

Is design playing a role in the realisation of circular economy projects in Europe? A case study analysis.

Original

Is design playing a role in the realisation of circular economy projects in Europe? A case study analysis / Battistoni, Chiara; Barbero, Silvia. - ELETTRONICO. - Designing sustainability for all. Proceedings of the 3rd LeNS World Distributed Conference, Milano, Mexico City, Beijing, Bangalore, Curitiba, Cape Town, 3-5 April 2019. Volume 2:(2019), pp. 356-361. (3rd LeNS World Distributed Conference Milano, Mexico City, Beijing, Bangalore, Curitiba, Cape Town 3-5 April 2019).

Availability:

This version is available at: 11583/2737434 since: 2022-01-29T18:39:28Z

Publisher:

EDIZIONI POLI.DESIGN

Published

DOI:

Terms of use:

This article is made available under terms and conditions as specified in the corresponding bibliographic description in the repository

Publisher copyright

(Article begins on next page)

MILANO | MEXICO CITY | BANGALORE | CAPE TOWN | CURITIBA | BEIJING

3-5 April 2019

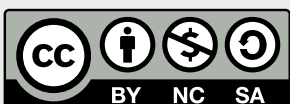
DESIGNING SUSTAINABILITY FOR ALL

Edited by Marcelo Ambrosio and Carlo Vezzoli

Proceedings of the

3rd LeNS world distributed conference
VOL. 2

ISBN 978-88-95651-26-2



EDIZIONI
POLI.DESIGN



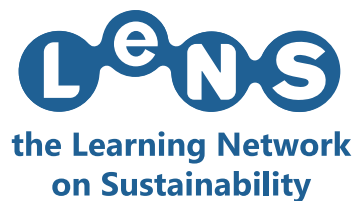
With the support of the
Erasmus+ Programme
of the European Union

Designing sustainability for all

Proceedings of the 3rd LeNS World Distributed Conference,
Milano, Mexico City, Beijing, Bangalore, Curitiba, Cape Town,
3-5 April 2019

Edited by **Marcelo Ambrosio** and **Carlo Vezzoli**

LeNS - the Learning Network on Sustainability - is a project funded by LeNSin Erasmus+ Programme of the European Union



Edited by Marcelo Ambrosio and Carlo Vezzoli

Double-Blind Peer Review.

Scientific Commetee:

Carlo Vezzoli, Politecnico di Milano, Italy
Aguinaldo dos Santos, Federal University of Paraná, Brazil
Leonardo Castillo, Universidad Federal de Pernambuco
Claudio Pereira Sampaio, Londrina State University
Ranjani Balasubramanian, Srishti Institute of Art Design and Technology
Ravi Mokashi, Indian Institute of technology Guwahati
Brenda Garcia, Universidad Autonoma Metropolitana, Mexico
Rodrigo Lepez Vela, Universidad dela Valle de México
Ephias Ruhode, Cape Peninsula University of Technology
Elmarie Costandius, Stellenbosch University, South Africa
Xin Liu, Tsinghua University, China
Jun Zhang, Hunan University, China
Fabrizio Ceschin, Brunel University, United Kingdom
Cindy Kohtala, Aalto University, Finland
Jan Carel Diehl, Delft University of Technology, Netherlands

Graphic project by:

Roman Maranov, Politecnico di Milano, Italy
Xinrui Wang, Politecnico di Milano, Italy
Yuting Zhang, Politecnico di Milano, Italy
Giacomo Bevacqua, Politecnico di Milano, Italy



This Work is Licensed under Creative Commons Attribution-NonCommercial-ShareAlike CC BY-NC-SA
For full details on the license, go to: <https://creativecommons.org/licenses/by-nc-sa/4.0/5>

The proceedings are also available at: www.lensconference3.org

Endorsment:



ISBN: 978-88-95651-26-2

Published by © 2019 Edizioni POLI.design
Address: via Durando 38/A – 20158 Milano
Tel. 02-2399.7206 Fax 02-2399.5970
e-mail: segreteria@polidesign.net
website: www.polidesign.net

First Edition

CONTENTS

VOLUME 2 (*paper in this volume*)

4. SYSTEM AND CIRCULAR DESIGN FOR SUSTAINABILITY

SYSTEM DESIGN FOR TERRITORIAL CYCLE TOURISM Alessio D'Onofrio	291
DESIGN TOOLKIT FOR SUSTAINABLE IDEATION Ameya Dabholkar, Shivangi Pande, Puneet Tandon	296
THE SUSTAINABILITY OF PACKAGING FOR E-COMMERCE: FROM SYSTEM TO PRODUCT. Amina Pereno, Silvia Barbero	301
SUSTAINABLE INTERACTION FOR MOBILITY SYSTEM Andrea Arcoraci	308
DESIGN AND AGRIFOOD FOR NEW SUSTAINABLE LOCAL DEVELOPMENT C. Anna Catania , Aurora Modica	313
ZERO KILOMETRE PLANTS PRODUCTION. AN INTEGRATED DESIGN APPLICATION Attilio Nebuloni, Giorgio Buratti, Matteo Meraviglia	319
DESIGN FOR CIRCULAR ECONOMY - A RE-THINKING PROGRESS IN THE WAY WE MAKE, BUY AND USE THINGS Barbara Wong	325
DESIGNING SUSTAINABLE AND HEALTHY FOOD SYSTEMS THROUGH CATERING: THE ROLE OF DESIGNERS Berill Takacs	333
SYSTEMIC DESIGN DELIVERING POLICY FOR FLOURISHING CIRCULAR REGIONS Carolina Giraldo Nohra	339
SUSTAINABLE CYCLE DESIGN AND EXPLORATION BASED ON TRADITIONAL GARBAGE COLLECTION MODEL Cheng Lin He	345
WHAT REALLY MATTERS? SYSTEMIC DESIGN, MOTIVATIONS AND VALUES OF THE CIRCULAR ECONOMY COMPANIES IN ITALY Chiara Battistoni, Silvia Barbero	351
IS DESIGN PLAYING A ROLE IN THE REALISATION OF CIRCULAR ECONOMY PROJECTS IN EUROPE? A CASE STUDY ANALYSIS.	356
“THE SEVEN TREES SIGNIFICANCE”. THE BENEDICTINE MONKS’ AGROSILVOPASTORAL PRODUCTIVE SYSTEM Prof. arch. Claudio Gambardella, Dott. Raoul Romano	362
ECOLOGICAL DESIGN THINKING FOR THE 21 ST CENTURY David Sánchez Ruano, PhD	366
DESIGN FOR SUSTAINABILITY TRANSITIONS AND SUFFICIENT CONSUMPTION SCENARIOS:A SYSTEMATIC REVIEW Iana Uliana Perez, Mônica Moura, Suzana Barreto Martins, Jacob Mathew, Faiyqa Halim	371

