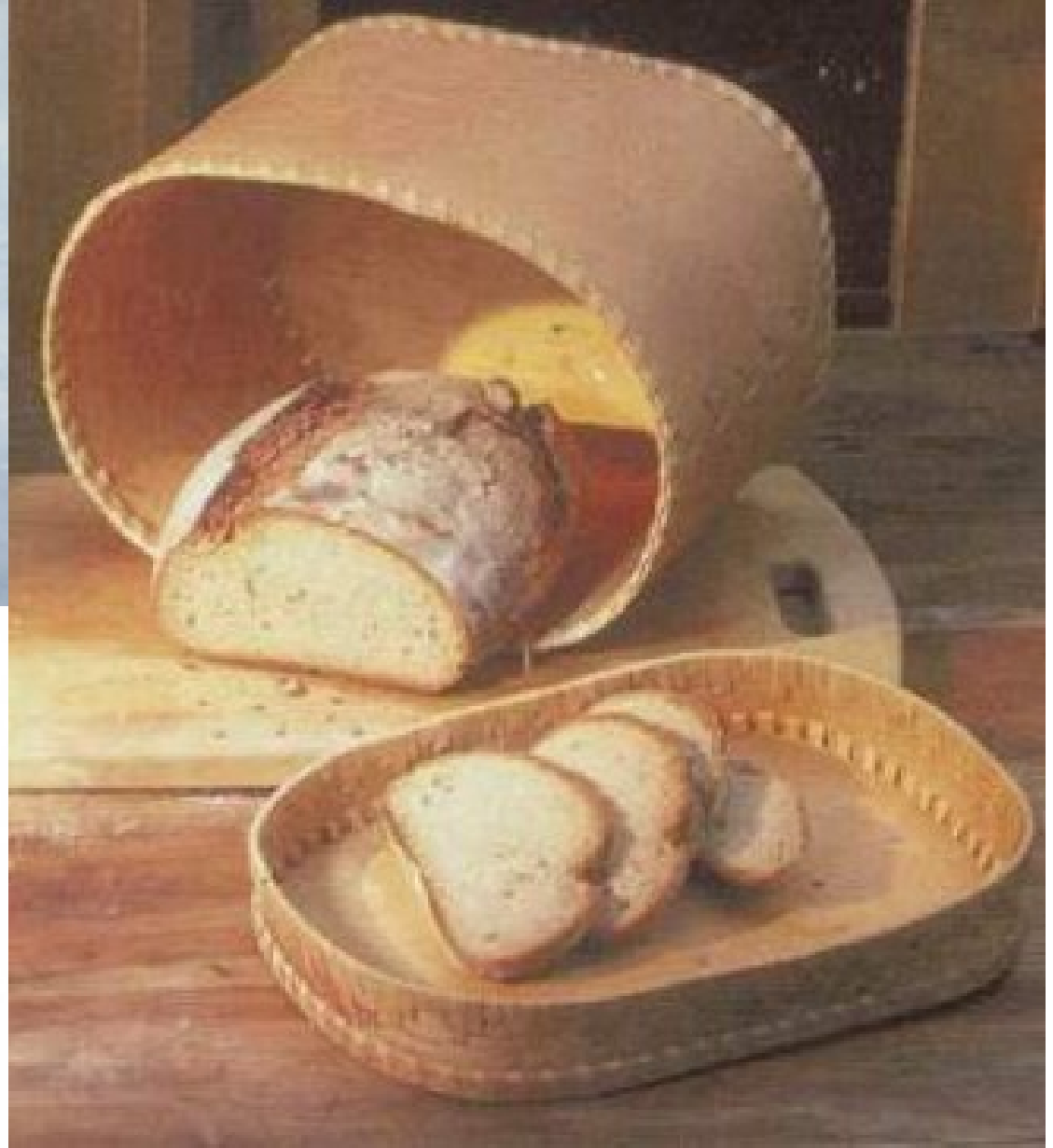
DIG FORM FIRE MOVE USE DISPOSE

# Quarry EcoLabel

- Waste water recovery closed system
- No interference with surface water bodies
- Water recycling
- Waste
- Air quality
- Noise



