

**Taiwan As a Cradle to Cradle® Island-
As Buildings Like Trees, Cities Like Forests and
Countries Like Ecosystems**
**台灣邁向搖籃到搖籃之島 -
當建物如樹木、城市如森林、國家如生態系統**

Prof. Dr. Michael Braungart
Cradle to Cradle Design Seminar

13th September - Taipei





什么是
“从摇篮到摇篮”
(简称C2C®)?
它能够为企业做
些什么?

简述什么是C2C?

[illegible]

QC的目标是什么?

- ◎ C2C方案的一个基本理念就是：人类，作为生态系统的一部分，应该让地球更丰富多样而不是使它越来越贫瘠。
- ◎ C2C方案将甚至增加人类文明及大自然的多样性。
- ◎ C2C方案不仅同时保护地球，保护人类健康和自然环境质量。

生態：極高生態價值

- C2C方案网生物降解连接: 材料在生物降解时不会给环境带来危害。
- C2C方案网工艺降解连接: 安全的材料可以被安全地回收并再利用。

經濟：探風經濟危機

社会：提高社会文化价值

C2C能够给本机构提供什么样的思维模式？

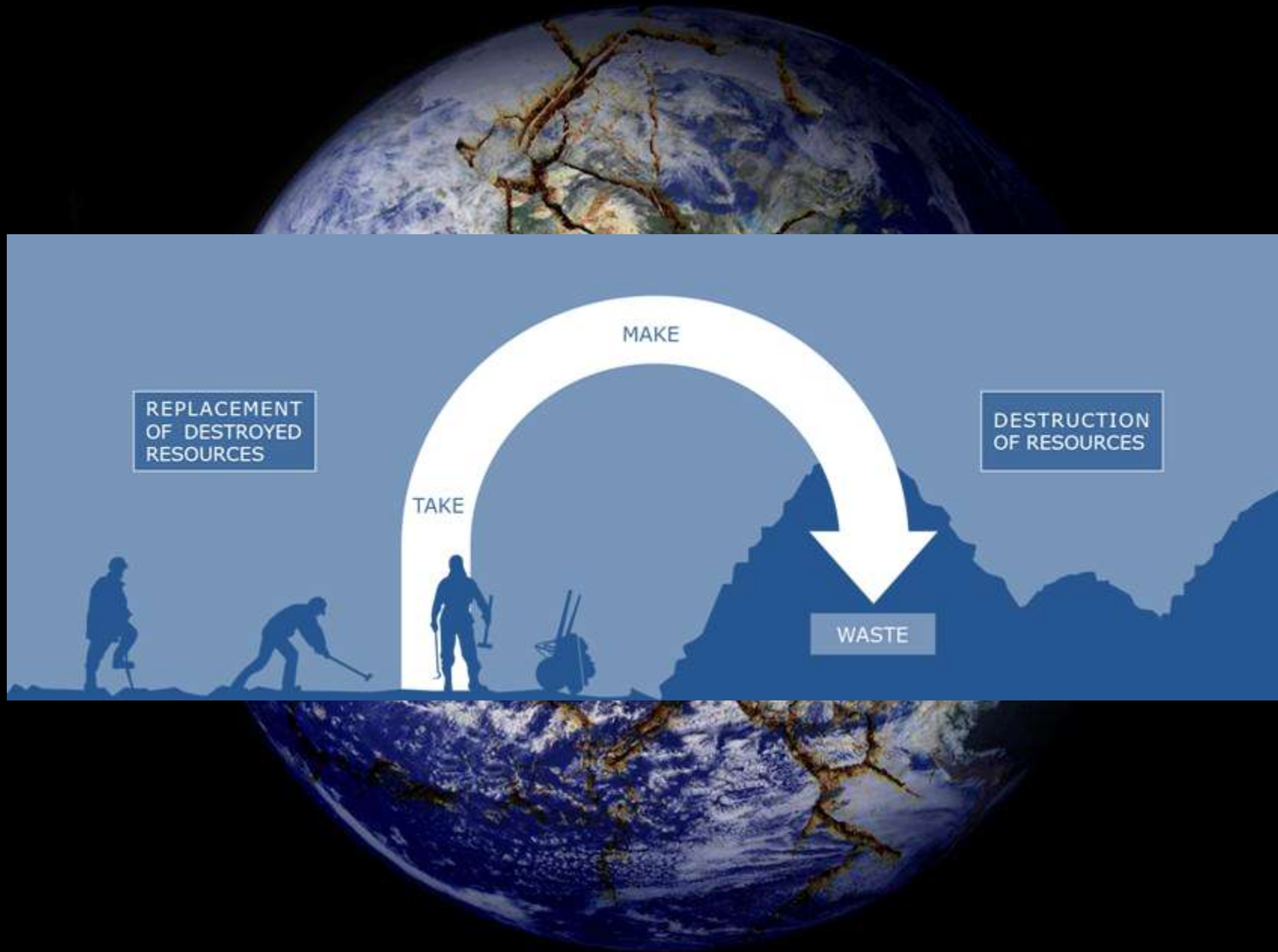
根據劍上的想通圖式

承股人的想進模式

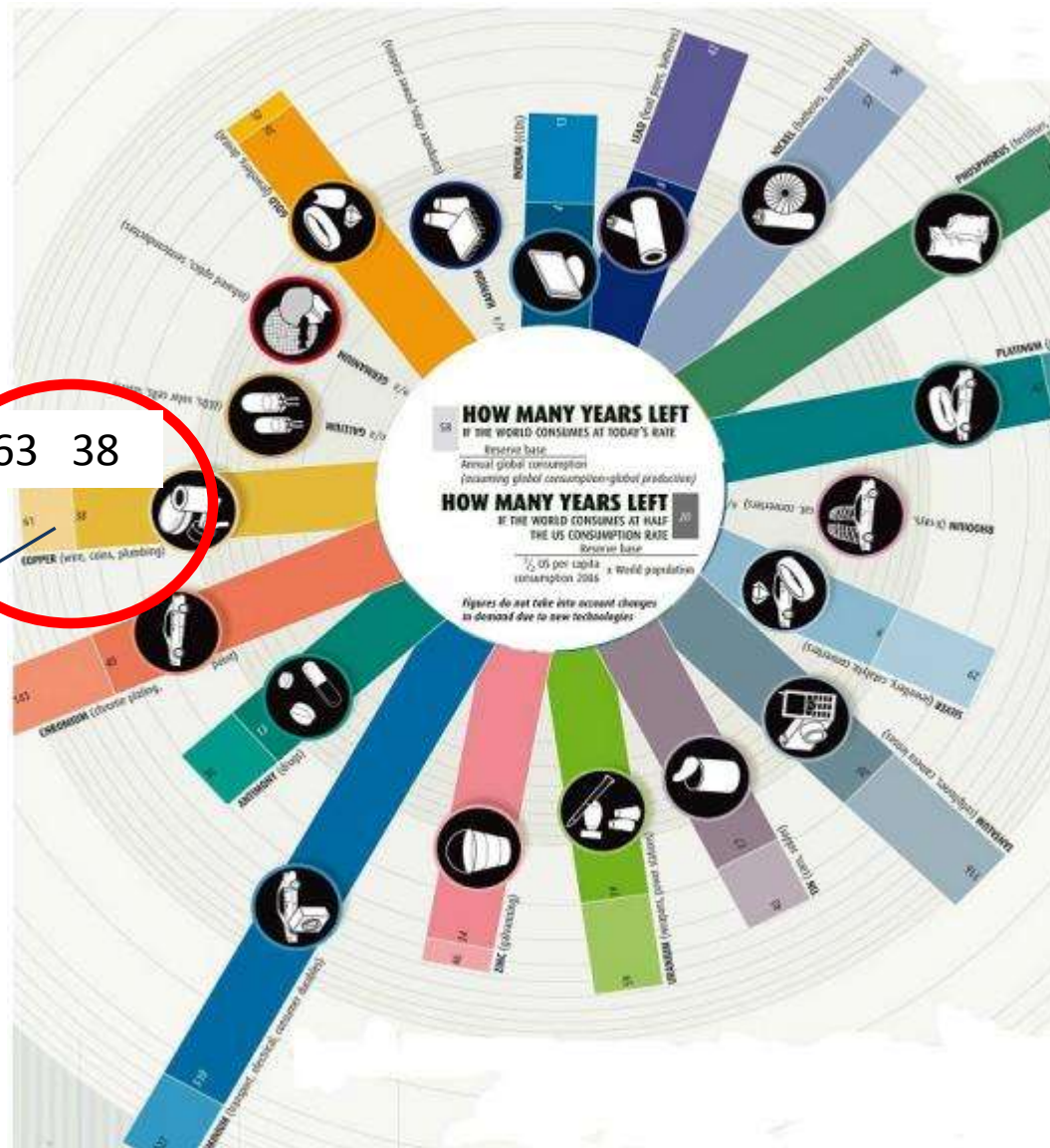
野生的戀情模式

C2C使用哪些理念?

- 生态效用：指生态、经济和社会文化多重增值。
- 生态效率：把人类对其自身和环境造成的伤害最小化。
- 生物圈：所有可生物降解材料的总和。
- 生物循环：从大自然获取生物材料，加以利用并安全地将其回归到大自然的循环过程中。
- 技术圈：指所有人工合成材料、金属和矿物的总和。
- 工艺循环：对技术材料的获取、利用、回收及安全物（药）利用的循环过程。
- 产品回收：这种回收利用的方式能保持或增加附加材料的使用价值（C2C等循环方式）。
- 降级回收：这种回收利用方式会降低附加材料的使用价值（目前通行的循环利用方式）。
- 智能化设计：这种设计产品的方式可以让产品在生产或使用的过程中给它们所在的系统带来增值。
- X名单：一份有害物质的名单。
- P名单：一份可安全使用的物质的名单。



Resource Scarcity 資源匱乏



Copper

Producing Humus 腐植質生成

- In the European regions it takes 100 to 300 years to build a 1 cm layer of Humus. 在歐洲生成1公分的腐植質需100到300年
- 25 cm of Humus is needed to have soil which is fertile enough to be used for food production. 土地需要至少25公分的腐植質才有足夠養分生產食物
- Every year we lose 4000 – 6000 times more humus than we build up. 每年失去的腐植質為生成的腐植質的4000到6000倍





Copenhagen Climate Plan

The short version

Copenhagen
Carbon Neutral
by 2025



CLIMATE CAPITAL
COPENHAGEN

Zertifikat*

Freie und Hansestadt Hamburg

*für eine Sekunde klimaneutral



http://greenmiles.de/files/products/hamburg_1.jpg



ANTE zero emissions

Nature embraces, nurtures and inspires us.

The Toyota Prius is just one of our vehicles that feature Hybrid Synergy Drive, its combination of electric and petrol power delivers the cleanest engine technology available.

Toyota's hybrid technology is creating a more sustainable tomorrow, today.

www.toyota-europe.com/environment



TOYOTA

aim: zero emissions



We are committed to preserving the delicate balance between man and nature.

We've come a long way since we launched our first hybrid car 10 years ago. But our goal goes beyond reducing exhaust emissions. We apply innovative environmental solutions to every aspect of the vehicle's life cycle: from design, manufacture and use, right through to recycling. It's the only way to reach our ultimate aim: zero emissions.

www.aimzeroemissions.eu

TOYOTA

How do you get more
out of the same resources?



