

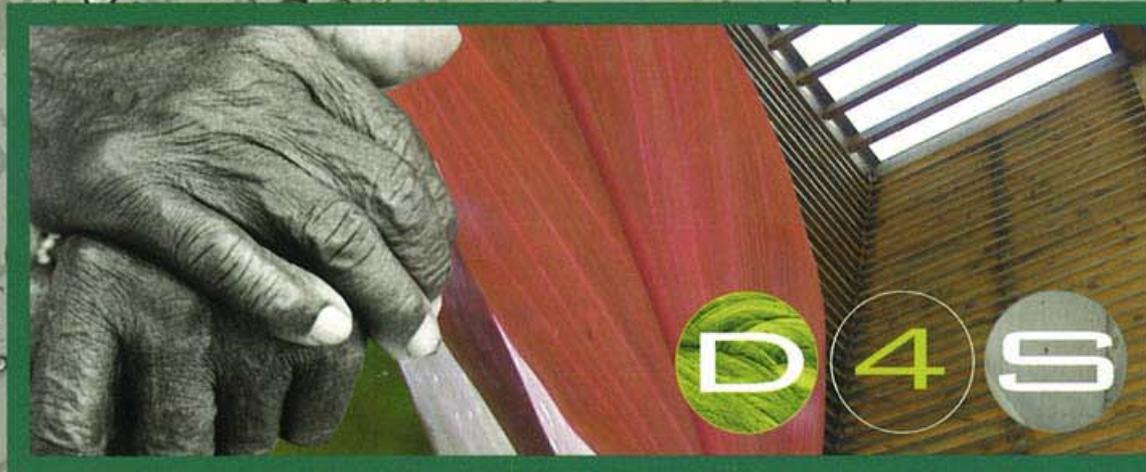


**TU Delft**  
Delft University of Technology

# DESIGN FOR SUSTAINABILITY

***A Practical Approach  
for Developing Economies***

UNITED NATIONS ENVIRONMENT PROGRAMME  
DELFT UNIVERSITY OF TECHNOLOGY



**inVent**

Internationale Weiterbildung  
und Entwicklung gGmbH Capacity Building  
International, Germany

**DESIGN FOR SUSTAINABILITY**

**A PRACTICAL APPROACH  
FOR DEVELOPING ECONOMIES**

**DESIGN FOR SUSTAINABILITY  
A PRACTICAL APPROACH  
FOR DEVELOPING ECONOMIES**



**Delft University of Technology**

**UNITED NATIONS ENVIRONMENT PROGRAMME  
DIVISION OF TECHNOLOGY, INDUSTRY AND ECONOMICS**

39-43 Quai André Citroën  
73739 Paris

CEDEX 15, France

Tel: +33 1 44371450

Fax: +33 1 44371474

E-mail: [unep.tie@unep.fr](mailto:unep.tie@unep.fr)

Internet: [www.unep.tie.fr/pc](http://www.unep.tie.fr/pc)

**DELFT UNIVERSITY OF TECHNOLOGY  
FACULTY OF INDUSTRIAL DESIGN ENGINEERING  
DESIGN FOR SUSTAINABILITY PROGRAMME**

Landbergstraat 15  
2628 CE Delft

The Netherlands

Tel: +31 15 278 2738

Fax: +31 15 278 2956

E-mail: [dfs@tudelft.nl](mailto:dfs@tudelft.nl)

Internet: [www.io.tudelft.nl/research/dfs](http://www.io.tudelft.nl/research/dfs)



Internationale Weiterbildung und Entwicklung gGmbH Capacity Building International, Germany

With financial support from  
**INWENT - INTERNATIONALE WEITERBILDUNG UND ENTWICKLUNG gGmbH**  
CAPACITY BUILDING INTERNATIONAL, GERMANY

Friedrich-Ebert-Allee 40

53113 Bonn

Germany

Tel: +49 (0) 228 - 44 60 1106

Fax: +49 (0) 228 - 44 60 1480

Internet: [www.inwent.org](http://www.inwent.org)



On behalf of the  
**FEDERAL MINISTRY FOR ECONOMIC  
COOPERATION AND DEVELOPMENT, Germany**

# ACKNOWLEDGEMENTS

## SUPERVISION, TECHNICAL EDITING AND SUPPORT

Ms. Garrette Clark, UNEP DTIE, France

## AUTHORS

Dr. M.R.M. Crul and Mr. J.C. Diehl  
Delft University of Technology, The Netherlands  
Faculty of Industrial Design Engineering