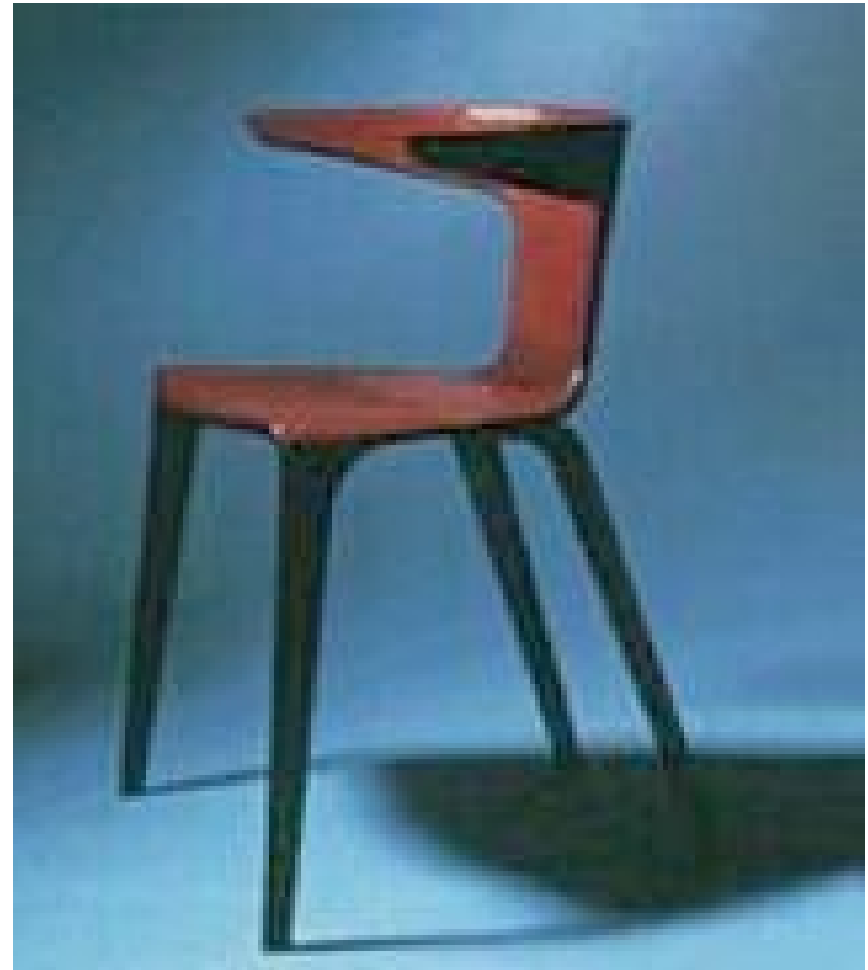
# Straw, Wood, Birch Bark



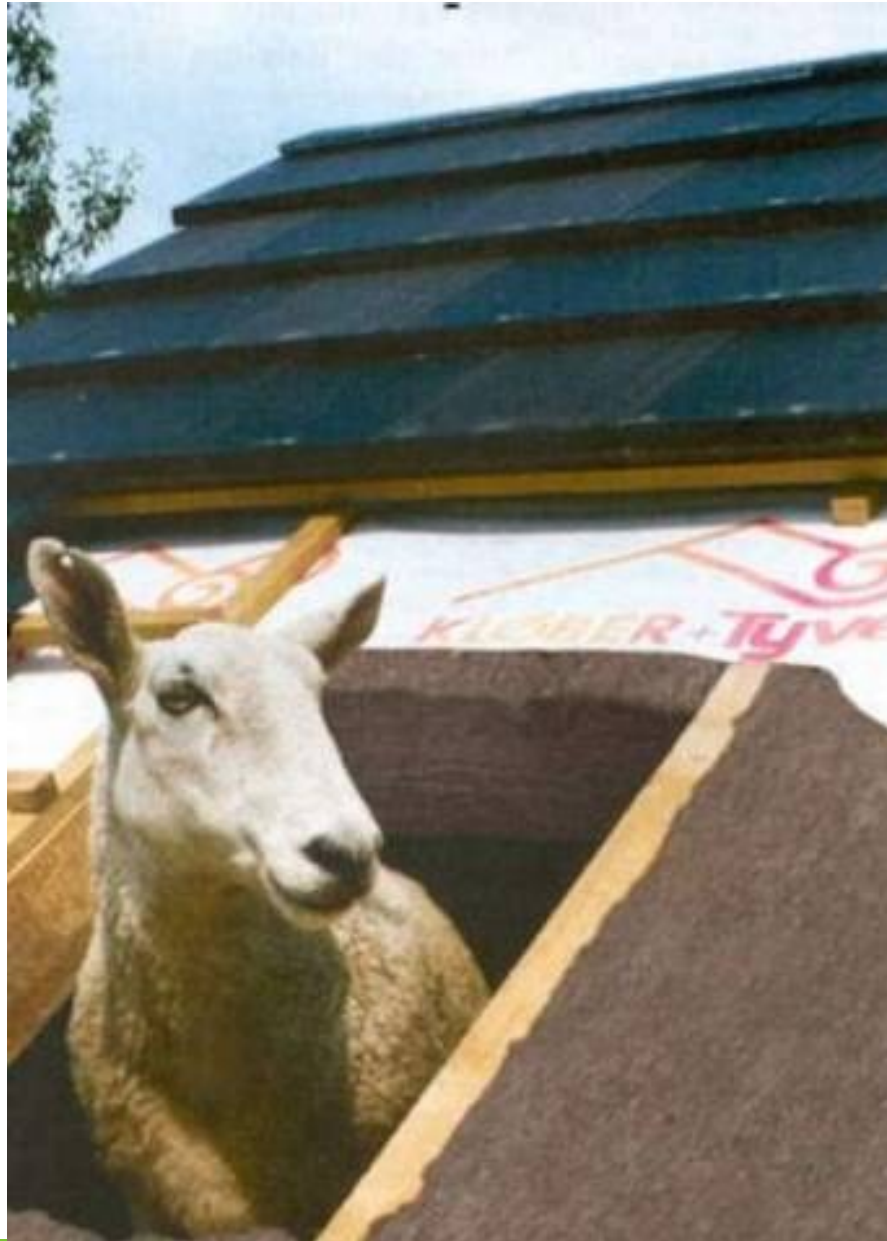
DIG FORM FIRE MOVE USE DISPOSE

# BioComposites

Alberto Lievore designed his Rothko chair to be made of Maderon, a moulded bio-material made from pulverized almond shell mixed with natural and synthetic resins.



# Sheeps Wool Insulation



# Chalk and Straw Blocks



# (Different Materials are NOT the Answer)



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# Ceramic Knives





# Tree Barcodes & RFIDs



DIG FORM FIRE MOVE USE DISPOSE



# Fair Trade



Guarantees  
a **better deal**  
for Third World  
Producers



DIG FORM FIRE MOVE USE DISPOSE



# Trannon: Local Wood



DIG FORM FIRE MOVE USE DISPOSE



# Restoration = Hope?



**DIG** FORM FIRE MOVE USE DISPOSE

# FORM

## Design and Mould

DIG **FORM** FIRE MOVE USE DISPOSE

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# Durable

Most chairs last a long time, but the longer they last, the less new chairs need to be made, and so the less pollution. This granite chair could last a thousand years, so is exceptionally **durable**.



# 1000 Year Design Life



DIG FORM FIRE MOVE USE DISPOSE



twin

# Carbon Fibre Toilet Bowl



DIG FORM FIRE MOVE USE DISPOSE

**BIOTHINKING**



# Minimise



DIG FORM FIRE MOVE USE DISPOSE

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# Lightweighting



DIG FORM FIRE MOVE USE DISPOSE

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# Modular



DIG FORM FIRE MOVE USE DISPOSE



# Modular



DIG FORM FIRE MOVE USE DISPOSE

# Multi-function



DIG FORM FIRE MOVE USE DISPOSE

# MultiNightmare



DIG FORM FIRE MOVE USE DISPOSE

# Bowl + Strainer



DIG FORM FIRE MOVE USE DISPOSE

# Bowl for Life?

STOKKE®



0-6 months

6-36 months

For life

Stokke® Grow

IDEA?



DIG FORM FIRE MOVE USE DISPOSE



# Inner Beauty



DIG FORM FIRE MOVE USE DISPOSE

**Inflated -> 98%  
Saving**



DIG **FORM** FIRE MOVE USE DISPOSE



# Bubbledeck



Bubbledeck panels placed on site. Bubbles have been omitted around the zone of influence of columns, where punching shear forces are high, and additional reinforcing is required. (photo courtesy Bubbledeck North America)



Rejected plastic kayaks (commonly sold at Walmart) were recycled for the batch of "bubbles" at the Daniels Faculty project



IDEA?