Accenture helps leading companies increase performance without increasing costs. By optimising supply chains to enhance productivity. By using predictive analytics that drive growth through insights. By applying outsourcing not only as a way to save money but also as a way to make it. Talk to us and find out all the ways our capabilities can help you make the most of yours.

• Consulting • Technology • Outsourcing

accenture
High performance. Delivered.



www.businessweek.com

BusinessWeek

JUNE 9, 2000

A PUBLICATION OF THE MCGRAW HILL COMPANIES

IS YOUR OFFICE KILLING YOU?

The
dangers
of sick
buildings

By Michelle Conlin

PAGE 114



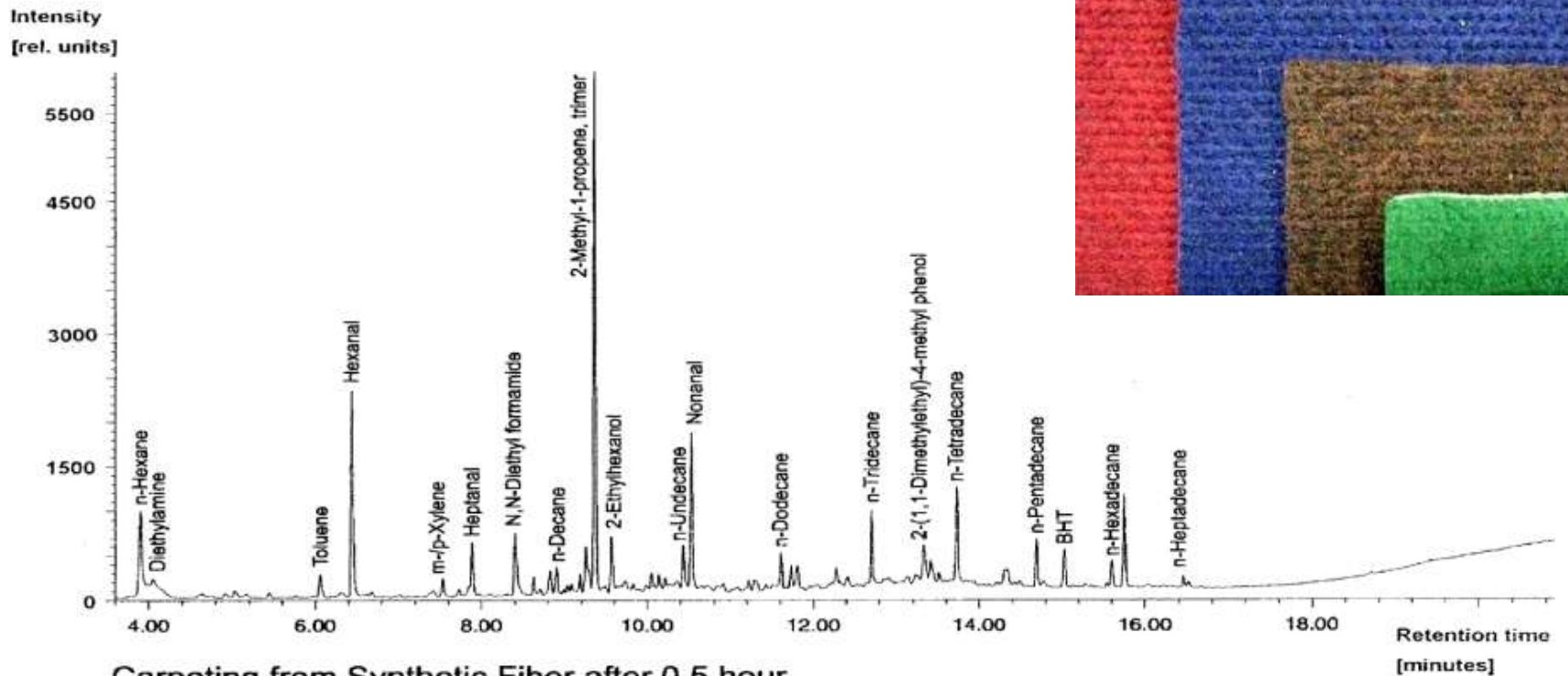
Indoor air pollution 室內空氣汙染



Source: <http://www.gonaturalbaby.com/blog/indoor-air-pollution/326/>

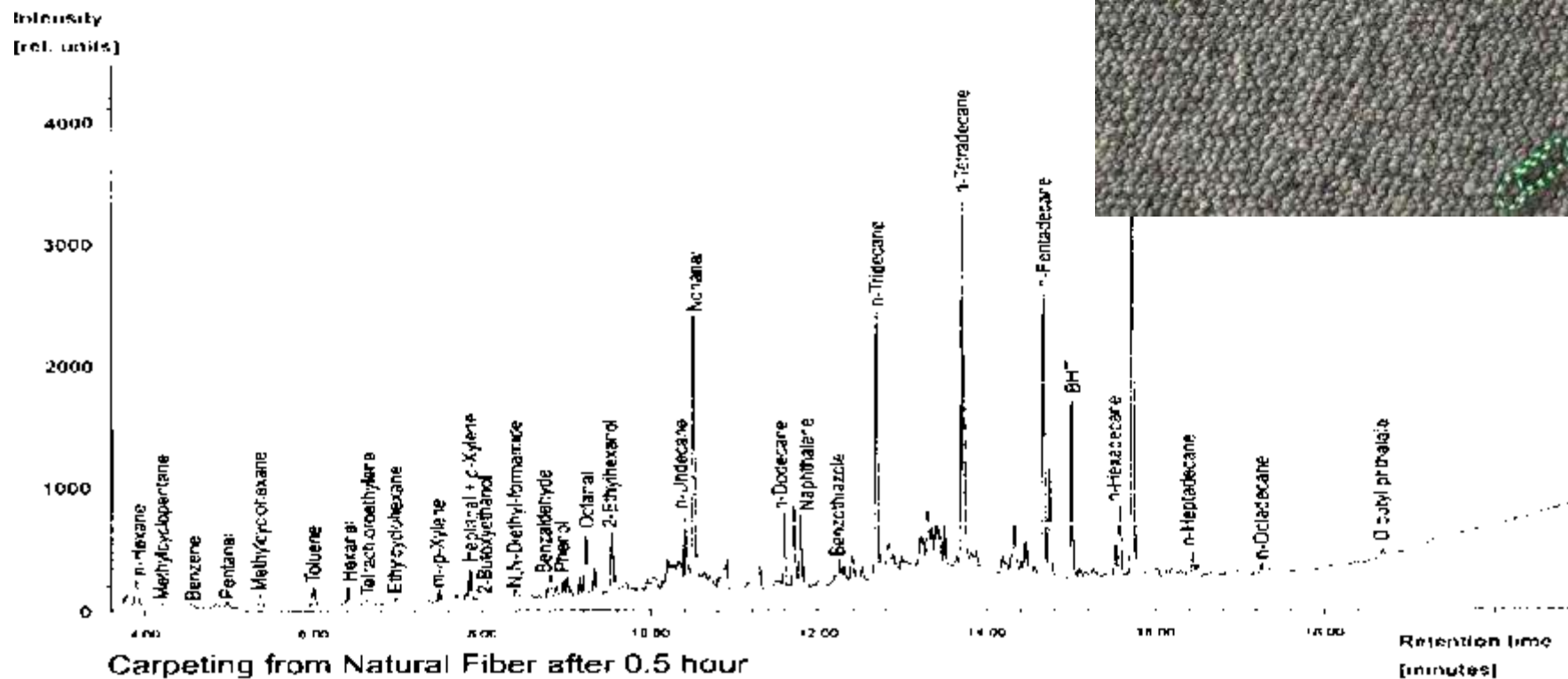
Off-Gassing Chromatogram: Carpet (synthetic fiber)

揮發氣相層析譜：地毯（合成纖維）



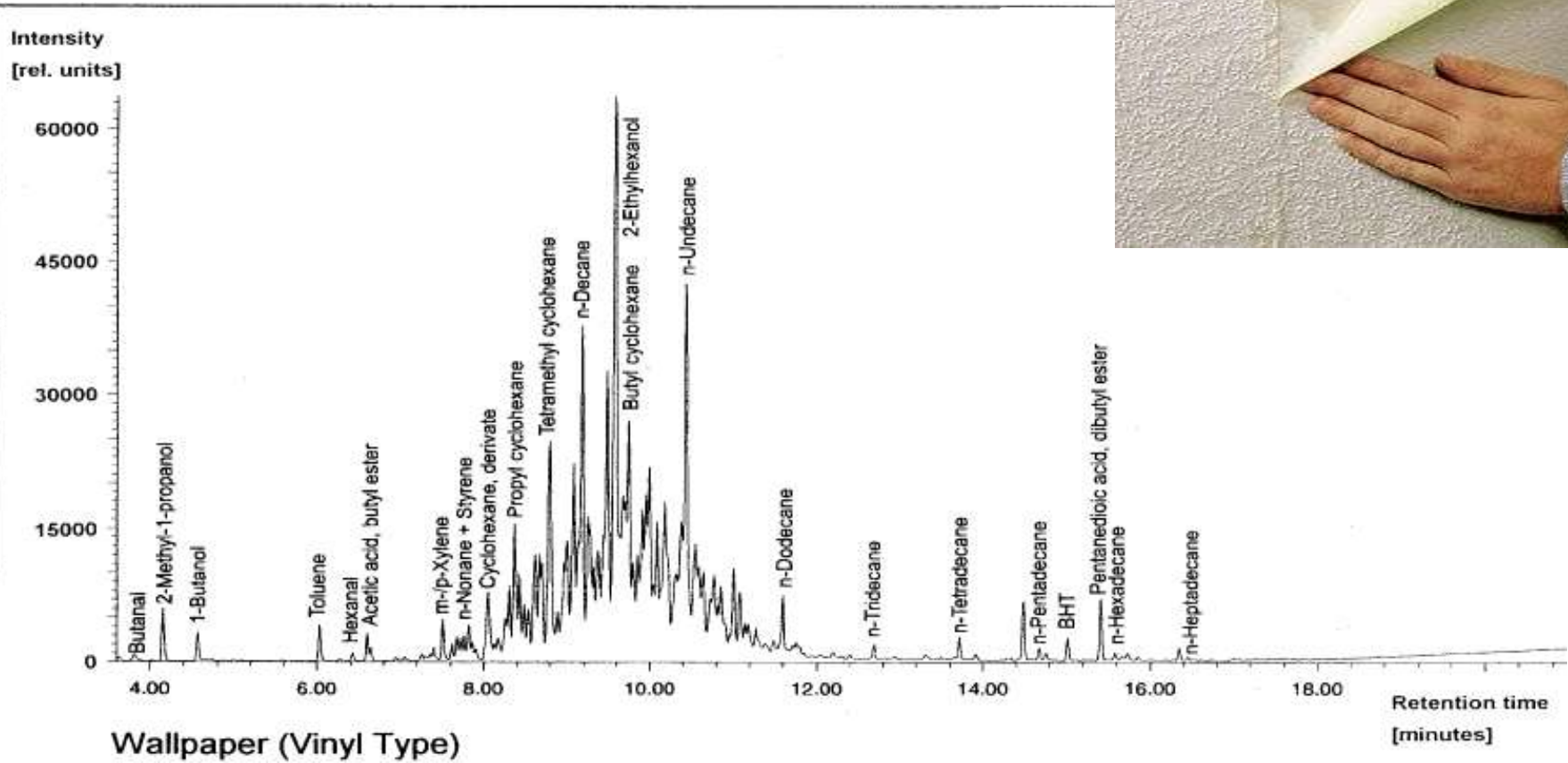
Off-Gassing Chromatogram: Carpet (natural fiber)

揮發氣相層析譜：地毯（天然纖維）



Off-Gassing of wallpaper

揮發氣相層析譜：壁紙



Indoor Air Quality for our children

我們孩子所需要的室內空氣品質



Toilet Paper used in German ICE trains

德國高速鐵路列車中衛生紙

Detected in the toilet paper* 衛生紙中偵測到的物質	In mg/kg
Organic Chlorine 有機氯	700
Organic Fluorine 有機氟	70
Zinc 鋅	35
Titanium 鈦	31
Copper 銅	27
Chromium 鉻	5.9
Lead 鉛	4.0
Nickel 鎳	1.4
Antimony 銻	1.2



Antimony 銻



Antimony leaches out of the bottle into the juice.