DESIGN FOR A SUSTAINABLE INNOVATION OF THE ITALIAN COMPANIES: THE ECODESIGNLAB EXPERIENCE Jacopo Mascitti, Daniele Galloppo	384
DESIGN AND TRANSITION MANAGEMENT: VALUE OF SYNERGY FOR SUSTAINABILITY Jotte de Koning	390
DESIGN AND NATURE: NEW WAYS OF KNOWING FOR SUSTAINABILITY Kate Fletcher, Louise St Pierre, Mathilda Tham	396
CO-DESIGNING A COMMUNITY CENTRE IN USING MULTI-MODAL INTERVENTIONS Kim Berman (Visual Art), Boitumelo Kembo-Tolo (Multi-Media)	401
CRAFTING SUSTAINABILITY THROUGH SMALL, LOCAL, OPEN AND CONNECTED ENTERPRISES ON THE CANADIAN PRAIRIES: THE CASE OF MANITOBAN CRAFT BREWERIES Iain Davidson-Hunt, Kurtis Ulrich, Hannah Muhajarine	406
CASULO VERDE PROJECT: A SYSTEMIC APPROACH TO DESIGN MANAGEMENT. Larissa Fontoura Berlatto, Isabel Cristina Moreira Victoria, Luiz Fernando Gonçalves de Figueiredo,	412
MAPPING & CLASSIFYING BUSINESS MODELS TO REPLACE SINGLE-USE PACKAGING IN THE FOOD & BEVERAGE INDUSTRY: A STRATEGIC DESIGN TOOL Noha Mansour, Fabrizio Ceschin, David Harrison, Yuan Long	418
CLIMATE SWITCH: DESIGN LED SYSTEM RESPONSE TO CLIMATE CHANGE INDUCED BY CONSUMPTION Palash Ghawde, Bindiya Mutum, Praveen Nahar	424
FARM ONTOLOGY: A SYSTEM THINKING APPROACH FOR PLANNING AND MONITORING FARM ACTIVITIES Pasqualina Sacco, Raimondo Gallo, Fabrizio Mazzetto	429
INCLUSIVE CIRCULAR ECONOMY: AN APPROACH FOR EMERGING ECONOMIES Priscilla R. Lepre, Leonardo Castillo	435
PARTICIPATORY AND SUSTAINABLE STRATEGY-MAKING FOR COMMUNITY RENEWAL: THE CASE OF IAO HON IN MACAO Yan Xiaoyi, Zhou Long, Guoqiang Shen	441
5. DESIGN FOR SOCIAL EQUITY, INCLUSION AND COHESION	
TRANSDISCIPLINARY AND INTERCULTURAL FIELD STUDY AS A NEW APPROACH TO ADDRESS CLIMATE CHANGE DESIGNERLY Yue Zou, Zhiyuan Ou,	448
CERNE PROJECT AND REMEXE COLLECTION: ACTIONS IN SOCIAL DESIGN IN SEARCH OF SOCIAL INNOVATIONS OF SYSTEMIC CHARACTER Juliana Pontes Ribeiro, Adriana Tonani Mazzeiro, Gabriel Julian Wendling	454
TOWARDS INCLUSIVITY: EXPLORING THE IMPLICATIONS OF MULTI-SENSORY AND PARTICIPATORY DESIGN APPROACHES IN A SOUTH AFRICAN CONTEXT Alexis Wellman, Karolien Perold-Bull,	459
THE OPPORTUNITIES OF SUSTAINABLE HOUSING TO PROMOTE GENDER EQUALITY Anahí Ramírez Ortíz	467
DESIGN FOR ALL TO SUSTAINABILITY FOR ALL SOCIETY Antonio Marano, Giuseppe Di Bucchianico	473

INTILANGA: THE HUMAN-CENTRED DESIGN OF AN OFF-GRID FOOD PROCESSING SYSTEM FOR MICRO-ENTERPRISES WITHIN JOHANNESBURG Antonio Marin, Martin Bolton	478
SOCIAL SUSTAINABILITY AND VIRTUAL REALITY HEAD-MOUNTED DISPLAYS: A REVIEW OF THE USE OF IMMERSIVE SYSTEMS IN THE AID OF WELL-BEING Antônio Roberto Miranda de Oliveira, Amilton José Vieira de Arruda	484
RESEARCH ON DESIGN EMPOWERMENT OPPORTUNITIES FOR THE ELDERLY IN COMMUNITY Binbin Zheng, Miaosen Gong, Zi Yang	490
FRAMEWORK OF ANALYTICAL DIMENSIONS AND DESIGN APPROACHES FOR SOCIAL INNOVATION Camila Ferrari Krassuski, Liliane Iten Chaves	496
COLLECTIVIZATION OF DESIGN AND DIGITAL MANUFACTURING: SOCIAL LABORATORIES Daniel Llermaly Larraín	502
FOSTERING SOCIAL INNOVATION THROUGH SOCIAL INCUBATORS AND CORPORATE SOCIAL INCUBATORS: EVIDENCE FROM ITALY Davide Vigliani, Paolo Landoni	507
UN-NUANCES OF CO-DESIGNING AND CO-CREATING: A DESIGN THINKING APPROACH WITHIN A ‘ZONGO’ COMMUNITY IN GHANA Patrick Gyamfi, Edward Appiah, Ralitsa Debrah	513
THE DESIGN OF BANYANKOLE TRADITIONAL HOUSE: POWER DIMENSIONS, HOSPITALITY AND BEDROOM DYNAMICS Emmanuel Mutungi	518
CHALLENGE BASED INNOVATION FOR HUMANITARIAN PURPOSES:DESIGNING A WEB-APP TO FIGHT OBESITY. RESULTS OF THEPORT_2018 PIER 32 Eveline Wandl-Vogt, Amelie Dorn, Enric Senabre Hidalgo, James Jennings, Giuseppe Reale,	
KAROLOS POTAMIANOS	524
USER EXPERIENCE IN DESIGN TARGETING POVERTY ALLEVIATION: A CASE STUDY OF “SHANJU RENOVATION” ACTIVITY IN MAGANG VILLAGE FEI HU, JIXING SHI,	529
DESIGNING SUSTAINABLE MOBILITY FOR PEOPLE AT RISK OF SOCIAL ISOLATION – TWO CULTURAL PERSPECTIVES FROM SINGAPORE AND FRANCE Henriette Cornet, Penny Kong, Flore Vallet, Anna Lane, Yin Leng Theng	535
RESEARCH ON THE DESIGN OF SUSTAINABLE BATH EQUIPMENT IN POOR RURAL AREAS OF HEBEI HuHong, Li Heng	541
MAKING A COMIC ABOUT WESTBURY’S ANTI-APARTHEID ACTIVIST, FLORRIE DANIELS Florrie Daniels, Jean Bollweg	546
FROM ROBOTS TO HUMANS: PROSTHETICS FOR ALL Maria Rosanna Fossati, Manuel Giuseppe Catalano, Giorgio Grioli, Antonio Bicchi	552
DESIGNING SUSTAINABILITY FOR ALL OR CO-DESIGNING SUSTAINABILITY WITH ALL? Marie Davidová	558

DESIGN FOR SOCIAL INNOVATION WITHIN A VULNERABLE GROUP. LESSONS LEARNT FROM THE EXPERIMENTATION VIVICALUSCA IN ITALY Daniela Selloni, Martina Rossi	564
SUSTAINABLE DESIGN IDEA FOR ALL PEOPLE Dong Meihui	570
THE FUTURE IS FRUGAL Naga Nandini Dasgupta, Sudipto Dasgupta	574
#ECOTERACY, DESIGNING AN INFO INCLUSIVE AND UNIVERSAL LANGUAGE OF SUSTAINABILITY Nina Costa, Alexandra Duborjal Cabral, Cristóvão Gonçalves, Andreia Duborjal Cabral, Isabel Vasconcelos, Dânia Ascensão, Adriana Duarte	580
CULTURAL AND NATURAL HERITAGE FOR ALL: SUSTAINABLE FRUITION OF SITES BEYOND PHYSICAL ACCESSIBILITY Paola Barcarolo, Emilio Rossi	585
ADOPTION OF BIO-BASED ECONOMIES IN RURAL KENYA FOR IMPROVED LIVELIHOODS Pauline N. Mutura, WairimuMaina, Peter Kamau	591
DESIGN DISCRIMINATION–REFLECTION FOR CRITICAL THINKING Ravi Mani	597
ORGANIC FARMING AS A LIVELIHOOD OPPORTUNITY AND WELL BEING FOR SUNDARBAN FARMERS Sanjukta Ghosh	602
ERSILIALAB IN MILAN. A PARTICIPATORY EXPERIENCE TO DESIGN NEW WAYS FOR ROMA’S SOCIAL INCLUSION Silvia Nessi, Beatrice Galimberti	608
REVITALIZING MARGINALIZED COMMUNITIES FOR SUSTAINABLE DEVELOPMENT BY DESIGN Tao Huang, Eric Anderson	614
THE CONTRIBUTION OF COMMUNICATION DESIGN TO ENCOURAGE GENDER EQUALITY Valeria Bucchetti, Francesca Casnati	619
APPLYING HUMAN-CENTERED TECHNOLOGICAL APPROACH FOR SUSTAINABLE BUSINESSES IN INDIAN INFORMAL ECONOMIES Vivek Chondagar	624
STUDY ON SUSTAINABILITY OF WATER MANAGEMENT SYSTEM IN TRADITIONAL VILLAGES IN WESTERN ZHEJIANG PROVINCE - TAKING SHEN’AO VILLAGE IN ZHEJIANG PROVINCE AS AN EXAMPLE Zhang Yao, Zhou Haoming	629
SUSTAINABLE RURAL TOURISM SERVICE SYSTEM DESIGN THAT BALANCES LOCAL REVITALIZATION AND EXTERNAL INVOLVEMENT—TAKING THE AKEKE AS AN EXAMPLE Yiting Zhao, Jun Zhang	634