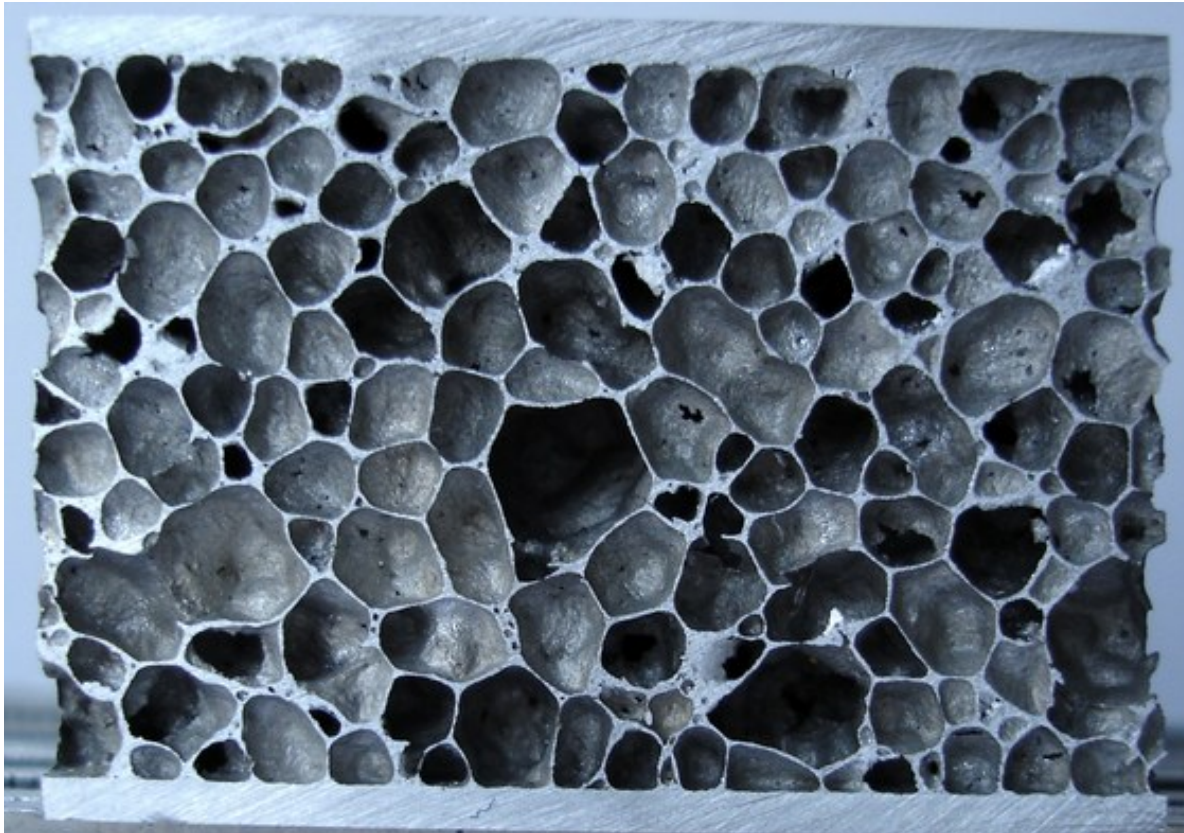
DIG FORM FIRE MOVE USE DISPOSE

# Mooi Blowaway Vase by Front



DIG FORM FIRE MOVE USE DISPOSE

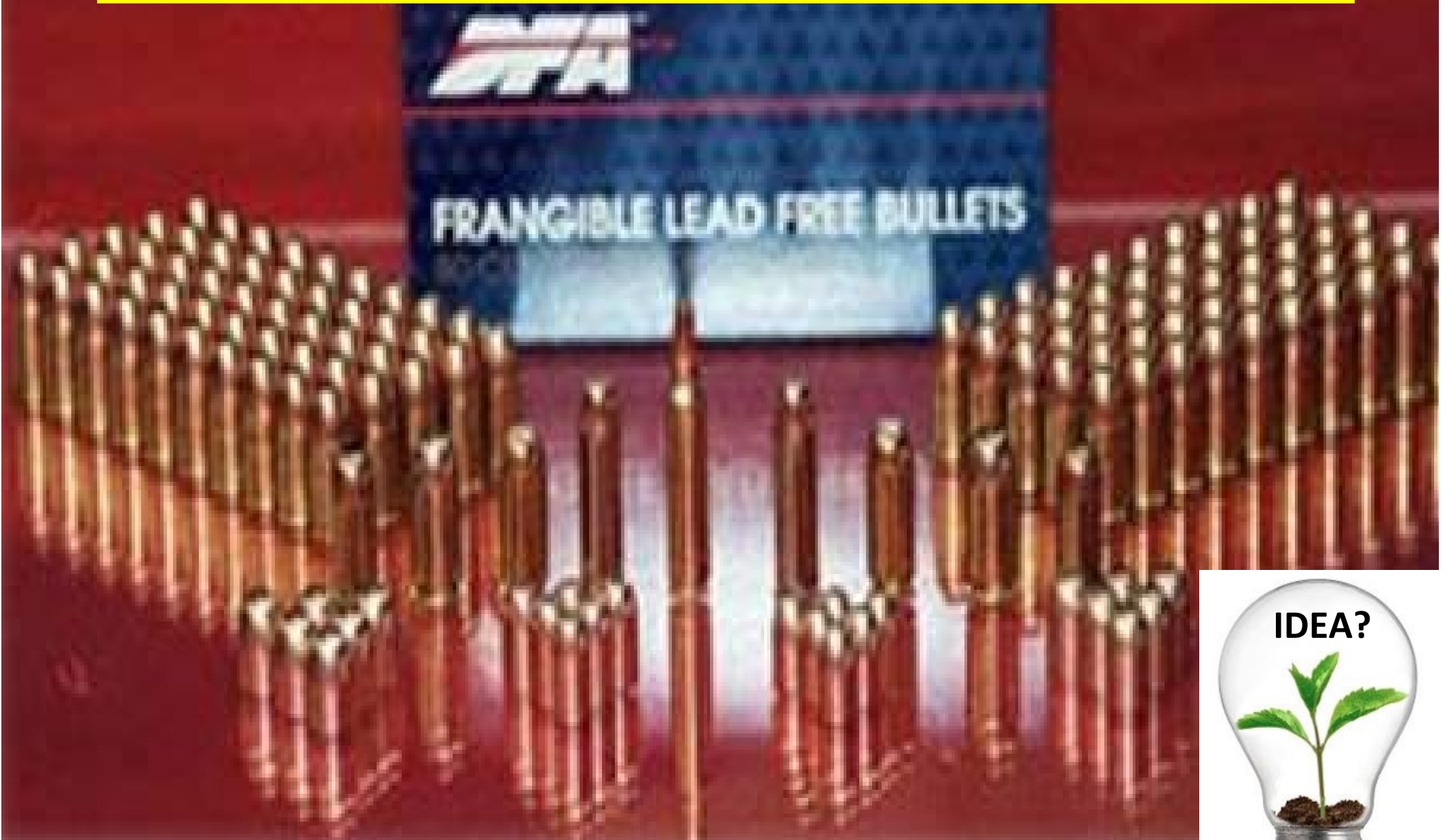
# Foam



DIG **FORM** FIRE MOVE USE DISPOSE



# Even Bullets Can Be Lead Free



DIG FORM FIRE MOVE USE DISPOSE



IDEA?

# Lotus Self-Cleaning



# Low-paper and Low-ink Fonts

*Gulliver* is a typeface which appears to be larger than it is, and which is narrow without looking narrow.

e c o f o n t





# FIRE

## Kiln and Factory

# Brick (Quarry to Site)

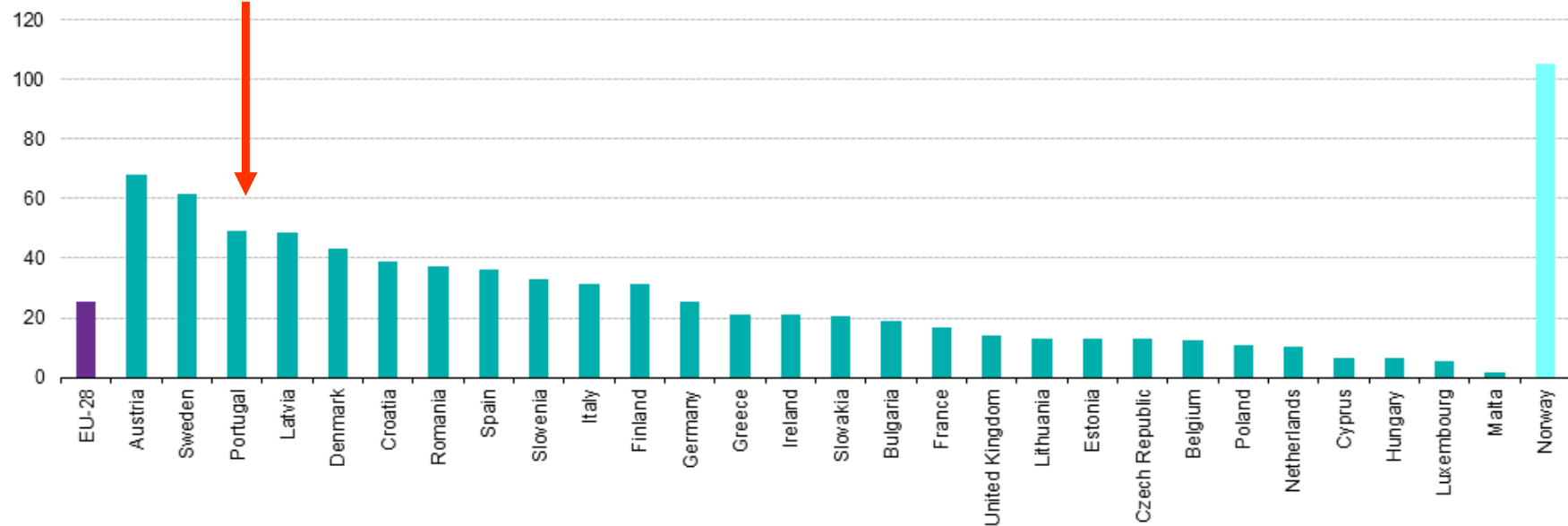
Material	Embodied Energy - MJ/Kg	Embodied Carbon - Kg CO2e/Kg
General simple baked clay products	3	0.24
Tile	6.5	0.48
Vitrified clay pipe DN 100 & DN 150	6.2	0.46
Vitrified clay pipe DN 200 & DN 300	7.0	0.50
Vitrified clay pipe DN 500	7.9	0.55
General Clay Bricks	3.0	0.24
<b>EXAMPLE: Single Brick</b>	6.9 MJ per brick	0.55 kgCO2 per brick