The citric acid in the juice speeds up the process.

銻會從果汁瓶中滲出，果汁中的檸檬酸將加速滲出過程。

SACHTLEBEN: Heavy-metal free PET catalysts

SACHTLEBEN: 無使用重金屬催化劑之PET寶特瓶



Are we too many?

我們人太多了嗎？

„ No goal is more **crucial** to healing the global environment, than **stabilizing human population**“

從改善地球環境劣化的角度來看，沒有任何一個目標比穩定世界人口更重要。

Al Gore
艾爾·高爾



Not welcome on the planet?

地球不歡迎他們嗎？



Are we too many?

我們人口會太多嗎？

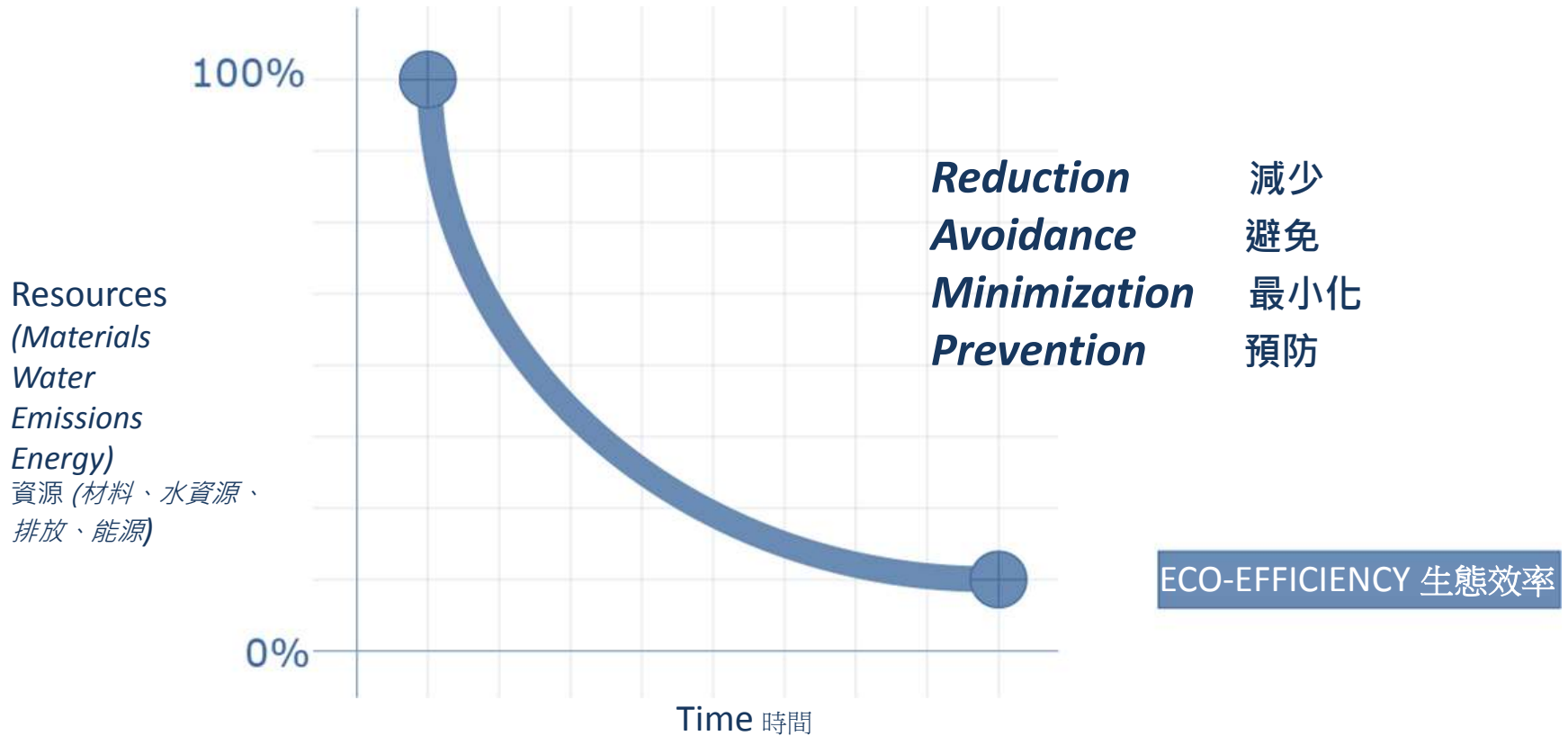


...are they too many?

螞蟻數量會太多嗎？

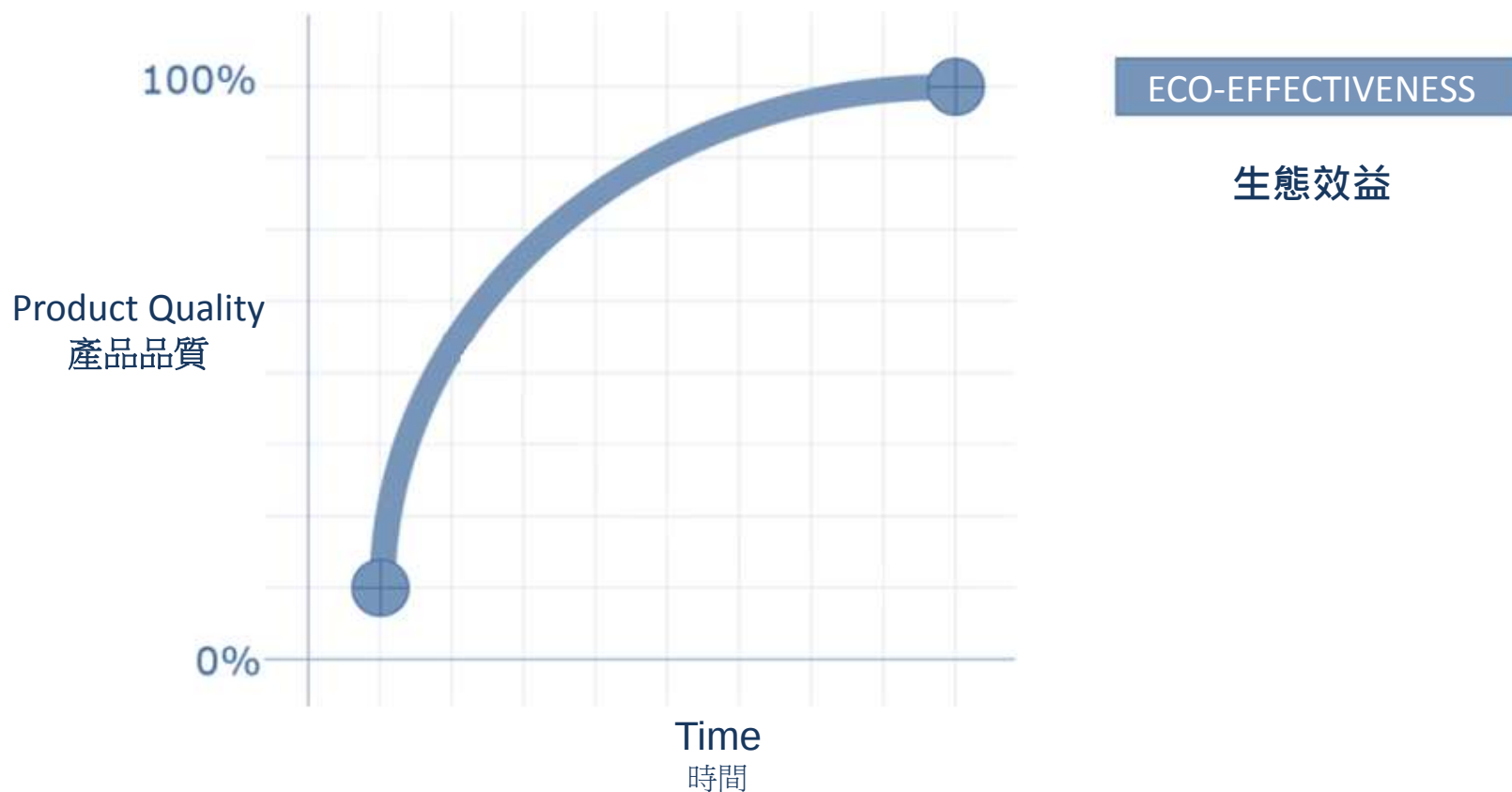
Cradle to Grave: target is zero harmfulness