VOLUME 1

FOREWORD	I
LENSIN PROJECT	II
THE LENS CONFERENCE	III
LENS MANIFESTO	IV
1.KEY NOTE PAPERS	
TOWARDS SUSTAINABLE DESIGN VALUES: EVOLUTIONARY CONCEPTS AND PRACTICES Xiaobo Lu	001
CIRCULAR ECONOMY, SYSTEMIC DESIGN AND SOCIAL DEVELOPMENT GUIDELINES FOR EMERGING ECONOMIES Leonardo Castillo	005
DESIGNING TO CREATE A SHARED UNDERSTANDING OF OUR COLLECTIVE CONCERNS Poonam Bir Kasturi	012
DESIGNERS FACING GLOBAL CHALLENGES Julio Frías Peña	015
SOUTH AFRICAN KEYNOTE SPEECH FOR LENS WORLD DISTRIBUTED CONFERENCE DESIGNING SUSTAINABILITY FOR ALL Angus Donald Campbell	019
THE CIRCULAR INDUSTRIAL ECONOMY IN A NUTSHELL Walter R. Stahel	024
2. PRODUCT-SERVICE SYSTEM DESIGN FOR SUSTAINABILITY	
SUSTAINABLE PRODUCT-SERVICE SYSTEM REQUIREMENTS IN FASHION RETAIL Alana Emily Dorigon, Maria Auxiliadora Cannarozzo Tinoco, Jonatas Ost Scherer, Arthur Marcon	1
1TRASTOCAR. INTERACTIVE ART-DESIGN TO MAKE VISIBLE ENVIRONMENTAL IMPACT Ana Carolina Robles Salvador, Rodrigo Rosales González	6
PRODUCT-SERVICE SYSTEMS DEVELOPMENT PROCESS: SYSTEMATIC LITERATURE REVIEW Barbara Tokarz, Bruno Tokarz, Délcio Pereira, Alexandre Borges Fagundes, Fernanda Hänsch Beuren	12
INTRODUCING SYSTEMIC SOLUTIONS FOR SUSTAINABILITY AT THE DESIGN COURSES IN UAM CUAJIMALPA. STUDY CASE: BOOK CLUB IN MEXICO CITY Leonel Sagahon, Brenda García	16
IMPLEMENTATION OF THE LENS PROJECT AT THE UNIVERSIDADE DO ESTADO DO PARÁ (UEPA) Camilla Dandara Pereira Leite, Alayna de Cássia Moreira Navegantes, Antonio Erlindo Braga Jr	20
INITIAL PROPOSALS FOR THE IMPLEMENTATION OF THE PRODUCT-SERVICE SYSTEM AT THE UNIVERSIDADE DO ESTADO DO PARÁ (UEPA) Camilla Dandara Pereira Leite, Jamille Santos dos Santos, Alayna de Cássia Moreira Navegantes, Vinícius Lopes	

Braga, Agatha Cristina Nogueira de Oliveira da Silva, Antonio Erlindo Braga Jr.	24
ASPECTS OF THE PRODUCT-SERVICE SYSTEM IN BRAZILIAN LITERATURE Camilla Dandara Pereira Leite, Antonio Erlindo Braga Jr.	27
“LIBRARY OF STUFF”: A CASE OF PRODUCT SHARING SYSTEM PRACTICE IN TURKEY Can Uckan Yuksel, Cigdem Kaya Pazarbas	31
RESEARCH ON SERVICE SYSTEM DESIGN BASED ON VISUALIZATION OF SUSTAINABLE PRODUCT CARBON FOOTPRINT Chenyang Sun, Jun Zhang	37
INNOVATIVE SCHEME RESEARCH OF SHIMEN CITRUS’ LIFE CYCLE BASED ON PRODUCT-SERVICE DESIGN THINKING Chuyao Zhou, Jixing Shi, Jeff Lai, Amber Tan, Yuan Luo, Yongshi Liu, Shaohua Han	42
PRODUCT-SERVICE SYSTEMS (PSS): THE USE OF PRINCIPLES IN THE CREATIVE PROCESS OF PSS Emanuela Lima Silveira, Aguinaldo dos Santos	47
STUDY ON THE SERVICE DESIGN OF URBAN YOUNG DRIFTERS COMMUNITY Fei Hu, Yimeng Jin , Xing Xu	53
URBAN AGRICULTURE STARTUP CASE STUDY FOR SERVICE DESIGN IN BRAZIL Gabriela Garcez Duarte, Elenice Lopes, Lucas Lobato da Costa, Mariana Schmitz Gonçalves, Aguinaldo dos Santos	59
DEVELOPMENT MECHANISM ON CHINA’S INDUSTRIAL DESIGN PARKS THEMED DESIGN ENTREPRENEURSHIP Hongbin Jiang, Qiao Zhang	65
RESEARCH OF SUSTAINABLE PRODUCT SERVICE SYSTEMS ON CHINESE MINORITY BRAND CONTEXT Hong Hu, Feiran Bai, Daitao Hao, Jie Zhou	69
CHILDREN’S TOY SHARING SYSTEM FROM THE PERSPECTIVE OF SUSTAINABLE COMMUNITY CONCEPT Zhong Huixian, He Yi, Chen Chaojie	75
PRODUCT SERVICE SYSTEM APPLIED TO AIR-ENERGY PRODUCT BUSINESS MODEL INNOVATION Jiahuan Qiu, Jun Zhang	81
DESIGN AND RESEARCH OF RESOURCE RECYCLING SERVICE SYSTEM IN TOURIST ATTRACTIONS: TAKING INTERNATIONAL CRUISES AS AN EXAMPLE Jingrui Shen, Jun Zhang	85
RESEARCH AND PRACTICE ON INTELLIGENT AGRICULTURAL MACHINERY PRODUCTS AND SUSTAINABLE BUSINESS MODEL DESIGN Jun Zhang, Caizhi Zhou	90
THE CORPORATE SOCIAL RESPONSIBILITY (CSR) AND STRATEGIC MANAGEMENT FOR THE MEXICAN SPECIALIZED PUBLISHING SMES Lupita Guillén Mandujano, Bertha Palomino Villavicencio, Gerardo Francisco Kloss Fernández del Castillo	96
SLOC MODEL BASED SERVICE DESIGN STRATEGIES AND PRACTICE ON ECOLOGICAL AGRICULTURE Lyu Ji, Miaosen Gong	101
APPLICATION OF THE CARD SORTING TECHNIQUE ASSOCIATED WITH THE STORYTELLING APPROACH IN A PSS FOR SUSTAINABILITY Manuela Gortz, Alison Alfred Klein, Evelyne Pretti Rodrigues, Félix Vieira Varejão Neto, Henrique Kozlowiski Buzatto, Aguinaldo dos Santos	106