# Electric Better Than Gas?



DIG FORM **FIRE** MOVE USE DISPOSE

# 50% Renewable Electricity



Source: Eurostat (online data code: tsdcc330)

# EU Ecolabel On Floor Tiles

- Absence of risk phrases in raw materials  
R45 (may cause cancer) etc to R68
- Limit on lead, cadmium and antimony used in the glazes
- Firing stages < 3.5 MJ/kg
- Water use < 1L/kg and 90% recovered
- PM, Fluorides, NO<sub>x</sub>, SO<sub>2</sub> limits
- Water releases Cd, CrVI, Fe, Pb
- 85% waste recovery
- Paperboard packaging with 70% recycled content
- An indication of the route of recycling or disposal





## THE GREEN FACT-TREE

As a BS EN ISO 14001:2004 accredited company, an Environmental Management System makes provision for continuous improvement and ongoing legal compliance, assessed through regular audits and management reviews.

Over 98% of Dudson ceramics lost in manufacture are recycled

Carbon emissions produced in the manufacture of Dudson ceramics are only 54% of the equivalent porcelain product

\* Independent research carried out by Endeka Ceramics Ltd.

All Dudson ceramics are protected by ThermECO\*, a high performance lead-free glaze that reduces energy consumption due to lower firing temperatures



\* ThermECO is a trademark of Endeka Ceramics Ltd.

We have installed two new fast-fire kilns, which are much more energy efficient than traditional methods of firing

Since 2005, mould waste has been reduced by 41% and general waste collections by 69%

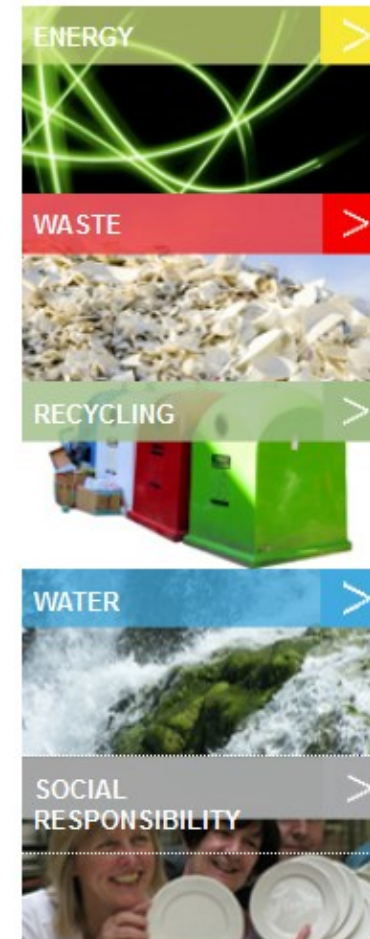
Our ceramics are made in Dudson-owned factories in England and France

The durability of Dudson products means lower replacement rates, resulting in lower resource use and lower transport costs

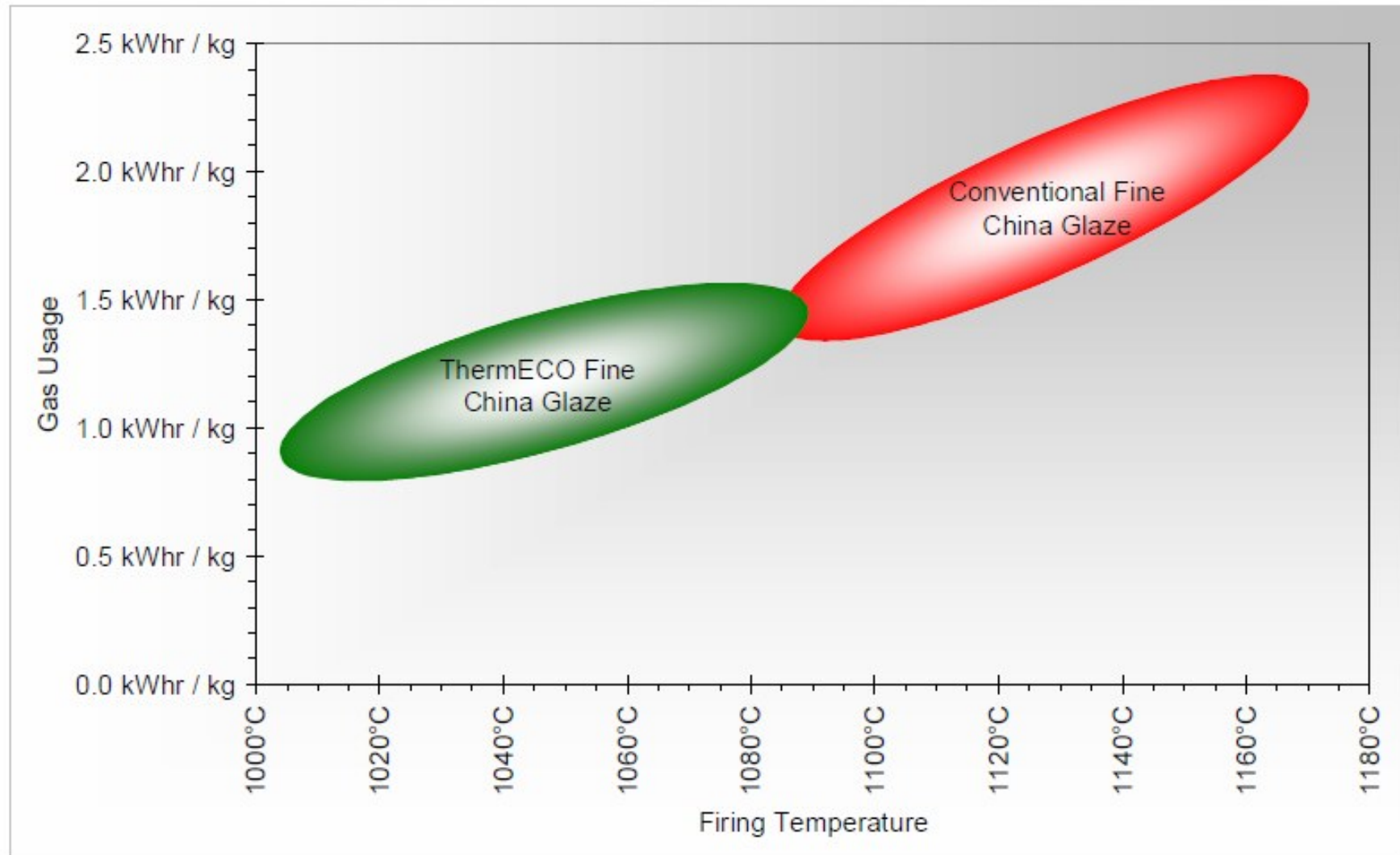


## Taking steps to reduce our environmental footprint...

Dudson has long since recognised its corporate responsibility in managing the impact of its operations on the environment, and has received recognition for its efforts from the British Standards Institution, through certification to the BS EN ISO 14001:2004 Environmental Standard.