搖籃到墳墓: 目標為將環境傷害減至零



Cradle to Cradle: target is all-encompassing quality and usefulness

搖籃到墳墓: 目標為將環境傷害減至零

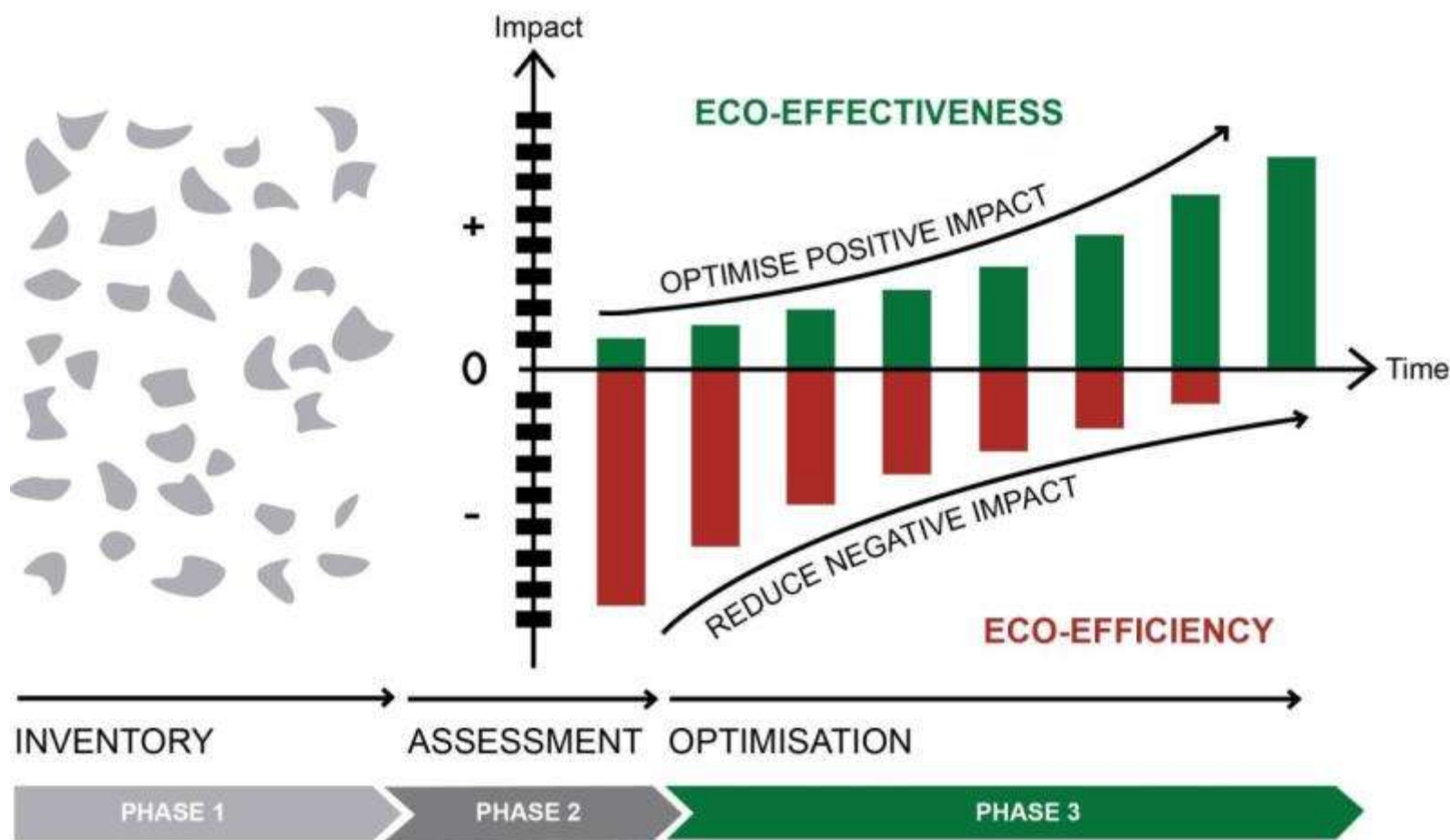


Eco-Effective 生態效益



Eco-Efficient 生態效率

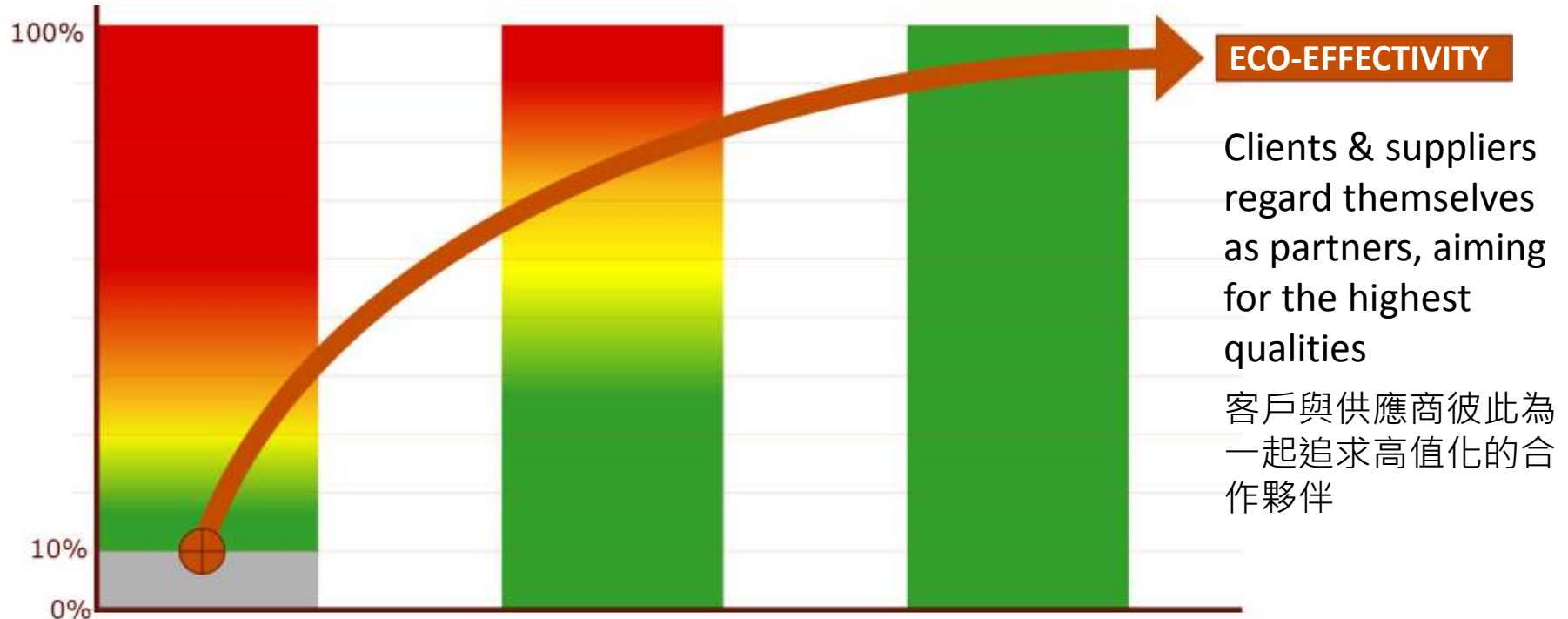
Cradle to Cradle® DESIGN PROCESS 搖籃到搖籃®設計程序



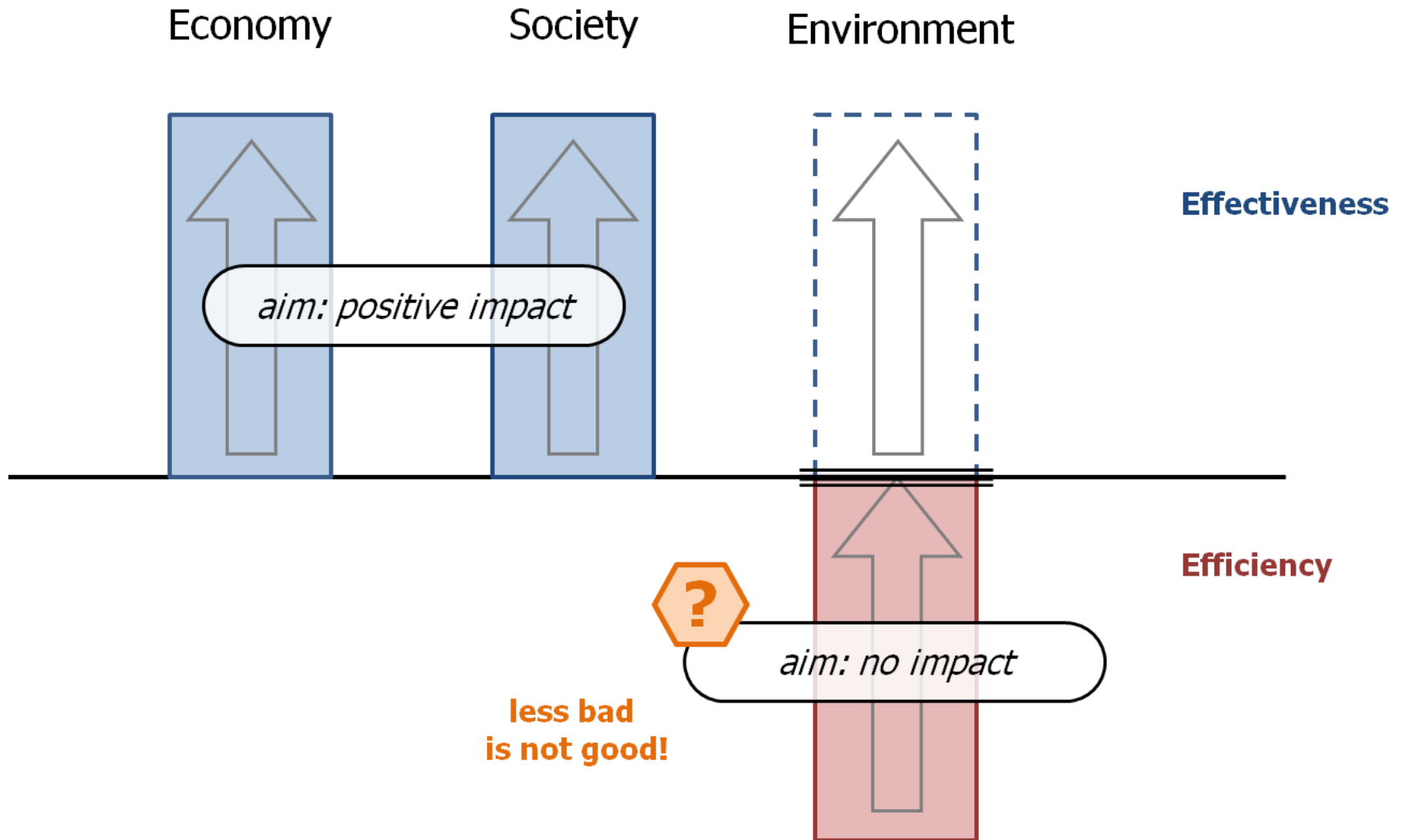
© 2012 EPEA Internationale Umweltforschung GmbH. All rights reserved.

Progress of quality from Cradle To Cradle® with time

利用搖籃到搖籃®設計產品品質隨時間更趨進步



Triple Top Line三個極端線



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Cradle to Cradle®: doing the right things!