EMOTIONAL DESIGN IN FUNCTIONAL ECONOMY AND PSS TOWARDS BEHAVIOR CHANGE Manuela Gortz, Décio Estevão do Nascimento	111
SOUTH-TO-SOUTH SOLUTIONS: AN EXCHANGE OF AUSTRALIAN AND LATIN AMERICAN DESIGN APPROACHES TO THE UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS Mariano Ramirez	117
DESIGN AND SUSTAINABILITY: SYSTEMATIC REVIEW OF LITERATURE IN BRAZILIAN PHD THESES Marina Arakaki, Conrado Renan da Silva, Tomas Queiroz Ferreira Barata, Olímpio José Pinheiro, Mariano Lopes de Andrade Neto	123
COMPARATIVE STUDY OF PRODUCT SERVICE SYSTEM BASED ON LIFE CYCLE ANALYSIS— INNOVATIVE LUNCH TAKEAWAY SERVICE SYSTEM DESIGN Nan Xia	129
SERVICE DESIGN FOR INNOVATION: THE STRATEGIC ROLE OF SERVICE DESIGN IN INNOVATION FOR MANUFACTURING COMPANIES Naotake Fukushima, Aguinaldo dos Santos	135
WICKED PROBLEMS AND DESIGN IN EMERGING ECONOMIES: REFLECTIONS ABOUT THE DESIGN OF SYSTEMIC APPROACHES FOCUSED ON FOOD AND TERRITORY Priscilla R. Lepre, Leonardo Castillo, Lia Krucken	141
HORTALIÇÁRIO: GARDEN FOR ANY SPACE Rita de Castro Engler, Thalita Vanessa Barbalho, Letícia Hilário Guimarães, Ana Carolina Lacerda	147
EMOTIONAL DESIGN IN FUNCTIONAL ECONOMY AND PSS TOWARDS BEHAVIOR CHANGE Manuela Gortz, Décio Estevão do Nascimento	154
DESIGN FOR SUSTAINABILITY APPLIED TO WORKSPACES Susana Soto Bustamante, Elena Elgani, Francesco Scullica, Ricardo Marques Sastre, Marcia Elisa Echeveste, Maria Auxiliadora Cannarozzo Tinoco, Fabiane Tubino Garcia, Arthur Marcon	160
MECHANISM ANALYSIS AND APPLICATION STUDY OF SUSTAINABILITY EVALUATION TOOL FOR FURNITURE E-COMMERCE(ICSFE) Chuyao Zhou, Fang Liu, Suqin Tan, Tianwei Sun, Guixian Li, Shaohua Han	174
SUSTAINABLE PRODUCT SERVICE SYSTEMS: A NEW APPROACH TO SUSTAINABLE FASHION Yaone Rapitsenyane, Sophia Njeru, Richie Moalosi	180
PRODUCT-SERVICE SYSTEM DESIGN OF HOUSEHOLD MEDICAL WASTE MANAGEMENT FOR DIABETICS Yiting Zhang, Miaosen Gong, Dongjuan Xiao, Yuan Hu	185
BUSINESS MODEL DESIGN BASED ON THE CONCEPT OF SUSTAINABLE DEVELOPMENT—A SERVICE DESIGN OF THE PHYSICAL IDLE MALL AS AN EXAMPLE Luo Yuqing	190
3. DISTRIBUTED ECONOMIES DESIGN FOR SUSTAINABILITY	
DISTRIBUTED MANUFACTURING APPLIED TO PRODUCT-SERVICE SYSTEMS: A SET OF NEAR-FUTURE SCENARIOS Aine Petruilaityte, Fabrizio Ceschin, Eujin Pei, David Harrison	196
METHODS AND TOOLS FOR COMMUNITY BASED RESEARCH PROJECTS: DISTRIBUTED DESIGN AND DISTRIBUTED INFORMATION FOR VOLUNTEER ORGANISATIONS IN SOUTH AFRICA Arnaud Nzawou, Ephias Ruhode	202

RECOVERY AND RECYCLING OF A BIOPOLYMER AS AN ALTERNATIVE OF SUSTAINABILITY FOR 3D PRINTING Camilla Dandara Pereira Leite, Leticia Faria Teixeira, Lauro Arthur Farias Paiva Cohen, Nubia Suely Silva Santos	207
EPLORING SCENARIOS TO FACILITATE THE ACCESS TO 3D PRINTING TECHNOLOGY IN EGYPT THROUGH SUSTAINABLE PSS APPLIED TO DISTRIBUTED MANUFACTURING Doaa Mohamed	211
INVESTIGATION OF THE IMPACT OF SUSTAINABILITY ON 3D PRINTING TECHNOLOGIES Emilio Rossi, Massimo Di Nicolantonio, Paola Barcarolo, Jessica Lagatta, Alessio D’Onofrio Design of abandoned vegetable and fruit transportation system based on sustainable distributed economy Haiwei Yan, Ruolin Gao, Yuanbo Sun, Ke Jiang	218
DESIGN OF ABANDONED VEGETABLE AND FRUIT TRANSPORTATION SYSTEM BASED ON SUSTAINABLE DISTRIBUTED ECONOMY Haiwei Yan	224
DISTRIBUTED PRODUCTION AND SUSTAINABILITY STRATEGIES FOR FASHION Alba Cappellieri, Livia Tenuta, Susanna Testa,	228
SUSTAINABLE PRODUCT SERVICE SYSTEMS: CASES FROM OCEANIA Mariano Ramirez	233
VISUALISING STAKEHOLDER CONFIGURATIONS IN DESIGNING SUSTAINABLE PRODUCT-SERVICE SYSTEMS APPLIED TO DISTRIBUTED ECONOMIES Meng Gao, Carlo Vezzoli	239
LAMPS - ‘DESIGNERLY WAYS’ FOR SUSTAINABLE DISTRIBUTED ECONOMY Prarthana Majumdar, Sharmistha Banerjee, Jan-Carel Diehl, J.M.L.van Engelen	245
THE THIRD SECTOR AS A VECTOR TO FOSTER DISTRIBUTED DESIGN AND DISTRIBUTED ECONOMY INITIATIVES: A CASE STUDY Priscilla Ramalho Lepre, Leonardo Castillo	251
‘SHKEN’ NATURALLY YOURS – SOCIAL DIMENSIONS OF SUSTAINING RURAL DISTRIBUTED BAMBOO CRAFT ENTERPRISES OF NORTH EAST INDIA Punekar Ravi Mokashi, Avinash Shende, Mandar Rane	257
DISTRIBUTED SUSTAINABLE MARKET DESIGN BASED ON COMMUNITY Ruolin Gao, Haiwei Yan, Ke Jiang, Yuanbo Sun	261
PURA FRAMEWORK - A MODEL FOR DISTRIBUTED ECONOMY FOR INDIA Sharmistha Banerjee	265
CONTEXTUALIZING SUSTAINABLE PRODUCT-SERVICE SYSTEM DESIGN METHODS FOR DISTRIBUTED ECONOMIES OF INDIA Sharmistha Banerjee, Pankaj Upadhyay, Ravi Mokashi Punekar	270
DISTRIBUTED ELECTRIC VEHICLE CHARGING SERVICE SYSTEM DESIGN BASED ON BLOCKCHAIN TECHNOLOGY Wandong Cheng, Jun Zhang	276
MODEL FOR THE DEVELOPMENT OF OPEN SOURCE PRODUCTS MOD+RE+CO+DE Willmar Ricardo Rugeles Joya, Sandra Gomez Puertas, Nataly Guataquira Sarmiento	280
RESEARCH AND TEACHING PRACTICE OF PRODUCT SERVICE SYSTEM APPLIED TO DISTRIBUTED ECONOMY Yao Wang, Jun Zhang	285