# ThermECO Glaze



ENDEKA Ceramics Ltd

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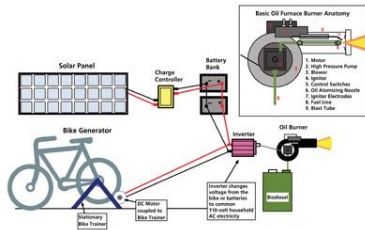
# Bio Fuels



DIG FORM FIRE MOVE USE DISPOSE



# Used Vegetable Oil



DIG FORM FIRE MOVE USE DISPOSE

# Wood-Fired Kiln



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# Self-Firing?



DIG FORM **FIRE** MOVE USE DISPOSE



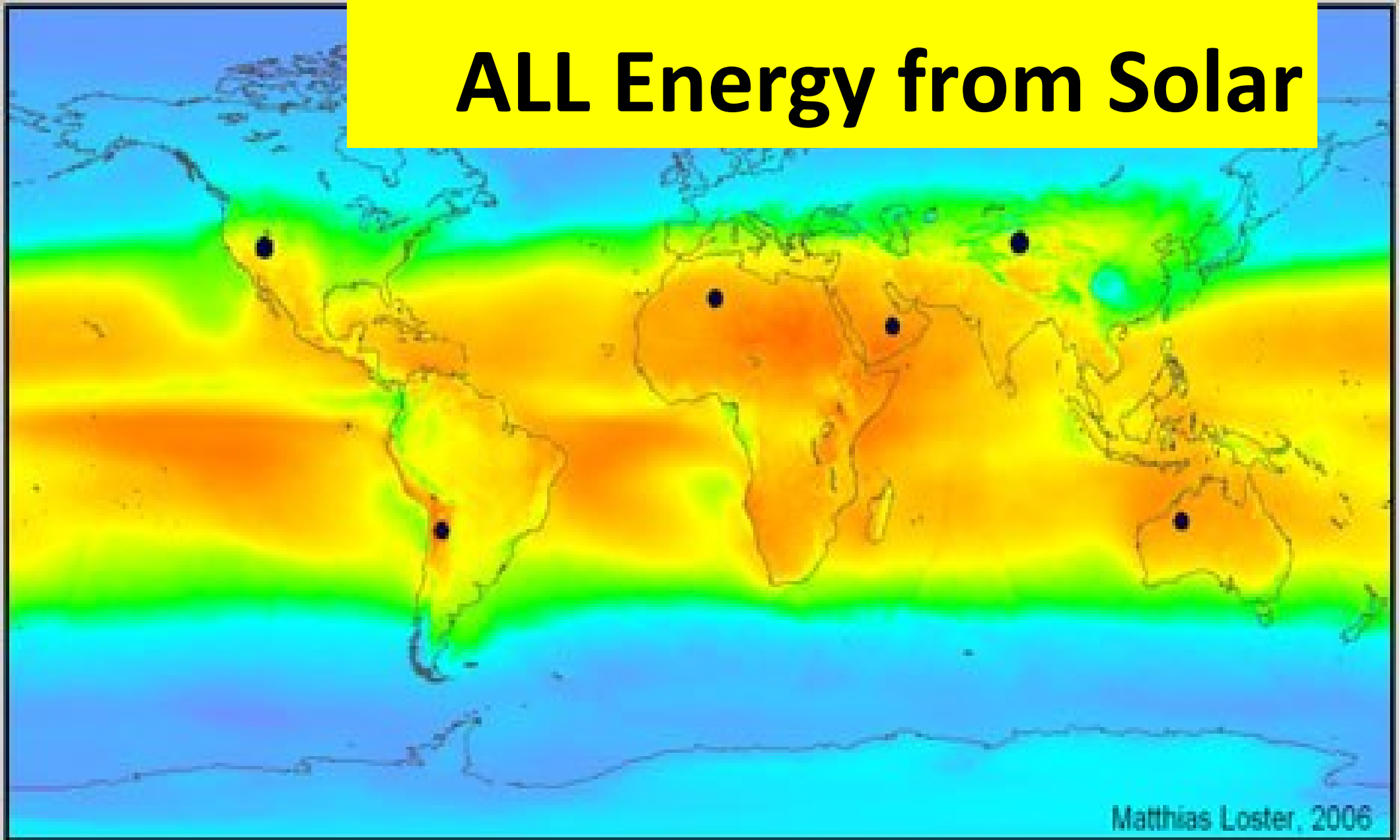
# Photon Farms



DIG FORM **FIRE** MOVE USE DISPOSE



# ALL Energy from Solar



$$\Sigma \bullet = 18 \text{ TWe}$$

DIG FORM **FIRE** MOVE USE DISPOSE

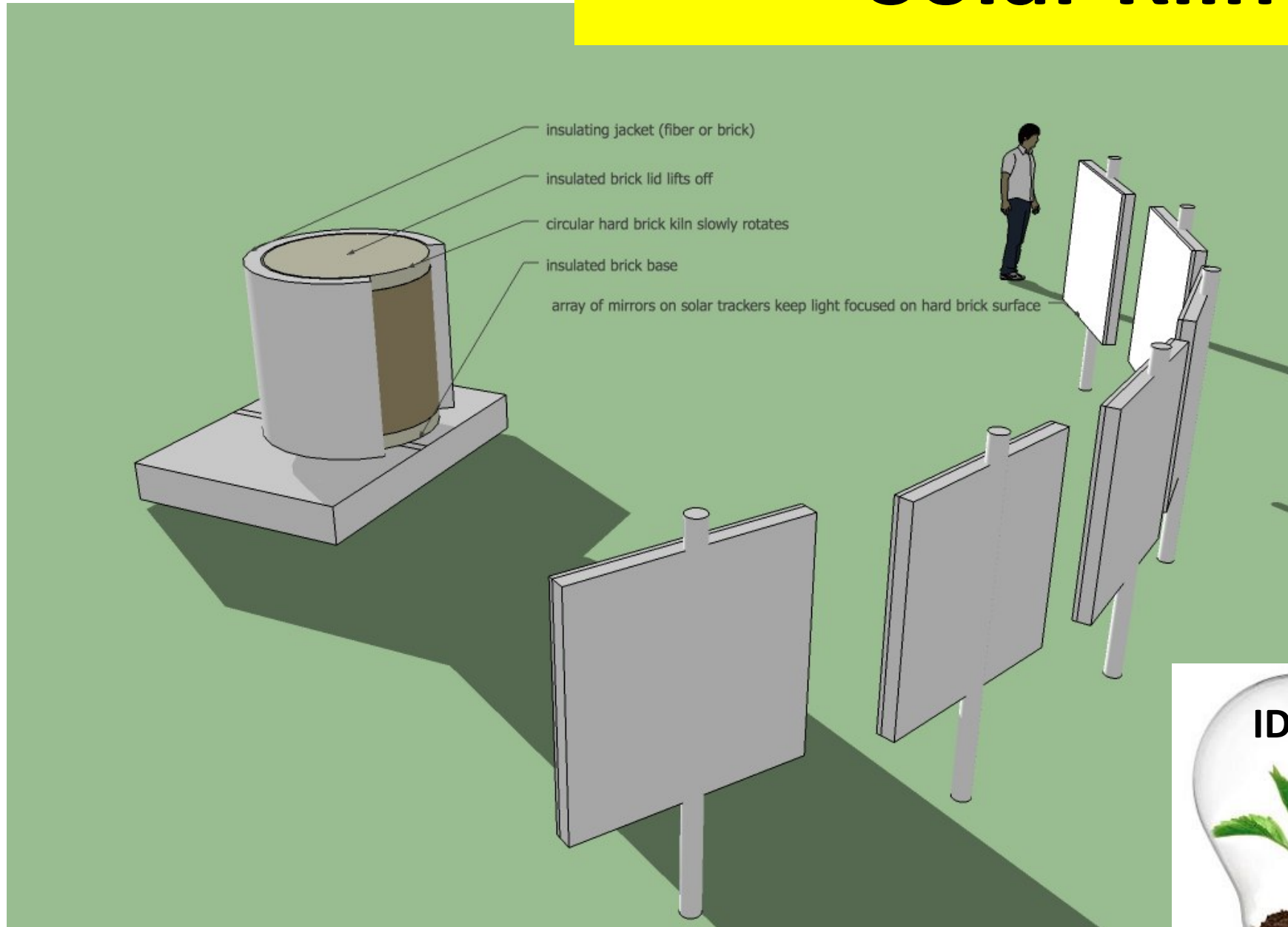
# Solar Collector



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# Solar Kiln?



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# On an Industrial Scale?



DIG FORM **FIRE** MOVE USE DISPOSE