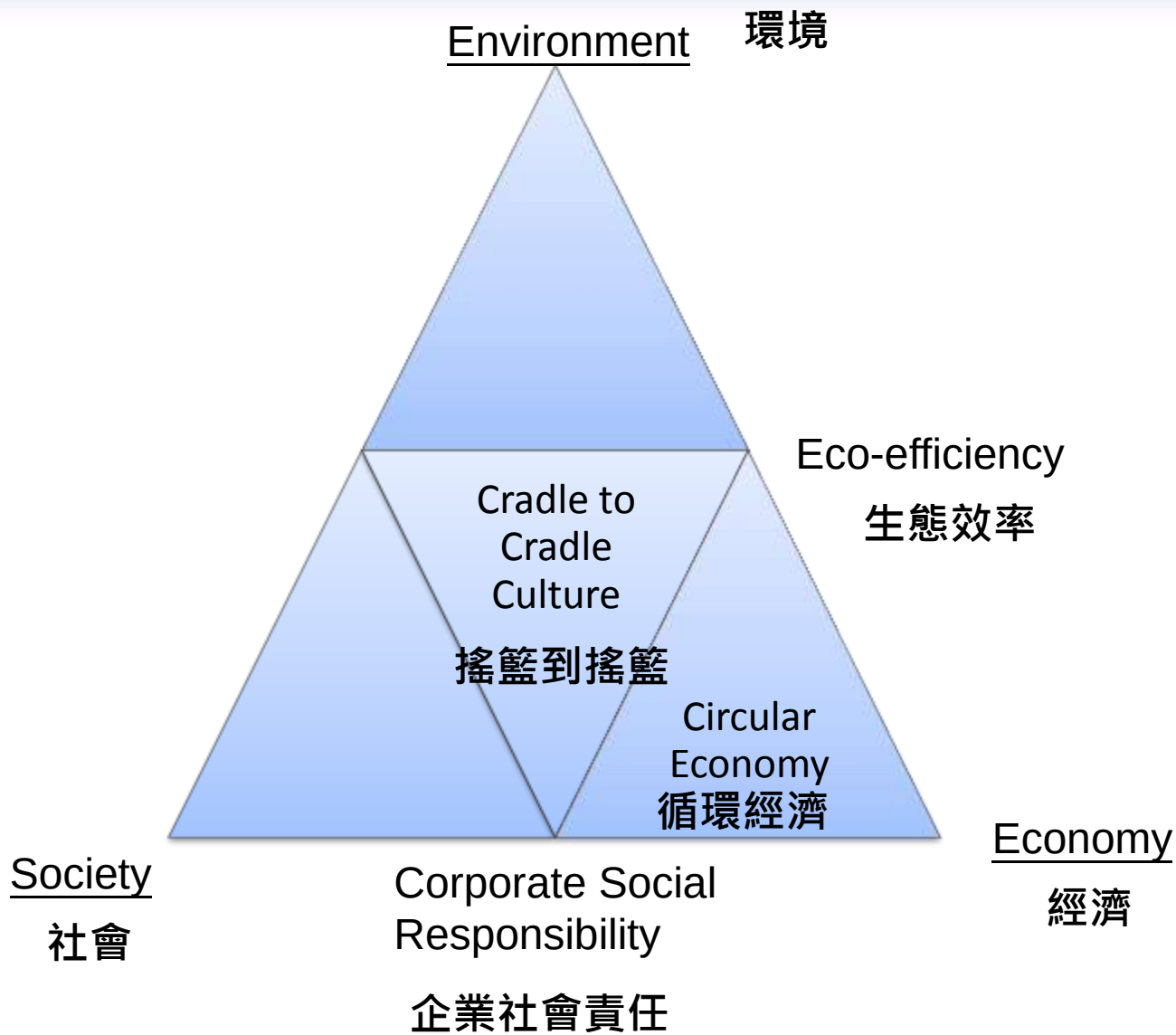
搖籃到搖籃®理念：做對的事情

Doing things
right

把事情做對



Doing the
right things!
做對的事情



Effectiveness 生態效益

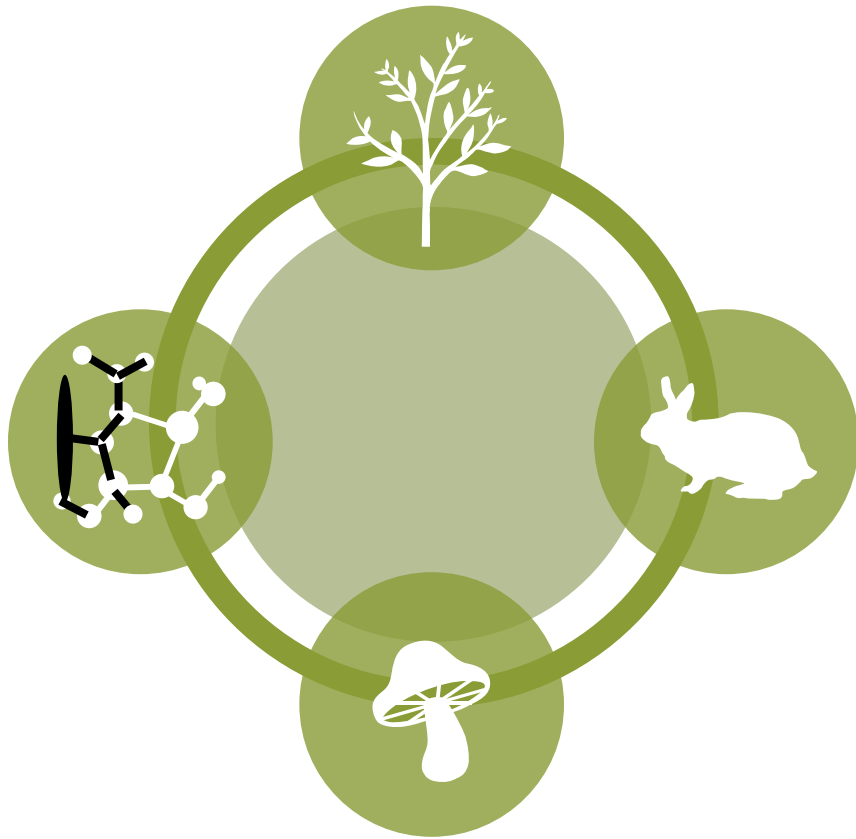


Cradle to Cradle® Design Paradigm

搖籃到搖籃® 設計原則

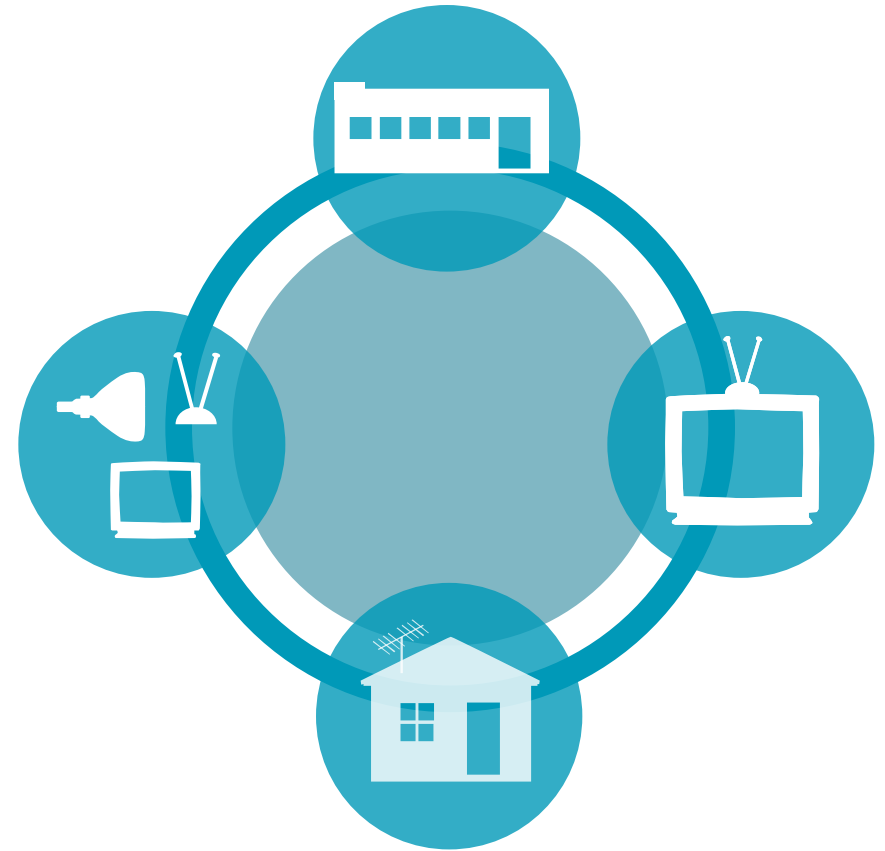
- Waste equals food 廢物即食物 → 養分即養分
→ Nutrients are nutrients!
- Use current solar income 使用再生能源
- Celebrate Diversity 提倡多樣性