VOLUME 3

6. DESIGN FOR SUSTAINABLE CULTURAL AND BEHAVIORAL CHANGE

ARTISTIC CRAFTSMANSHIP VS DEGRADATION RISK OF HISTORICAL AREAS Adriano Magliocco, Maria Canepa	639
STRATEGIES FOR ECO-SOCIAL TRANSFORMATION: COMPARING EFFICIENCY, SUFFICIENCY AND CONSISTENCY Andreas Metzner-Szigeth	644
SYNTHESIZING SOLUTIONS: EXPLORING SOCIALIST DESIGN AND ITS MODERN RELEVANCE THROUGH THE MEDIUM OF PLASTICS Aniruddha Gupte	650
MOTHERS FROM INOSEL: AN EXERCISE IN COLLABORATION TOWARDS A MORE SUSTAINABLE SOCIETY Bárbara de Oliveira e Cruz, Rita Maria de Souza Couto, Roberta Portas Gonçalves Rodrigues	655
THE ECOLOGICAL AESTHETIC CONNOTATIONS IN CHINESE TRADITIONAL ENVIRONMENT CONSTRUCTION SKILLS Changliang Tan	661
UPCYCLING IN COMMUNITIES: LOW CARBON DESIGN PROMOTES PUBLIC ENVIRONMENTAL AWARENESS AND OPTIMIZES SOCIAL Qiu Dengke, Peng Jinqi, David Bramston, Qiu Zhiyun, Chen Danrong	667
FASHION DESIGN FOR SUSTAINABILITY: A FRAMEWORK FOR PARTICIPATORY PRACTICE Dilys Williams	672
A DIFFERENT DEFINITION OF GENERATIVE DESIGN Erika Marlene Cortés López	678
SUSTAINABILITY AND DEMOCRACY WIDESPREAD COLLABORATIVE DESIGN INTELLIGENCE Ezio Manzini	682
UTSTAL: HEADING HEARTS AND JOINING COMMUNITIES Fernando Rafael Calzadilla Sánchez, Francisco Emanuel Pérez Mejía	687
SUSTAINABLE DESIGN AND AESTHETICS IN THE SOFT SCIENCE AGE Francesca La Rocca, Chiara Scarpitti	690
THE SOCIAL CONSTRUCTION OF ENVIRONMENTAL CRISIS AND REFLECTIONS ON THE SUSTAINABILITY DEBATE Gabriela Sandoval Andrade	696
DESIGN FOR HUMAN FLOURISHING: PERCEPTUAL MAPPING OF DIFFERENT DESIGN APPROACHES TOWARDS HAPPINESS AND WELL-BEING Guilherme Toledo	700
USING EMOTIONAL DURABILITY FOR SUSTAINABLE PACKAGING DESIGN PRACTICE BASED ON USAGE SCENARIO Jifa Zhang	706
THE VALORIZATION OF INDIGENOUS CULTURE THROUGH UPCYCLING Jordana de Oliveira Bennemann, Eduarda Regina da Veiga, Ana Luisa Boavista Lustosa Cavalcante	711

CLOTHING LANDSCAPES: INTERDISCIPLINARY MAPMAKING METHODS FOR A RELATIONAL UNDERSTANDING OF FASHION BEHAVIOURS AND PLACE Katelyn Toth-Fejel	715
INTEGRATION OF ART OF HOSTING METHODOLOGIES AND PRINCIPLES INTO THE SOCIAL INNOVATION LAB PRACTICE: Lewis Muirhead, Rosamund Mosse	720
DESIGN AS DEMOCRACY: THE DEMOCRATIC POTENTIAL OF DESIGN Luiz Lagares Izidio, Dijon De Moraes	727
REGENERATIVE FOOD SERVING SYSTEM FOR A SUSTAINABLE UNIVERSITY CAMPUS LIFESTYLE: A SOCIAL AND BEHAVIOURAL STUDY Nariman G. Lotfi, Sara Khedre	732
DESIGNING FURNITURE BASED ON STUDENT’S LIFESTYLE AND MERGING WITH A SUSTAINABLE CAMPUS Neha Priolkar, Franklin Kristi	737
PERIOD. A CARD GAME ON SOCIAL TABOOS AROUND MENSTRUATION Devika Saraogi, Gayatri Chudekar, Nikita Pathak, Sreya Majumdar	742
ESTABLISHING A QUANTITATIVE EVALUATION MODEL FOR CULTURE-BASED PRODUCT DESIGN Pan Li, Baosheng Wang	748
SUSTAINING CULTURAL HERITAGE : DERIVING THE CONTEMPORARY FROM THE IDIOM OF TRADITIONAL CRAFTS Puja Anand, Alok Bhasin	753
EMPATHY SQUARE: AN AID FOR SERVICE DESIGN FOR BEHAVIOUR CHANGE TO SUPPORT SUSTAINABILITY Ravi Mahamuni, Anna Meroni, Pramod Khambete, Ravi Mokashi Puneekar	759
ECOMUSEUM AS A DESIGN TOOL FOR SUSTAINABLE SOCIAL INNOVATION Rita de Castro Engler, Gabrielle Lana Linhares	764
MISLEADING IDENTITIES: DO PERCEPTUAL ATTRIBUTES OF MATERIALS DRIVE THE DISPOSAL OF SINGLE-USE PACKAGING IN THE CORRECT WASTE STREAM? Romina Santi, Agnese Piselli, Graziano Elegir, Barbara Del Curto	770
I TAKE CARE OF MY PLACES—PROJECT BY ALESSANDRO MANZONI HIGH SCHOOL, LECCO Rossana Papagni, Anna Niccolai, Eugenia Chiara, Laura Todde	776
THE ESPERANÇA COMMUNITY GARDEN AND THE CHALLENGES OF INTEGRAL SUSTAINABILITY Samantha de Oliveira Nery, Ediméia Maria Ribeiro de Mello, Rosângela Míriam Lemos Oliveira Mendonça	780
SPIRAL DYNAMICS: A VISIONARY SET OF VALUES FOR HUMANITY’S SUSTAINABLE DEVELOPMENT Sergio Dávila Urrutia	785
CRAFT CHANGE: BEHAVIOUR PROGRESSION FRAMEWORK – EVALUATION IN QUASI PARTICIPATORY DESIGN SETTING Shivani Sharma, Ravi Mahamuni, Sylvan Lobo, Bhaskarjyoti Das, Ulemba Hirom, Radhika Verma, Malay Dhamelia	791
FOR AN AESTHETICS FOCUSED ON SUSTAINABILITY: STUDIES FOR THE CONFIGURATION OF ECOLOGICALLY ORIENTED PACKAGING Thamyres Oliveira Clementino, Amilton José Vieira de Arruda, Itamar Ferreira da Silva	796