## INTERNATIONAL SCIENTIFIC AND PROFESSIONAL REVIEW PANEL

Mr. Smail Al-Hilali, MCPC, Morocco  
Prof. Dr. Han Brezet, Delft University of Technology, The Netherlands  
Prof. Dr. Tijani Bounahmidi, LASPI, Morocco  
Mr. Lelisa Daba, NCPC, Ethiopia  
Mr. Bas de Leeuw, UNEP DTIE, France  
Prof. Dr. Patrik Egan, University of Wisconsin-Madison, United States of America  
Mr. Juan Carlos Espinosa, Universidad Los Andes, Colombia  
Mr. Leonardo Guiruta, MNCPC, Mozambique  
Mr. Jens Hönerhoff, CEGESTI, Costa Rica  
Mr. Evert Kok, UNIDO, Austria  
Mr. Samantha Kumarasena, NCPC, Sri Lanka  
Mr. Nguyen Hong Long, NCPC, Vietnam  
Ms. Sophie Loran, UNEP DTIE, France  
Dr. Diego Masera, UNEP Regional Office for Latin America and the Caribbean, Mexico  
Dr. Desta Mebratu, UNEP Regional Office for Africa, Kenya  
Mr. Zhao Ming, Tsinghua University Beijing, China  
Mr. Sergio Musmanni, CNPML, Costa Rica  
Dr. Kasimoni Patrick Mwesigye, UCPC, Uganda  
Ms. Maria Amalia Porta, CGPML, Guatemala  
Mr. Peter Repinski, UNEP Regional Office of North America, United States of America  
Mr. Alex Saer Saker, ODES, Colombia  
Dr. Nurelegne Tefera, Addis Abbaba University, Ethiopia  
Mr. B.S. Samarasiri, Moratuwa University, Sri Lanka  
Prof. Dr. John Turyagyanda, Makerere University, Uganda  
Dr. Sonia Valdivia, UNEP DTIE, France

## DESIGN AND LAY-OUT

Ms. Ana Mestre and Ms. Graça Campelo, SUSDESIGN, Portugal

## PHOTOGRAPHY

Mrs. Carmen van der Vecht, The Netherlands and SUSDESIGN Portugal

## FINANCIAL SUPPORT

InWEnt - Capacity Building International, Germany

# FOREWORD

It is clear that current patterns of consumption and production are unsustainable. The accelerating processes of globalization and trade liberalization, supported by advances in information technologies, have fundamentally changed the landscape of the private sector in all countries -developed and developing- providing new opportunities and challenges. Companies, large and small, have made impressive efforts to address sustainability issues with a triple bottom line focus. Design for Sustainability (D4S) has the potential to improve efficiencies, product quality and market opportunities (local and export) and at the same time improve environmental performance. In many developed countries, because of a high level of awareness, D4S efforts are linked to the broader concepts of product-service mixes, systems innovation and other life cycle-based efforts. In developing economies, due to limited awareness, more immediate technical support is needed to introduce the D4S concept. However, successful implementation of D4S requires working in partnership. This publication is an example of one such effort.

The growing attention paid to D4S is a natural outcome of UNEP's work on cleaner production, eco-efficient industrial systems and life cycle management. It is the next step in a progressive widening of the horizon of pollution prevention; a widening which has gone from a limited focus on production processes (cleaner production), to include products (ecodesign), product-systems (D4S incorporating transport logistics, end-of-life collection and component reuse or materials recycling) and systems innovation.

Building upon the work carried out with the Dutch Delft University of Technology and other experts in ecodesign, UNEP published the ground breaking manual 'Ecodesign: A Promising Approach to Sustainable Production and Consumption' in 1997. The concept of product re-design has since then spread as seen in the number of manuals and sector specific supporting materials now produced in many languages. As a result and based on experience gained, ecodesign has evolved through Design for Environment (DfE) to the broader concept of D4S – which encompasses issues such the social component of sustainability and the need to develop new ways to meet consumer needs in a less resource intensive way. D4S goes beyond how to make a 'green' product – and now strives to meet consumer needs through sustainability in a systematic and systemic way.

UNEP's activities in the D4S area include the development of an updated global manual for designers and other professionals working in the area of product development in industry and elsewhere to provide support and guidance on the evolved concept of D4S. It is useful to those new to ecodesign as well as those interested in breakthrough innovation for sustainability.