Biological
Metabolism

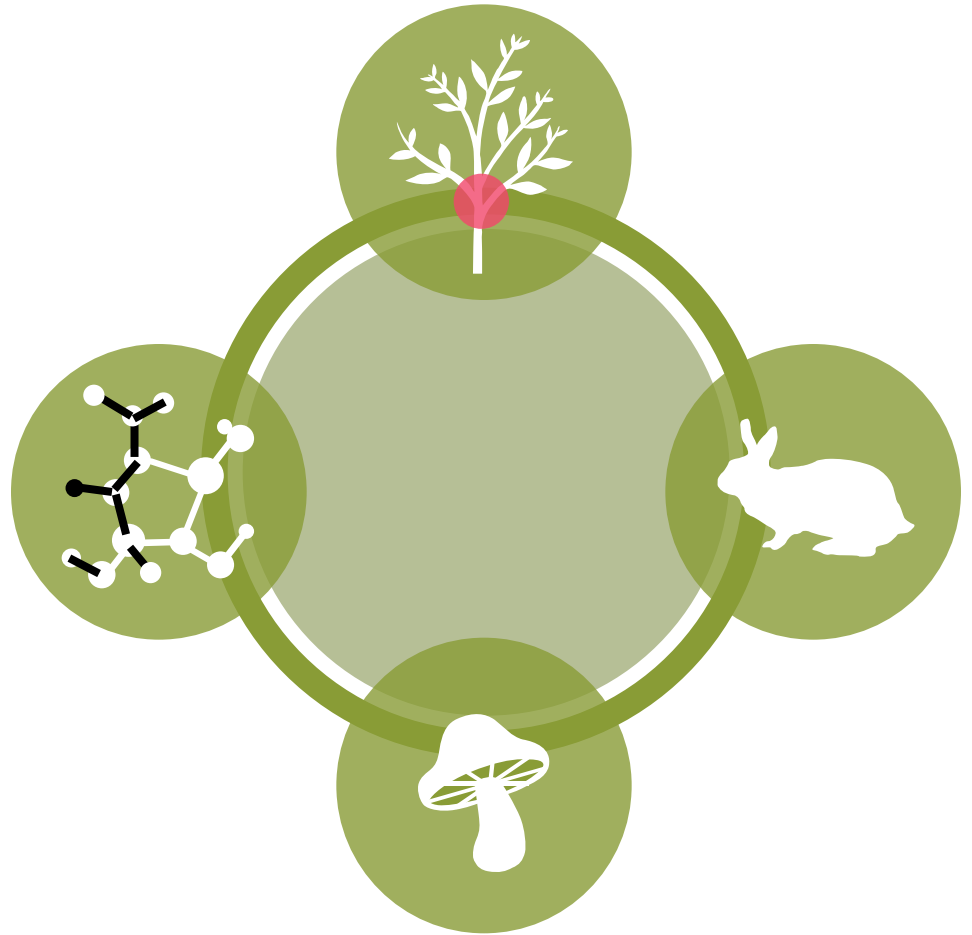
生物循環



Technical
Metabolism

工業循環

Biological Nutrient 生物循環



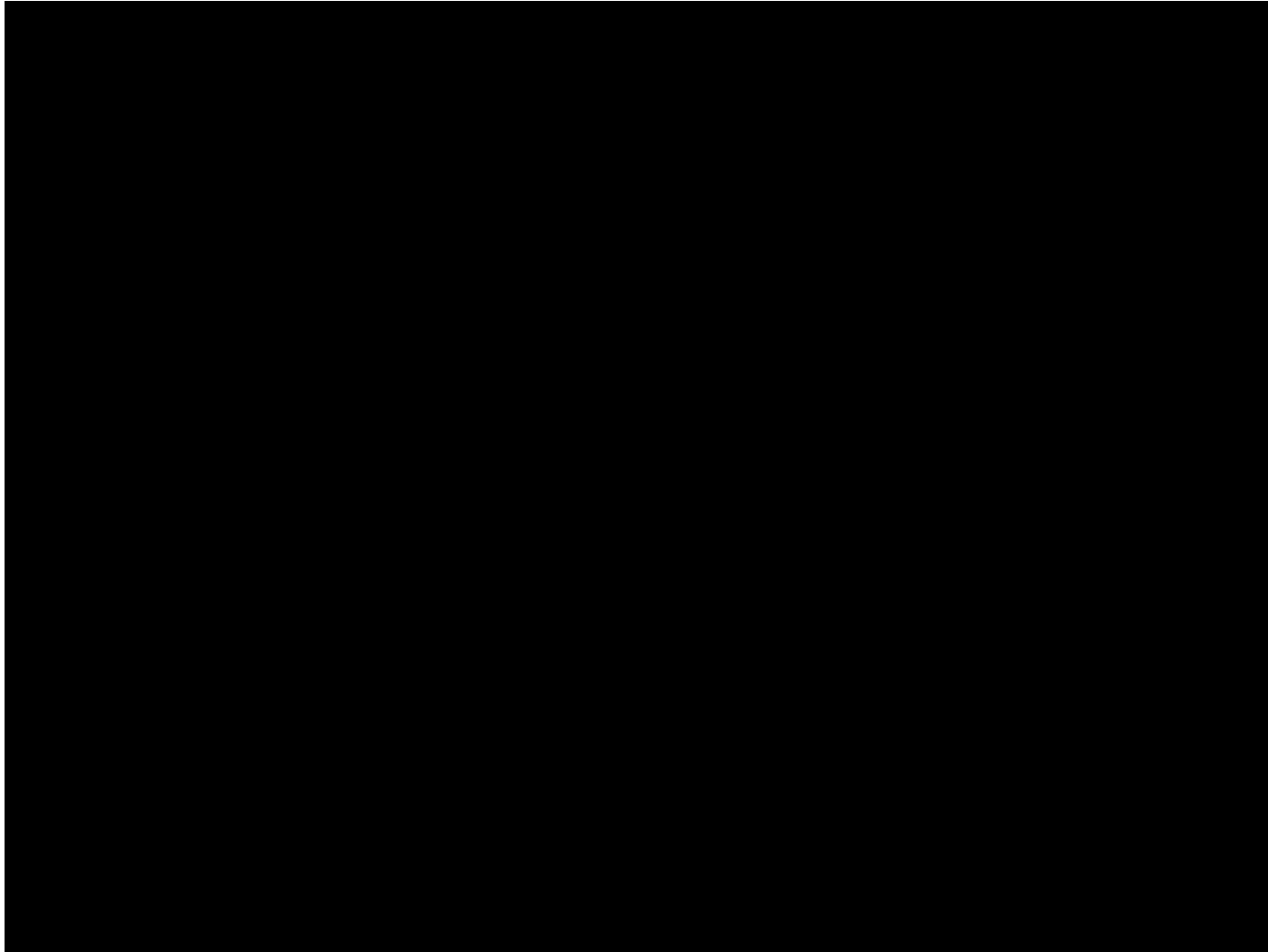
PUMA Biological Cycle PUMA的生物循環



Shirts
biodegradable
可生物分解的T恤

PUMA Video

PUMA 介紹影片



Offset-Printing innovated by gugler* and EPEA

Gugler*與EPEA共同研發的革新印刷品

gugler*
cross media



Method 美則

Cradle to Cradle certified clean products

→ Biological cycle

搖籃到搖籃認證的清潔產品 → 生物循環

Packaging

→ Technical cycle

包裝 → 工業循環

method.

make a cleaner clean start.

It's time to ditch the toxins for good.



Technical Nutrient 工業循環



PUMA Bring Me Back-System PUMA “帶我回來” 系統



PUMA Bring Back Pin

Recyclable InCycle Products Label



Biodegradable InCycle Products

EMCO



<http://epea-hamburg.org/fileadmin/downloads/2013/130115%20PI-Emco-Bau-C2C-Zertifikat.pdf>

Steelcase: Technical Nutrient

Steelcase: 工業養分



COVER STORY



Green Chemistry: Cradle-to-Cradle System Gains Momentum

Some chemical companies say it is more profitable and environmentally beneficial to design and produce chemicals that may be readily recovered as raw materials once a product's useful life has ended. Such a system, dubbed cradle-to-cradle (C2C) manufacturing, is gaining traction even beyond industry as some retailers and government officials advocate C2C as the basis for the next industrial revolution.



Cradle-to-cradle at DSM

ENJOY THE CHALLENGE !

A world without waste. Closing the loops. 100%. Cradle-to-cradle is a powerful concept that is mobilizing a rapidly growing number of people. From all walks of life. Uniting people, creating new market opportunities. With this concept, Michael Braungart and William McDonough have presented a very appealing vision and challenge. Appealing, because it means we can create added value by doing business in innovative ways that benefit society and our children. A combination that is most inspiring and motivating. It fits perfectly with DSM's core business and sustainability drive. With our ambition to meet the needs of the global community. We want to be an ideal partner for customers embarking on cradle-to-cradle. It's a wonderful challenge.

Chemistry is an enabler of innovation. DSM is in the business of developing processes and materials that are at the very basis of many products that help enhance the quality of life. For more than a century we have built our expertise – and our success – on science. Understanding substances, using and manipulating their properties to develop and produce materials and ingredients that meet customers' often complex demands. Cradle-to-cradle is a new way to find solutions for existing and emerging market needs.

Perfect fit

Over the last decade, our strategy has been to focus on the combination of Materials Sciences and Life Sciences as our core competences to come up with innovative business opportunities for our customers. Practical, value adding solutions in a rapidly changing world. Re-inventing the way we make things is a logical step forward for DSM. Especially at the interface between these

搖籃到搖籃與DSM

CHEManager „Celebrating the Human Footprint“



Celebrating The Human Footprint

Michael Braungart Makes the Case for Good Chemistry



Celebrating The Human Footprint

Michael Braungart Makes the Case for Good Chemistry

Is the European chemical industry being run with a bad conscience?

M. Braungart: Yes, it is a type of gift management thing. And this is a pity, because the European chemical industry

of innovation in chemistry, they are wasting their time feeling guilty about existing.

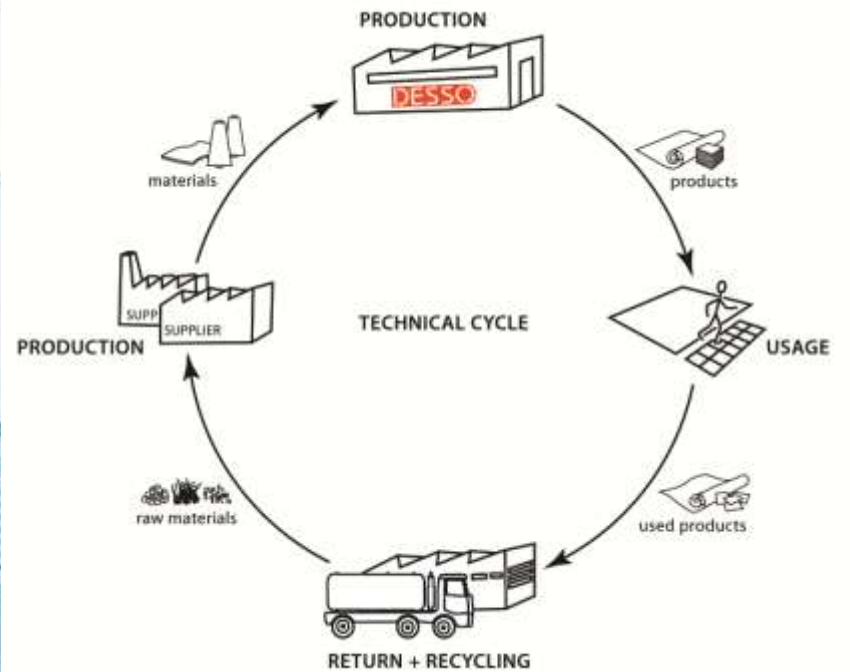
Have you found that innovation in chemical companies has slowed

have rights; they don't need to be taken care of.

It's very simple: When a baby drinks breast milk, that baby has the right not to be harassed by chemicals. I am more into partnership; partnership with nature, with colleagues. With-

CHEManager:

提倡人類足跡



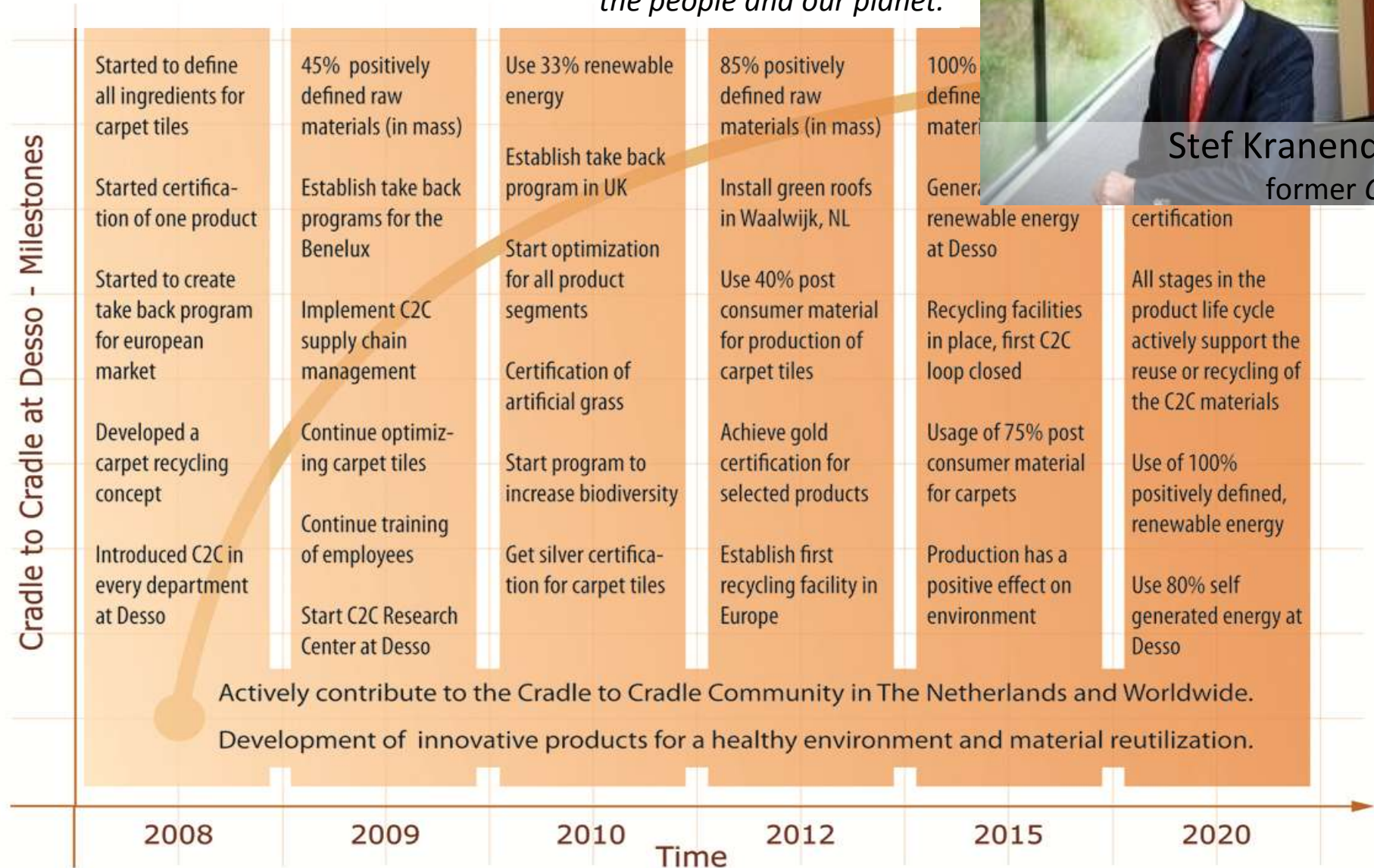
The Floor is Yours

*It's a task we're proud to undertake,
for the betterment of our products, our brand,
the people and our planet.*