CRITICAL ZONE: THE EARTH BELOW OUR FEET Vasanthi Mariadass	800
SERIOUS GAME AS A NEW WAY OF HANDICRAFT INHERITANCE—A CASE STUDY ON “HUAYAO CROSS-STITCH MASTER GROWTH RECORD” Xile Wang, Duoduo Zhang, Yuanyuan Yang	807
7. PRODUCT DESIGN FOR SUSTAINABILITY	
PROPOSAL OF RECOMMENDATIONS FOR DESIGN UNDER A SUSTAINABLE APPROACH: LCA CASE. Bonifaz Ramírez Adonis Wenceslao, González Leopoldo Adrián	812
CIRCULAR DESIGN AND HOUSEHOLD MEDICATION: A STUDY ON THE VOLUNTARY DRUG DISPOSAL PROGRAM OF THE CITY OF BETIM MUNICIPALITY Aline Rodrigues Fonseca, Rita de Castro Engler, Armindo de Souza Teodósio, Luiz Fernando de Freitas Júnior, Mariana Costa Laktim, Travis Higgins	817
DESIGN FOR SUSTAINABLE FASHION: A SUSTAINABILITY DESIGN-ORIENTING TOOL FOR FASHION Barbara Azzi, Carlo Vezzoli, Giovanni Maria Conti	823
DESIGN PRACTICE FOR SUSTAINABILITY: DEVELOPMENT OF A LOW-COST ORTHOSIS Caelen Teger, Isabella de Souza Sierra, Dominique Leite Adam, Maria Lúcia Leite Ribeiro Okimoto, José Aguiomar Foggiatto	831
MECHANISM ANALYSIS AND APPLICATION STUDY OF SUSTAINABILITY EVALUATION TOOL FOR FURNITURE E-COMMERCE(ICSFE) Chuyao Zhou, Fang Liu, Suqin Tan, Tianwei Sun, Guixian Li, Shaohua Han*	837
ANUVAD: CREATING SUSTAINABLE SMART TEXTILES THROUGH THE MEDIUM OF TRADITIONAL CRAFTS Chhail Khalsa	843
DESIGN FOR SUSTAINABILITY FRAMEWORK APPLIED TO THE PROBLEM OF GARMENT WASTE: A BRAZILIAN STUDY Cláudio Pereira de Sampaio, Suzana Barreto Martins	848
LIFE CYCLE DESIGN (LCD) GUIDELINES FOR ENVIRONMENTALLY SUSTAINABLE CLOTHING CARE SYSTEMS: AN OPEN AND OPERATIVE TOOL FOR DESIGNERS Carlo Vezzoli, Giovanni Maria Conti	854
THE RESEARCH OF YI ETHNICITY FURNITURE DESIGN BASED ON ARCHITECTURAL SPACE Ding Yang	860
DESIGN FOR SUSTAINABILITY AND ICT: A HOUSEHOLD PROTOTYPE FOR WASTE WATER RECYCLING Fiammetta Costa, Marco Aureggi, Luciana Migliore, Paolo Perego, Margherita Pillan, Carlo Emilio Standoli, Giorgio Vignati	864
OPEN-ENDED DESIGN. LOCAL RE-APPROPRIATIONS THROUGH IMPERFECTION Francesca Ostuzzi, Valentina Rognoli, Francesco Fittipaldi, Patrizia Ranzo, Rosanna Veneziano, Gustavo R. P. Nascimento, Victor J.D. S. Baldan, T. M. Ponciano, Janaina M. H. Costa, Eduvaldo P. Sichert, Javier M. Pablos	868
ANALYSIS OF THE POTENTIAL APPLICATION OF RECYCLED THERMOFIX INDUSTRIAL POLYURETHANE RESIDUE IN SCHOOL DESKS Gustavo Ribeiro Palma Nascimento, Victor José Dos Santos Baldan, Thales Martins Ponciano, Janaina M. H. Costa	

Eduvaldo Paulo Sichieri, Javier Mazariegos Pablos	880
RE-DESIGNING RECOVERED MATERIALS. CASE STUDY: FIBERGLASS IN THE NAUTICAL SECTOR Helga Aversa, Valentina Rognoli, Carla Langella	884
UNFINISHEDISM Huanhuan Peng	890
CRITICAL FUTURES TODAY: BACK-CASTING SPECULATIVE PRODUCT DESIGN TOWARDS LONG-TERM SUSTAINABILITY Jomy Joseph Jomy Joseph, Mariana Costa Laktim, Larissa Duarte Oliveira, Rita de Castro Engler, Aline Fonseca, Camilla Borelli, Julia Baruque-Ramos	899
HOME TEXTILE: AN ANALYSIS OF ENVIRONMENTAL AND ECONOMICAL IMPACTS IN BRAZIL Mariana Costa Laktim, Larissa Duarte Oliveira, Rita de Castro Engler, Aline Fonseca, Camilla Borelli, Julia Baruque-Ramos	905
PRODUCT DESIGN FOR SUSTAINABILITY – GUIDELINES FOR THE LIFE CYCLE DESIGN OF OFFICE FURNITURE Lena Plaschke, Carlo Vezzoli, Francesco Scullica	910
ON THE COLLABORATIVE MODELS FOR DESIGN SCHOOLS ENGAGING IN THE SUSTAINABLE DEVELOPMENT OF TRADITIONAL BAMBOO CRAFTS Li Zhang, Hai Fang	915
EXPERIMENTAL MATERIAL DEVELOPMENT LEADING TO SUSTAINABLE PRODUCT DESIGN Martin Bolton	921
AUTOMATIC COMPOSTER FOR HOME USE Maycon Manoel Sagaz, Paulo Cesar Machado Ferroli	926
SUSTAINABILITY IN THE PRODUCT LIFE CYCLE OF PAPER Qian Yang	932
BIOINSPIRED STRUCTURES IN LIGHTWEIGHT PRODUCT DESIGN WITH ADDITIVE MANUFACTURING Owen Gagnon, Brenton Whanger, Hao Zhang, Ji Xu	936
SMART HOME GRID: TOWARDS INTERCONNECTED AND INTEROPERABLE ELECTRICAL MODEL TO IMPROVE THE USAGE AWARENESS Paolo Perego, Gregorio Stano	941
ZERO WASTE: EXPLORING ALTERNATIVES THROUGH FOLDING Pragya Sharma	946
ENVIRONMENTAL PRODUCT OPTIMISATION: AN INTEGRAL APPROACH Reino Veenstra, Henri C. Moll	953
SUSTAINABLE DESIGN 4.0: METHODS AND TECHNIQUES OF THE CONTEMPORARY DESIGNER IN THE KNOWLEDGE SOCIETY Roberta Angari, Gabriele Pontillo	959
NEM, NEAPOLITAN EVOLUTION MEN’S WEAR: A BIO PROJECT OF MEN’S TAILORING Roberto Liberti	965
NEW SUSTAINABLE COSMETIC PRODUCTS FROM FOOD WASTE: A JOINED-UP APPROACH BETWEEN DESIGN AND FOOD CHEMISTRY Severina Pacifico, Simona Piccolella, Rosanna Veneziano	970

CHILDREN FURNITURE DESIGN FOR SUSTAINABILITY Xiang Wang, Lulu Chai, Ren Fu	975
STUDY ON THE DESIGN OF TENON AND MORTISE JOINTS FOR NEW TYPE SUSTAINABLE EXPRESS PACKAGING BASED ON THE CONCEPT OF INTEGRATED CYCLING Xue-ying Wang, Jiao Yi	981
8. DESIGN FOR SUSTAINABLE TECHNOLOGIES AND RESOURCES	
INTERACTIVE DESIGN STRATEGY FOR SUSTAINABLE BEHAVIOR CHANGE BASED ON OPEN SOURCE HARDWARE Yongshi Liu, Jing Ou, Yunshuang Zheng, Jun Zhang	988
DESIGN-DRIVEN STRATEGY FOR THE SUSTAINABLE TEXTILE HERITAGE COMMUNITY IN CHINA Yuxin Yang, Eleonora Lupo	994
EXPLORING THE DESIGN ETHICS OF THE FUTURE INFORMATION SOCIETY: A BRIEF DESIGN ETHICS STUDY OF “DIDI GLOBAL” AS A SOCIALITY INTERNET PRODUCT Zhilong Luan, Xiaobo Lu	1000
GLEBANITE® FOR MODELS AND MOULDS IN SHIPYARDS APPLICATIONS RATHER RESORTING TO MONOMATERIC SOLUTIONS Andrea Ratti, Mauro Ceconello, Cristian Ferretti, Carlo Proserpio, Giacomo Bonaiti, Enrico Benco	1006
PROJECT REMA: THE REGIONAL ECO-MATERIALS ARCHIVE Y.H. Brian Lee, Ding Benny Leong	1010
MATERIALS CLASSIFICATION IN FURNITURE DESIGN – FOCUS ON SUSTAINABILITY Paulo Cesar Machado Ferroli, Emanuele de Castro Nascimento, Lisiane Ilha Librelotto, Franchesca Medina, Luana Torralles Carbonari	1015
THE SUSTAINABILITY OF BIOMIMETIC SYSTEM DESIGN: FROM ORGANISM TO ECOLOGY Fan Wu, Jun Zhang	1021
SUSTAINABILITY DESIGNED WITH(OUT) PEOPLE? UNDERSTANDING FOR WHAT ENERGY IS (OVER-)USED BY TENANTS IN AN ENERGY EFFICIENT PUBLIC HOUSING IN MILAN Giuseppe Salvia, Federica Rotondo, Eugenio Morello, Andrea Sangalli, Lorenzo Pagliano, Francesco Causone	1027
RESEARCH ON BIOMASS ENERGY UTILIZATION IN RURAL AREAS BASED ON SUSTAINABLE DESIGN CONCEPT Haiwei Yan, Ruolin Gao, Ke Jiang, Yuanbo Sun	1032
LIFE THE TOUGH GET GOING PROJECT: IMPROVING THE EFFICIENCY OF THE PDO CHEESE PRODUCTION CHAINS BY A DEDICATED SOFTWARE Jacopo Famiglietti, Carlo Proserpio, Pieter Ravaglia, Mauro Ceconello	1035
RETHINKING AND RECONSTITUTED MATERIALS FOR A SUSTAINABLE FUTURE — “RECONSTITUTING-PLAN” PROJECT AS AN EXAMPLE Jiajia Song	1040
BAMBOO SUPPLY CHAIN: OPPORTUNITY FOR CIRCULAR AND CREATIVE ECONOMY Lisiane Ilha Librelotto, Franchesca Medina, Paulo Cesar Ferroli, Emanuele de Castro Nascimento, Luana Torralles Carbonari	1046
ALTERNATIVE MATERIALS TO IMPROVE THE ASSEMBLY PROCESS OF FURNITURE FOCUSED ON SUSTAINABILITY DESIGN Paulo Cesar Machado Ferroli, Lisiane Ilha Librelotto, Natália Geraldo	1051