# Solar Collector



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# Muscle Power



DIG FORM **FIRE** MOVE USE DISPOSE

# Muscle Power



DIG FORM **FIRE** MOVE USE DISPOSE

# Spring Drive Bagpipes?



DIG FORM FIRE MOVE USE DISPOSE

# MOVE

# Pack and Transport

DIG FORM FIRE **MOVE** USE DISPOSE

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# Container Ship



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# Containers Are Great



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# Boats are Efficient but Smoky

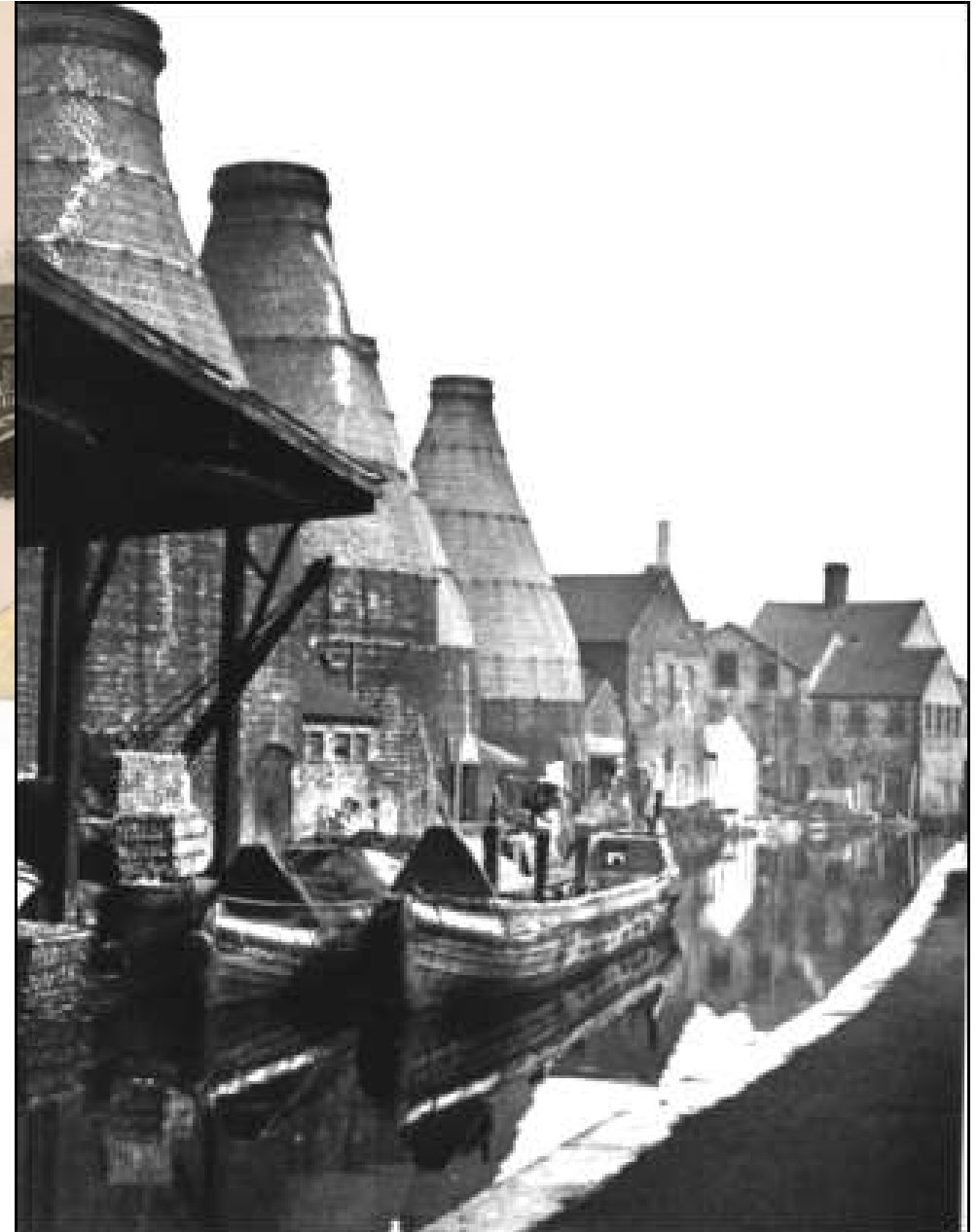
## Freight transport efficiency

Average CO2 emission per tkm

- Sea transport 2 – 7 g/tkm
- Rail transport 18 – 35 g/tkm
- Inland waterways 30 – 49 g/tkm
- Road transport 62 – 110 g/tkm
- Air transport 665+ g/tkm