Stef Kranendijk
former CEO

Cradle to Cradle at Desso - Milestones

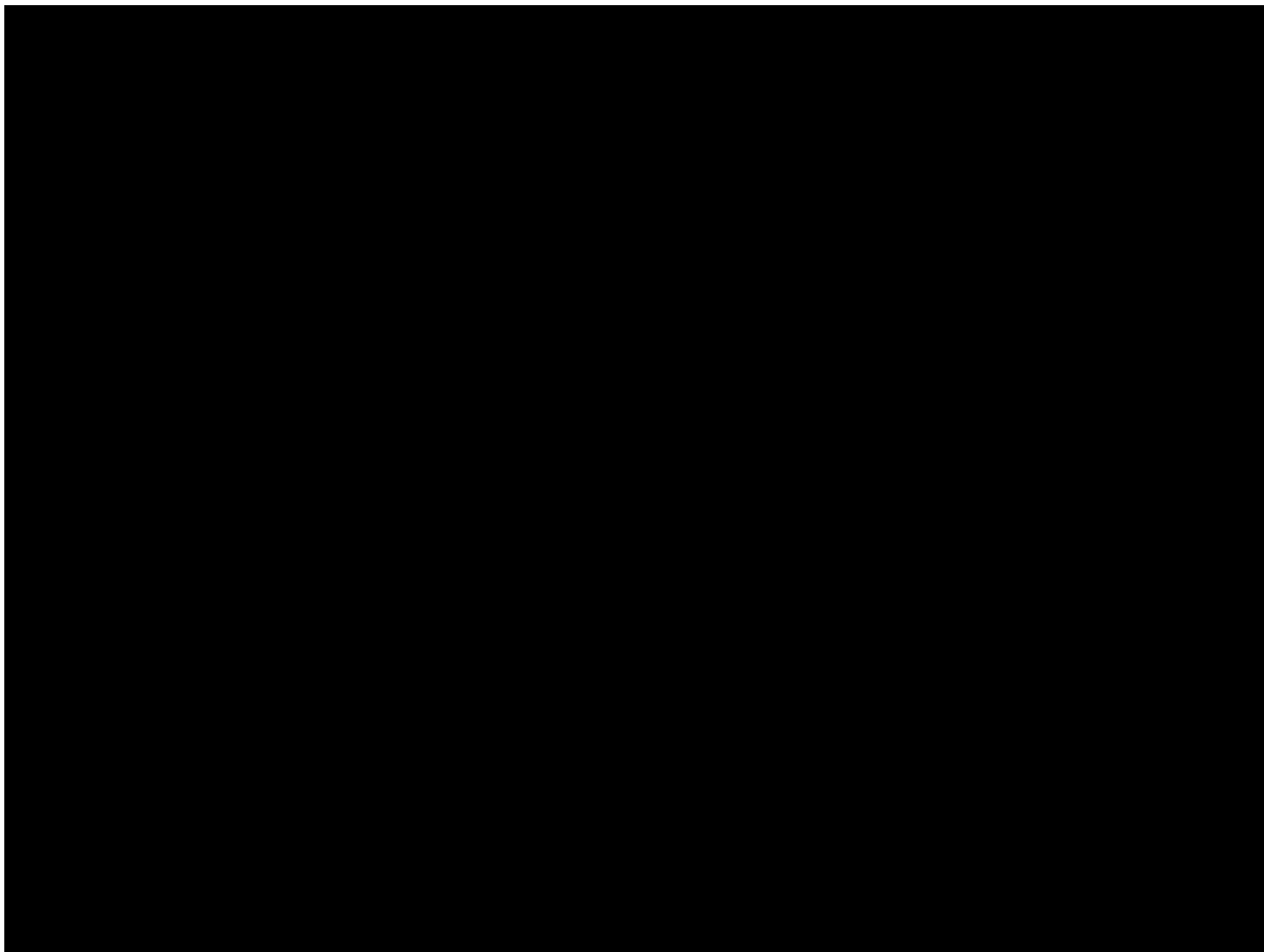


Desso 邁向搖籃到搖籃的路徑圖

Goodbaby 好孩子



Goodbaby 好孩子影片介紹



WILLIAM MCDONOUGH: BUILDINGS LIKE TREES, CITIES LIKE FORESTS



FORD ROUGE CENTER



ADAM JOSEPH SMITH CENTER FOR ENVIRONMENTAL STUDIES OBERLIN, OH

Buildings like trees – cities like forests

像樹一樣的建築，像森林一樣的城市



Saving money while boosting abundance

省提升豐富度又可省成本



Guantang Chuangye Park new town masterplan

中國柳州高新區官塘創業園計畫

Rooftop Farming

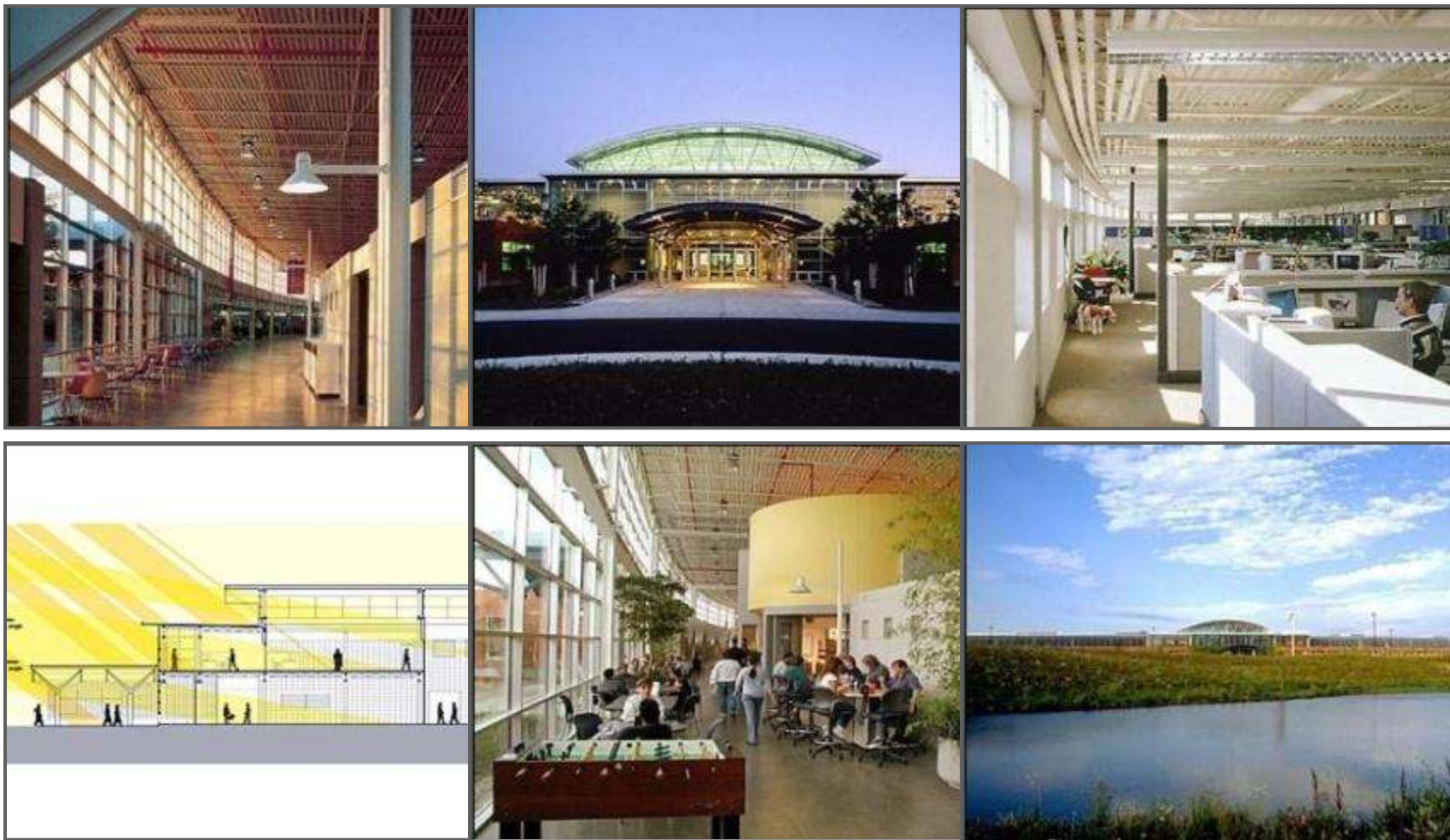
屋頂上的稻田



Liuzhou, Guangxi Zhuang Autonomous Region, People's Republic of China

Herman Miller „Green House“ Factory

Herman Miller “綠房子” 工廠



Bionorica: Building like a tree

Bionorica: 橡樹一樣的建築

HEIDELBERGCEMENT

DESSO
The Floor is Yours

backhausen
interior textiles



SCHÜCO

Xero floor®

Herman Miller



Forbo Flooring B.V.



Marmoleum®



Walton



Artoleum®

Daas Baksteen: ClickBrick®



Intersmart® wall system



DREES & SOMMER

Construction and Real Estate Management



- 1.500 employees
- 35 locations worldwide
- 40 years of experience

MANAGE

ADVISE

PLAN



SCHÜCO

SCHÜCO



Keeping materials while selling the use of services







Tarkett Linoleum range is awarded the
Cradle to Cradle Silver Certificate
取得搖籃到搖籃銀級認證的亞麻地板



Quelle: http://www.ais-online.de/6/category/01/88/00/category_6.html



Quelle: <http://c2c.mbdc.com/c2c/itemDetails.php?item=611>

Green facades → air filter and habitat



綠外牆→空氣過濾與生物棲息地

Bionorica House



Park 20|20 in Hoofddorp, Netherlands



Park 20|20 在荷蘭霍夫多普

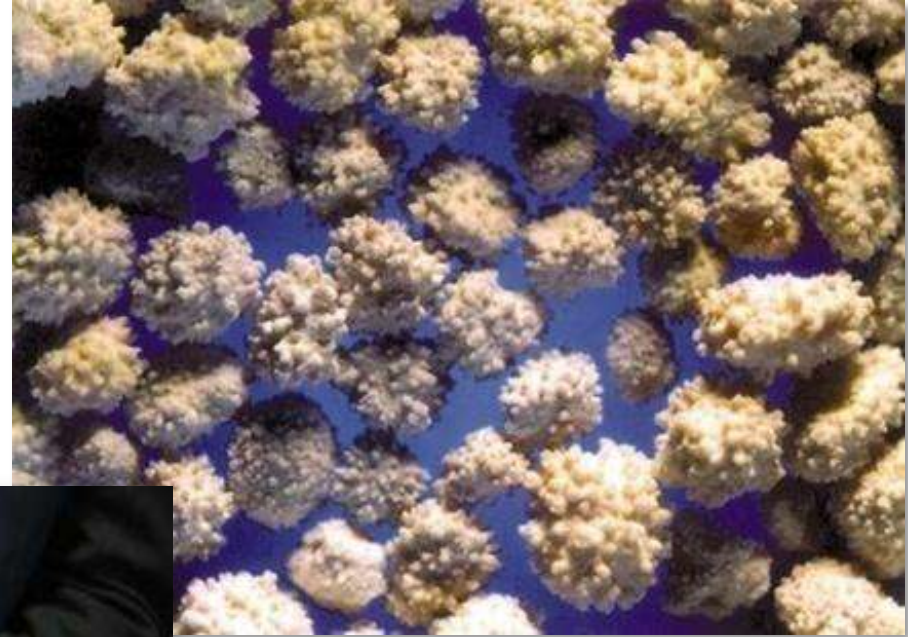


www.park2020.com

Park 20|20 is being jointly developed by Delta Development Groep, VolkerWessels, Reggeborgh Groep