SUSTAINABLE DESIGN PRINCIPLES FOR USING BAMBOO STEMS Ping Wu, Tao Huang	1056
SUSTAINABLE MATERIALS AND PROCESSES DESIGN: THE CASE STUDY OF POLY-PAPER Romina Santi, Silvia Farè, Barbara Del Curto, Alberto Cigada	1061
ENABLING USER KNOWLEDGE TO SUPPORT THE DECISION-MAKING PROCESS IN ENERGY RETROFITTING OF PUBLIC HOUSING: A CASE STUDY IN MILAN Giuseppe Salvia, Federica Rotondo, Eugenio Morello	1067
EFFECTS OF COLOURED AMBIENT LIGHT ON PERCEIVED TEMPERATURE FOR ENERGY EFFICIENCY: A PRELIMINARY STUDY IN VIRTUAL REALITY Siyuan Huang, Giulia W. Scurati, Roberta Etzi, Francesco Ferrise, Serena Graziosi, Lavinia C. Tagliabue, Alberto Gallace, Monica Bordegoni	1073
BUILDING INTEGRATED PHOTOVOLTAICS (BIPV): SYSTEM APPLICATION GUIDELINES AND ALBEDO ASPECTS Sofia Hinckel Dias, Flávia Silveira, Aloísio Schmid	1079

VOLUME 4

9. ARCHITECTURAL AND INTERIOR DESIGN FOR SUSTAINABILITY

SUSTAINABLE-ORIENTED CHANGE MANAGEMENT FOR ALL BUILDING DESIGN PRACTICE Anna Dalla Valle, Monica Lavagna, Andrea Campioli,	1083
RELIGIOUS BUILDINGS AND SUSTAINABLE BEHAVIOUR: UNDERSTANDING IMPACT OF DESIGN ELEMENTS ON HUMAN BEHAVIOUR Ashish Saxena	1088
RESTRICTING FACTORS IN THE SELECTION AND SPECIFICATION OF SUSTAINABLE MATERIALS: AN INTERIOR DESIGN PERSPECTIVE. Emmerencia Petronella Marisca Deminey, Amanda Breytenbach	1094
OPTIMIZATION AND LCSA-BASED DESIGN METHOD FOR ENERGY RETROFITTING OF EXISTING BUILDINGS Hashem Amini Toosi, Monica Lavagna	1101
INDOOR ENVIRONMENTAL QUALITY DESIGN OF HOTELS IN THE UNITED STATES AND EUROPE Ivan Alvarez Leon, Elena Elgani, Francesco Scullica	1106
SUSTAINABLE TECHNIQUES TO IMPROVE THE INDOOR AIR QUALITY (IAQ) AND THERMAL COMFORT IN HOT AND ARID CLIMATE. Laura Dominici, Sanam Ilkhanlar, Sara Etminan, Elena Comino	1112
DEVELOPMENT AND PROPOSITION OF A TOOL TO EVALUATE THE ECOLOGICAL IDENTITY OF PRODUCTS: FURNITURE CASE Onur Y. Demiröz, Meltem Özkaraman Sen	1117
INTERVENING ON 'BUILDING AS A PRODUCT' AND 'HABITATION AS A SERVICE' IN CONTEMPORARY URBAN SETTINGS FOR ADAPTIVE MICRO HABITATION DESIGN Shiva Ji, Ravi Mokashi Puneekar	1123
RESEARCH ON THE SUSTAINABLE DESIGN OF TRADITIONAL ARCHITECTURAL NARRATIVE CULTURE OF BEIJING HUTONG BLOCKS: A CASE STUDY OF NANLUOGUXIANG STREET Xin Wen, Fan Zhang	1129

SUSTAINABILITY INVOLVES EMOTION: AN INTERPRETATION ON THE EMOTIONAL CHARACTERISTICS OF SUSTAINABLE ARCHITECTURE Yun-Ting Gao	1134
10. LANDSCAPE AND URBAN DESIGN FOR SUSTAINABILITY	
TOWARD SUSTAINABLE CITIES THROUGH FUTURISTIC DESIGN MODEL: A CONSUMERISTIC SOCIETY PERSPECTIVE Azadeh Razzagh Shoar, Hassan Sadeghi Naeini	1141
STUDY ON SUSTAINABLE DESIGN OF RAINWATER LANDSCAPE IN EXISTING URBAN RESIDENTIAL COMMUNITY Di Gao, Xuerong Teng	1145
DESIGN FOR PUBLIC TOILETS: CHALLENGES AND CONTRIBUTION TO THE REESTABLISHMENT OF PUBLIC VALUE Fang Zhong, Xin Liu, Nan Xia	1151
DESIGNING COMMUNITY THROUGH URBAN GARDENING Gloria Elena Matiella Castro,	1157
EXPLORING FOG HARVESTING IN EUROPE: CHARACTERISTICS AND GUIDELINES FOR A SUSTAINABLE CITY MODEL Gloria Morichi, Dr. Gabriela Fernandez, Lucas B. Calixto	1161
CHARACTERIZATION OF TWO URBAN FARMS IN THE CUAUHEMOC BOROUGH OF MEXICO CITY Iskar Jasmani Waluyo Moreno	1166
THE CHALLENGES OF USING PUBLIC LAND SUSTAINABLY IN MEXICO FOR OUTDOORS RECREATION: CAN SERVICE DESIGN HELP BRIDGE THE GAP? Ivan Osorio Avila	1171
INTERCITY RELATIONSHIPS WITHIN URBAN AGGLOMERATION AND THEIR IMPACTS ON URBAN ECONOMIC DEVELOPMENT Jianhua Zhang	1177
URBAN-RURAL NETWORK TOOL FOR DESIGNING SYSTEMS THAT SUCCESSFULLY INTEGRATE COMPANIES AND COMMUNITIES TOWARDS SUSTAINABILITY AND RESILIENCE Juan Montalván, Akie Manrique, Santiago Velasquez, Lucia Rivera, Helen Jara, Luis Quispe	1183
SOCIAL INEQUITY IN PUBLIC TRANSPORT INFRASTRUCTURE & ITS IMPACT ON A CITY'S SUSTAINABILITY Lakshmi Srinivasan	1188
A TOOLKIT: FOSTERING A PARTICIPATORY STUDY OF SUSTAINABLE PAVEMENT DEVELOPMENT Lulu Yin, Eujin Pei	1194
THE LOGIC OF PLACE-MAKING TOWARDS SUSTAINABLE NEW URBAN AREAS IN HANOI: FROM ZERO TO HERO? Minh Tung Tran, Ngoc Huyen Chu, Pham Thuy Linh	1200
MATI- FINDING SELF AND COMMUNITY THROUGH LAND RECLAMATION Srishti Srivastava, Shivangi Pant, Sahil Raina	1206
THE PATTERN AND METHODS CONCERNING THE MICRO-RENEWAL OF THE URBAN ENVIRONMENT Tingting Liu	1211
RITICAL ZONE: THE EARTH BELOW OUR FEET Vasanthi Mariadass	1216