This practical approach for developing economies is based on the larger Design for Sustainability: A Global Guide but focuses on the specific needs of small- and medium-sized companies in developing economies. With all the progress in D4S, few targeted efforts have been made to introduce the benefits of D4S to business and business intermediaries in developing economies. Surveys of centres of excellence confirm that D4S is a service that they could sell to industry. Increasing focus of supply chain management efforts on resource use improvements reinforces this need. Whereas, in developed countries end-of-life regulations provide incentives for com-



panies to rethink what and how they are designing products, in developing economies products tend to be 'benchmarked' (copied) from those existing on the market. Companies are concerned about entering developed country markets. They need to take into account new market standards to have access. In general, there is also an overall lack of awareness in companies on how to improve efficiencies and improve environmental performance at the same time.

Developing economies have different and more immediate needs. Awareness about the implications of resource use – efficiency or environmental - is relatively low. Reaching companies in developing economies can best be done through intermediaries such as centres of excellence (UNIDO-UNEP National Cleaner Production Centres, for example) or through supply chain relations with larger companies including multi-nationals. Concerns for poverty alleviation and rapid environmental degradation underscore the potential in developing economies for integrating D4S into business development. D4S is one approach that enables 'leap frogging' over the resource intensive and pollution generating development patterns that have been followed by developed countries. UNEP, whose mandate is to work globally on environmental protection and poverty reduction, especially in developing economies, is one of the key international actors involved in developing this approach.

A draft version of the D4S approach was tested and modified based on the results of a training session sponsored by InWEnt in October 2005, on representatives from 9 countries. The publication introduces the D4S concept and outlines how to apply it in a company setting. It can be used by companies to pursue internal D4S efforts (via the supply chain or single operation context) and by intermediaries who work with companies. The initial dissemination of the D4S concept will be through the UNIDO-UNEP NCPCs, which operate as capacity building focal points in some 30 countries. To further adapt the training materials, relevant examples and case studies will be developed based on demonstration projects being carried out in Costa Rica and Morocco in 2006. The lessons learned from the projects will be integrated into the Spanish and French versions of the manual which will be available on UNEP's web site in 2007.

UNEP invites partners - companies, industry associations, governmental bodies, educators- to join in collaboration by using the material in their own training programs and developing additional sector/product specific guides on how to plan for and develop more sustainable products and services. In particular, we also welcome case studies of lessons learned and feedback on how to best apply the D4S concept in a practical setting.

Changing current unsustainable consumption and production patterns can benefit a lot from the D4S approach. We envision that, as a result of the joint efforts of all concerned partners, this publication will contribute to reversing the current negative trends.

Monique Barbut  
Director  
UNEP DTIE



## D4S GRAPHIC DESIGN CONCEPT

The D4S graphic design of this publication is based on the sustainability concept and its consideration of the three elements of PEOPLE, PROFIT AND PLANET. The graphic design is comprised of 3 subjects and 3 colours to illustrate these elements:

PEOPLE are illustrated by the expressions of Human beings from different cultures and races.

PLANET is represented by different natural elements of the planet such as water, rocks, trees, sand and plants.

PROFIT is illustrated by views of the building environment taken from examples of highly developed sites from throughout the world.

The graphic design was developed by SUSDESIGN, an entity devoted to the promotion of Design for Sustainability and is illustrated with photographs of Carmen van der Vecht and SUSDESIGN.



**susdesign®**

Lgo Sto Antoninho, 3  
1200 406 Lisboa  
Portugal  
Tel | Fax: + 351 213 422 200  
info@susdesign.org  
www.susdesign.org

Photos by:  
Carmen van der Vecht  
carmen-v@dds.nl  
www.streetarts.info  
and SUSDESIGN



# PART I

## WHAT IS D4S AND WHY DO IT?

### 1> Introduction

1.1 _ The relevance of Design for Sustainability (D4S).....	15
1.2 _ To whom is this publication addressed?.....	16
1.3 _ How is the publication organized?.....	17

### 2> Design for Sustainability (D4S)

2.1 _ Products and Sustainability.....	21
2.2 _ Products and environmental aspects – Planet implications.....	23
2.3 _ Life cycle and improvement factor thinking.....	23
2.4 _ Products and social aspects – People implications.....	25
2.5 _ Why should a company look into D4S?.....	26

### 3> Product Innovation

3.1 _ Innovation.....	29
-----------------------	----

预览已结束，完整报告链接和二维码如下：

[https://www.yunbaogao.cn/report/index/report?reportId=5\\_11137](https://www.yunbaogao.cn/report/index/report?reportId=5_11137)