# Why The Canals Were Built



DIG FORM FIRE MOVE USE DISPOSE

# Move Ceramics by Sail?



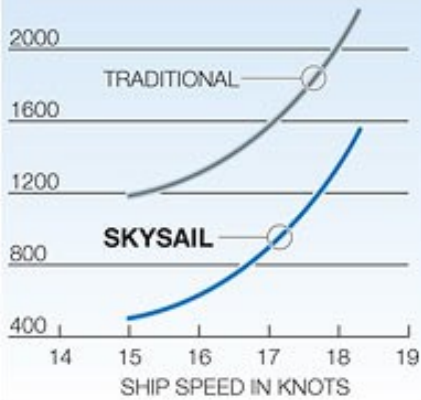
DIG FORM FIRE **MOVE** USE DISPOSE

# Move Ceramics by Sail?

## HARNESSING THE WIND

### FUEL CONSUMPTION OF A FULLY LADEN 200-METRE SHIP

FUEL CONSUMPTION IN LITRES PER HOUR  
2400



### CROSS-SECTION



### PARAFOIL

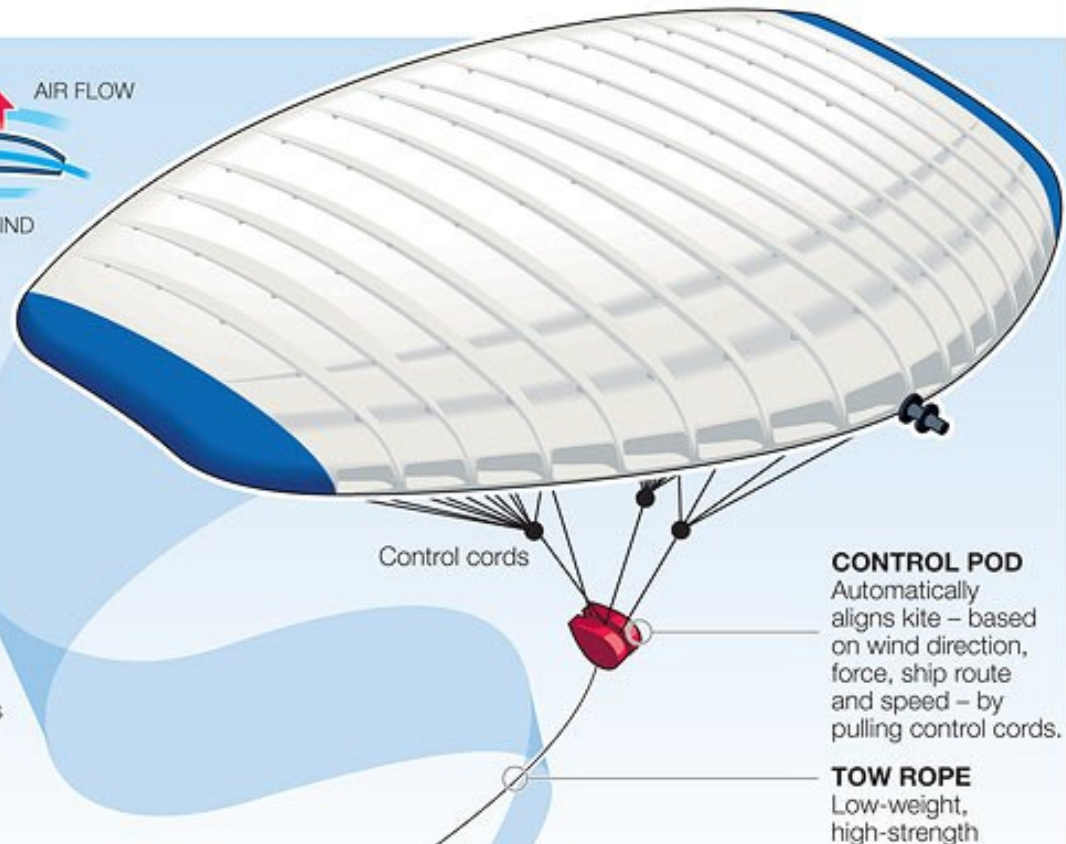
Up to 5,000m<sup>2</sup> multi-cell kite. Its aerodynamic shape generates lift for greater pulling power.

Largest kites have towing power equivalent to 6,800hp engine.

Dynamic manoeuvres increase air flow over kite for exponential increase in power.

### SAILING DIRECTION

SkySail can be used to sail at up to 50° against wind.



# Move Ceramics by Bike?

Freight bikes such as this Brox 4 wheeler are in use in London by delivery company Red Star, and Taxi Bikes ferry people around the West End.



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# USE

# Using and Wash

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# Communications



DIG FORM FIRE MOVE **USE** DISPOSE

**BIOTHINKING**

**Wash at 30°**



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# Visual



DIG FORM FIRE MOVE **USE** DISPOSE

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# SAVING THE WORLD ISN'T JUST FOR THE MOVIES

WASH AT 30° AND HELP SCOTLAND FIGHT CLIMATE CHANGE

LET'S GO GREENER TOGETHER  
[GREENERSCOTLAND.ORG](http://GREENERSCOTLAND.ORG)