Phosphate Recovery

磷的回收



Quelle: crystalgreen.com



Crystal Green:
fertilizer from recovered
Phosphorus
由回收磷所製成的肥料

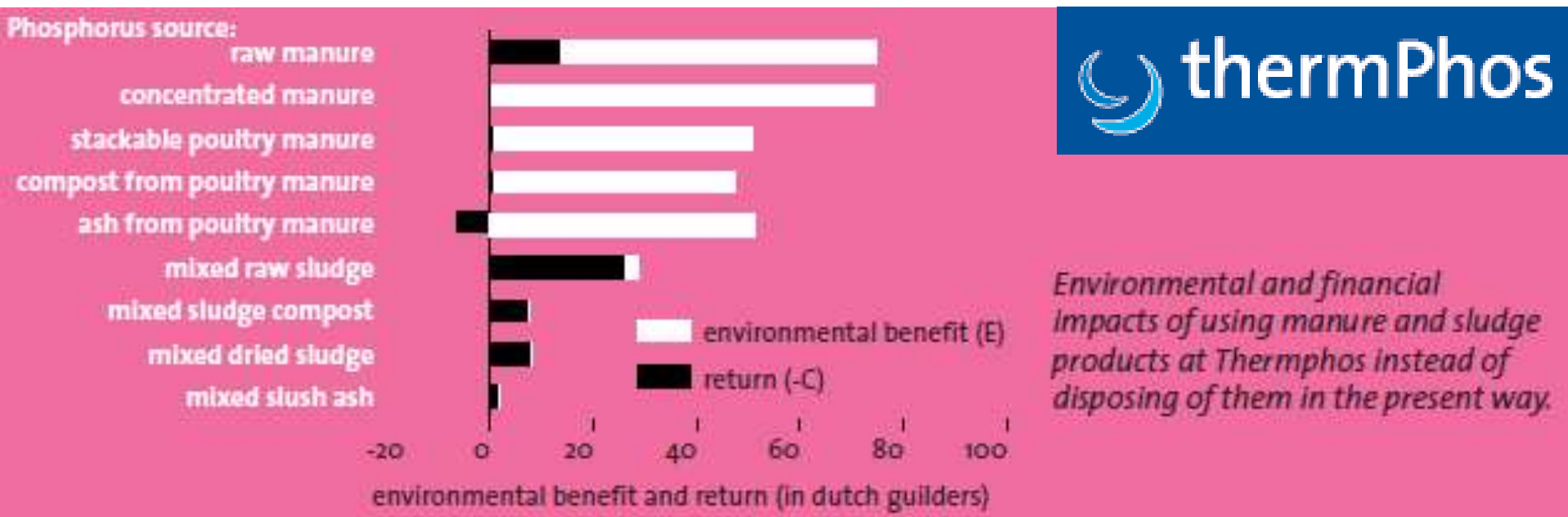
Phosphorus: back to the source

磷：回到源頭

Can ThermPhos help to close the phosphorus cycle?

可以幫助封閉磷的循環嗎？

(and take away the Dutch manure mountain? 並帶走荷蘭的糞便山?)



http://www.thermphos.com/Home/Brochures/Brochure_07.aspx

Dutch government: Bring Phosphorus flows into cycles

荷蘭政府：成功封閉磷的循環

State Secretary **Mr. Joop Atsma** (Ministry of Infrastructure and the Environment):

‘Ik ben er trots op dat Nederland als eerste land ter wereld de fosfaatkringloop gaat sluiten.’

“I am proud to be able to say that the Netherlands are the first country in the world to close phosphate cycles”

“我對於荷蘭成為世界上第一個完成磷的封閉循環再利用的國家感到驕傲”

4th of Oktober 2011



Ministry of Infrastructure and the
Environment

Cradle to Cradle® in Belgium

搖籃到搖籃®在比利時



Joke Schauvliege
President of the
EU's Environment
Council



Maxime Verhagen
Ministry of Economic
Affairs, Agriculture &
Innovation



Herman Van Rompuy
EU President

„ **The Belgian EU Presidency**
wants to promote the concept of
„sustainable materials management’
...which covers the whole life-cycle of products
in a so called **Cradle to Cradle® - approach“**

比利時的聯合國任期總理提倡這種關注產品整體生命週期的永續物料管理系統 - 搖籃到搖籃®概念



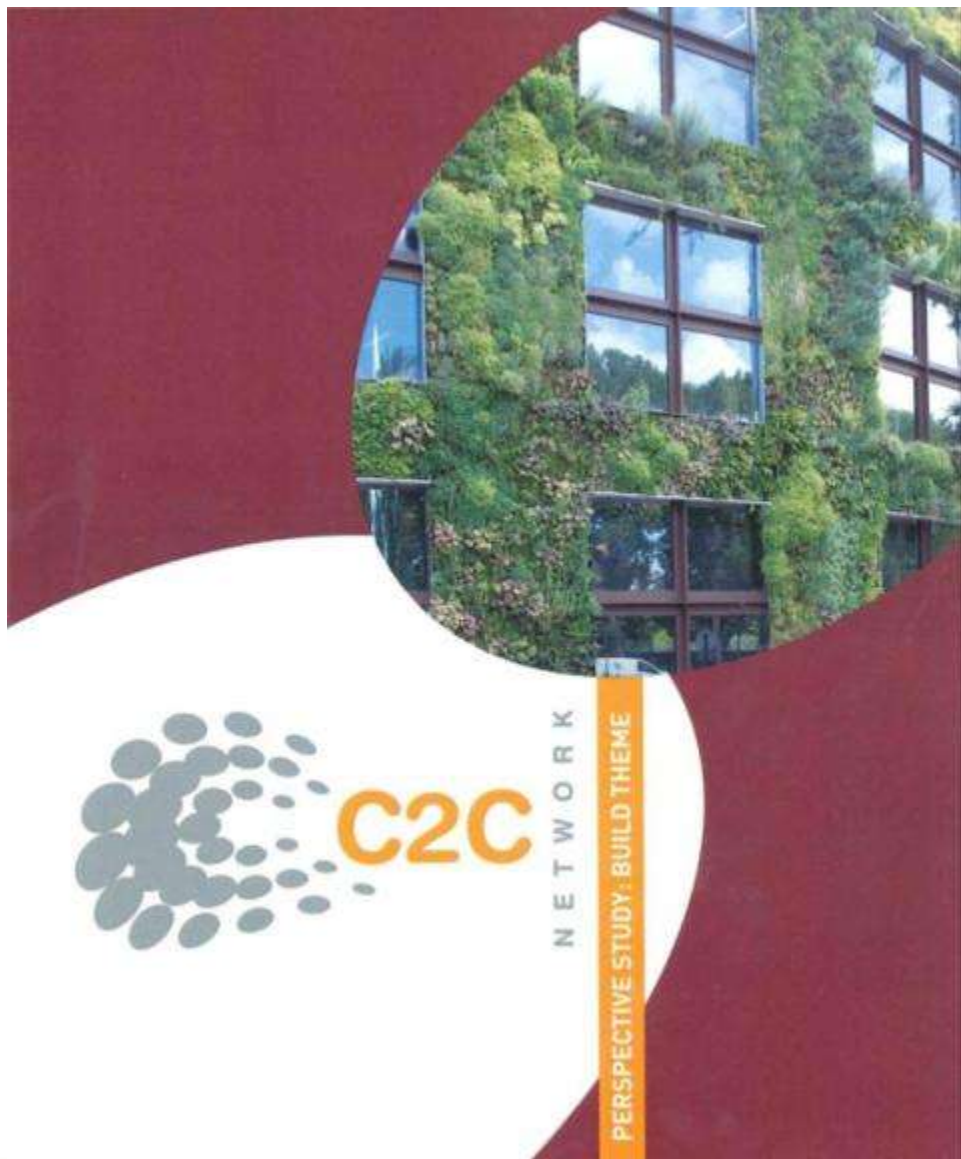
European Union

European Regional Development Fund



INTERREG IVC

INNOVATION & ENVIRONMENT
REGIONS OF EUROPE SHARING SOLUTIONS



cradle to cradle



islands

The partnership



The C2CI project is funded within the Interreg North Sea Programme



The Interreg IYB
North Sea Region
Programme



provinsje fryslân
provincie fryslân



THE UPCYCLE

BEYOND SUSTAINABILITY—
DESIGNING FOR ABUNDANCE

WILLIAM
MCDONOUGH

FOREWORD BY PRESIDENT BILL CLINTON

&

AUTHORS OF CRADLE TO CRADLE

MICHAEL
BRAUNINGART

Taiwan EPA participated in the C2CI project

台灣環保署加入歐盟搖籃到搖籃島嶼計畫



Taiwan Cradle to Cradle Strategic Alliance

台灣搖籃到搖籃策略聯盟



2013 Asia Pacific Cities Summit (APCS), Kaohsiung

2013 亞太城市高峰會在高雄



Taiwan...

台灣...



Cradle to Cradle Certified^{CM} products in Taiwan

台灣搖籃到搖籃認證產品



Minlan ML PP Fabric



Lung Meng Stone Paper



SJ TaifoamTM Nature



Hair O'right Goji Berry
Volumizing Shampoo



Daai Grey Eco Blanket

Taiwan Cradle to Cradle Strategic Alliance

臺灣搖籃到搖籃策略聯盟

SINGTEX®



中台資源科技股份有限公司
CHUNG TAI RESOURCE TECHNOLOGY CORP.

新北市政府
環境保護局

sintex®
Technology for Green Living



Oswald
Essence

EPEA
Taiwan

DA.AI
Coexist with the Earth



BASF
The Chemical Company



紡織產業綜合研究所
Taiwan Textile Research Institute



工業技術研究院
Industrial Technology
Research Institute



行政院
環境保護署



地球公司 GLOBE TAPE



財團法人 塑膠工業技術發展中心
Plastics Industry Development Center



寶成國際集團
POU CHEN GROUP



大鄴企業



歐萊德
自然純淨髮妝
Green Hair Care



立順興資源科技股份有限公司
RE-SOURCE TECHNOLOGY CO., LTD.



藍天大地有限公司
Azureland Organic Co., Ltd.



台灣綠領協會
TAIWAN GREEN COLLAR ASSOCIATION



Everlight
Chemical



wistron®
緯創資通

MINLAN FABRIC
INDUSTRIAL CO., LTD.



TÜVRheinland®
Precisely Right.



大地旅人
Earth Passengers
<http://earthpassengers.org>



SJ GROUP
Since 1971 ISO9001 ISO14001



大豐環保科技股份有限公司
回收紙、罐、五金、塑膠、拆屋工程、廢棄物清除



Buote

FABRICKING®
Since 1987

J.J. Pan 潘翼聯合建築師事務所
and Partners, Architects and Planners



Example of a Cradle to Cradle® Platform

搖籃到搖籃®平台及網絡典範







EPEA Internationale Umweltforschung GmbH

Head Office

Trostbrücke 4

20457 Hamburg, Germany

T. +49 40 43 13 49 0

F. +49 40 43 13 49 49

E-Mail: epea@epea.com

www.epea.com

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