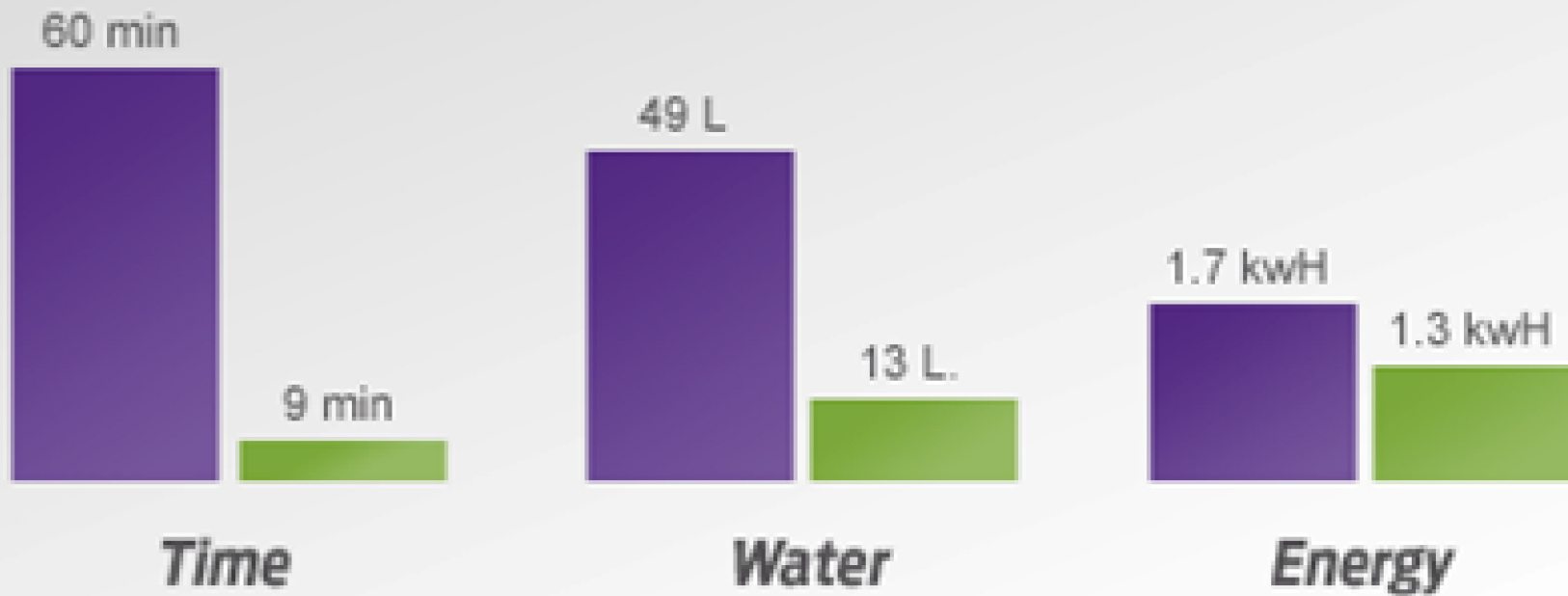
DIG FORM FIRE MOVE **USE** DISPOSE

**BIOTHINKING**

# HandWash



■ *Washing By Hand*  
■ *Using a Dishwasher*





DIG FORM FIRE MOVE **USE** DISPOSE

**Dog**



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# User Advice



Wash me  
Cold and  
Quick



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# Communicate



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# DISPOSE

## End Of Life

DIG FORM FIRE MOVE USE **DISPOSE**

BIOTHINKING

# Ceramics Recycling Still Rare

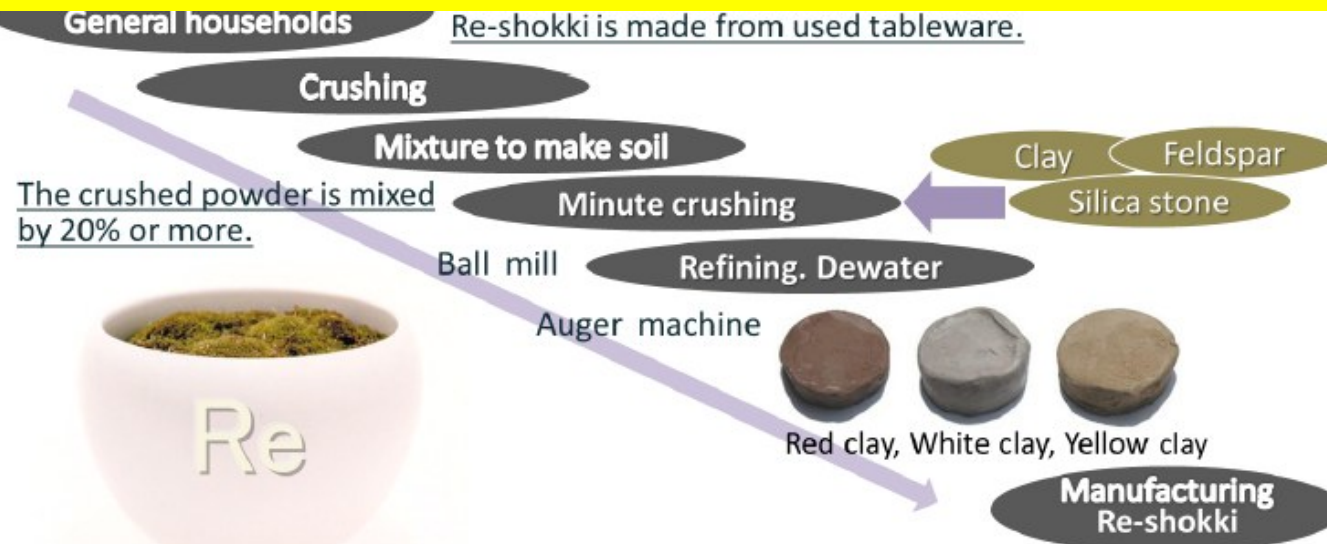


Fig. 8 Re-shokki •Saisei-001



Fig. 9 Re-shokki •Oliva

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# Ceramics Recycling Still Crude



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# Recycled by Oregon University



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# Resell Tableware



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# Optimal Lifetime



**Durable**

**Disposable**

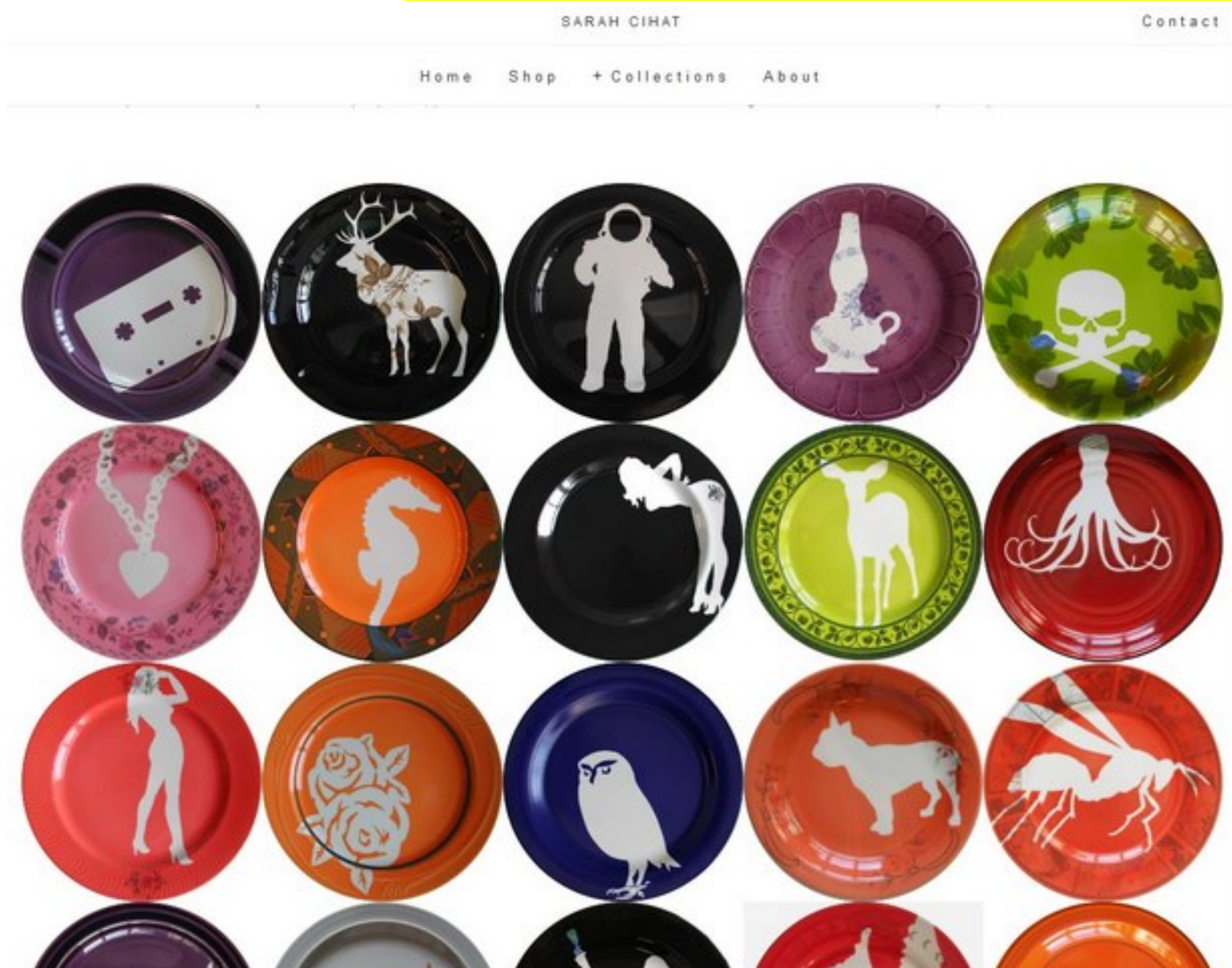
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# Repurposing



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# Sarah Chiat RePlate



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# Barbour Repair Service



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# Disassembly



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# Top 20 Ennovative Principles

1. Biomaterials
2. Cyclic Molecular
3. Re-use and Repurposing
4. Low Carbon Energy
5. Toxics Reduction
6. Stewardship Sourcing
7. Cleaner Production
8. Materials Efficiency
9. Energy Efficiency
10. Optimal Lifetime
11. Multifunction
12. Communication
13. Fair Trade
14. Traditional Methods
15. Rental
16. Seasonal or Local
17. Embodied Energy
18. Better Agriculture
19. Muscle Power
20. Disassembly

# There is Progress

- Many sectors have made more sustainable products
- Ceramics not so much
- Plenty of potential
- **But so much more to be done**

# “Drop” – A Radical View?

- Sustainability is binary
- 100% compatible with nature is required
- One drop in the ocean is too much
- One speck on the land is too much
- One wisp into the air is too much
- Even fields are not natural
- All land to be restored to wild

# My Vision

1. All products 100% compatible with nature
2. Life spread across the universe
3. All land returned to wild

# What's Your Superpower?



# What's Your Superpower?

- Energise a whole city?
- Crush rubbish for recycling like the Hulk?
- Make food from just from air and water?
  
- But all those already possible!
- **You** already have a superpower: The ability to merge art and science
- No-one else can do what you do

# You Can

- You can be more than stylists
- You can be Sustainability Superheroes



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	<i>(1 gallon=4.546L)</i>	<i>kgCO2</i>
Litre of Petrol		2.25
Litre of Diesel		2.57
Litre of LPG		1.49
Mile in a 30 mpg petrol car		0.34
Mile in a 40 mpg diesel car		0.29
Mile in a 60 mpg diesel car		0.19
Mile on train, tram, tube or coach		0.06
Mile on a local bus		0.15
Mile on a plane		0.18