STUDY ON THE LANDSCAPE POLICY AND USAGE SITUATION : A CASE OF XIADU PARK IN YANQING COUNTY, BEIJING Yuanyuan Zhang	1223
AN ANALYSIS AND APPLICATION OF AFFORDANCE THEORY IN DESIGN OF URBAN RAIL TRANSIT Yu-Feng Zhang	1228
DISCUSSION ON THE SUSTAINABLE MODE OF NEW RURAL CONSTRUCTION IN CHINA FROM THE PERSPECTIVE OF ENVIRONMENTAL CONSTRUCTION Zhong Zhen	1234
11. EDUCATION AND DIFFUSION OF DESIGN FOR SUSTAINABILITY	
DSXC: TOOLKIT TO SUPPORT DESIGN EDUCATION PROCESSES FOR SUSTAINABILITY Adolfo Vargas Espitia, Álvarez Quintero, Willmar Ricardo Rugeles Joya	1239
UPSCALING LOCAL AND NATIONAL EXPERIENCES ON EDUCATION FOR SOCIAL DESIGN AND SUSTAINABILITY FOR ALL TO A WIDER INTERNATIONAL ARENA: CONSIDERATIONS AND CHALLENGES Ana Margarida Ferreira, Nicos Souleles, Stefania Savva	1244
INTERDISCIPLINARY HIGH EDUCATION IN PLACE BASED SOCIAL-TECH: THE EXPERIENCE OF THE TAMBALI FII PROJECT IN DAKAR Andrea Ratti, Francesco Gerli, Arianna Bionda, Irene Bengo	1248
EDUCATION STRATEGIES AND BEHAVIORAL ACTIONS TO MITIGATE ENERGY POVERTY Anna Realini, Simone Maggiore, Marina Varvesi, Valentina Castello, Corrado Milito	1254
DESIGNING FOR CLIMATE CHANGE FOR ALL—A MEDIA AND COMMUNICATION DESIGN COURSE TO INCREASE PUBLIC AWARENESS Bo Gao, Glenda Drew, Jesse Drew,	1260
DESIGN PEDAGOGY FOR SUSTAINABILITY: DEVELOPING QUALITIES OF TRANSFORMATIVE AGENTIVE LEARNING. Bruce Snaddon, Andrea Grant Broom	1265
ENVIRONMENTAL ASPECTS IN THE UEL DESIGN COURSE: LEGAL CONCEPTIONS AND REALITY Camila Santos Doubek Lopes, Gabriela Namie Komatsu Yoshida	1270
EDUCATION FOR SUSTAINABLE DEVELOPMENT. CASE OF AN INDUSTRIAL ENGINEERING PROGRAM IN COLOMBIA. Carolina Montoya-Rodríguez	1275
USING DESIGN THINKING AND FACEBOOK TO HELP MOROCCAN WOMEN ADAPT TO CLIMATE CHANGE IMPACTS Diane Pruneau, Abdellatif Khattabi, Boutaina El Jai, Maroua Mahjoub	1281
DESIGN FOR SOCIAL SUSTAINABILITY: DECOLONISING DESIGN EDUCATION Elmarie Costandius, Neeske Alexander	1286
A SUSTAINABLE DESIGN-ORIENTED PROCESS FOR CONVERTING AND SHARING KNOW-HOW Emilio Rossi	1292
FASHION DESIGN EDUCATION AND SUSTAINABILITY. A CHALLENGE ACCEPTED. Erminia D'Itria	1297
TRANSITION DESIGN – PRESENTATION AND EDUCATIONAL APPROACH Erwan Geffroy, Manuel Irlés, Xavier Moulin	1303
SOCIAL INNOVATION THROUGH DESIGN IN THE TRAINING OF YOUNG APPRENTICES: EXPERIENCING SOCIO-EDUCATIONAL PROJECTS Karina Pereira Weber, Isabel Cristina Moreira Victoria, Marco Antonio Weiss, Luiz Fernando Gonçalves De Figueiredo	1309

INSPIRING STUDENTS TO BE AGENTS OF CHANGE: A SOUTH AFRICAN PERSPECTIVE Laskarina Yiannakaris	1314
THE TECHNOLOGICAL MEDIATION OF SUSTAINABILITY: DESIGN AS A MODE OF INQUIRY Lisa Thomas, Stuart Walker, Lynne Blair	1320
DESIGN FOR SUSTAINABILITY. STATE OF THE ART IN BRAZILIAN UNDERGRADUATE COURSES Marcelo Ambrósio, Maria Cecília Loschiavo dos Santos	1326
SUSTAINABLE DESIGN TRENDS WITHIN CREATIVE LEARNING ENVIRONMENTS Mireille Anja Oberholster, Francesco Scullica	1331
MODEL-MAKING COURSES AND APPROACHES IN TERMS OF SUSTAINABILITY: EXAMINATION OF INDUSTRIAL DESIGN SCHOOLS IN TURKEY Necla Ilknur Sevinc Gokmen	1336
SUSTAINABILITY IN UNDERGRADUATE ARCHITECTURAL EDUCATION: A CASE STUDY FROM KAZGASA, KAZAKHSTAN Nurgul Nsanbayeva	1342
ENCOURAGING DFE IN DESIGN EDUCATION TO PROMOTE SUSTAINABLE MEDICAL PRODUCT DESIGN Pranay Arun Kumar, Stephen Jia Wang	1348
INCORPORATING SUSTAINABILITY INTO RESEARCH PROJECTS Rosana Aparecida Vasques, Maria Cecilia Loschiavo dos Santos	1354
TEACHING DESIGN FOR SUSTAINABILITY BEYOND THE ENVIRONMENTAL DIMENSION: A TOOLKIT AND TEACHING STRATEGIES Rosana Aparecida Vasques	1359
ROLE OF DESIGN EDUCATION IN IMPARTING VALUES OF SUSTAINABILITY AS SOCIAL RESPONSIBILITY OF DESIGNERS Sanjeev Bothra	1365
SPREADING GOOD SUSTAINABILITY PRACTICES THROUGH TEMPORARY RETAIL SHOPS Silvia Piardi	1370
FASHION DESIGN-RELATED DOCTORAL STUDIES IN SELECTED KENYAN UNIVERSITIES: ADVANCING APPLIED RESEARCH IN SUSTAINABILITY Sophia N. Njeru. Mugendi K. M'rithaa	1375
TRANSDISCIPLINARY FUTURES: WHERE DO EMBODIMENT, ETHICS AND EDUCATION MEET FOR SUSTAINABILITY LEADERSHIP? Srisrividhiya Kalyanasundaram, Sandhiya Kalyanasundaram,	1382
DESIGN: A REFLEXIVE, REFLECTIVE AND PEDAGOGICAL INQUIRY INTO SUSTAINABILITY Sudebi Thakurata	1388
URBAN MINE REDESIGN COURSE: RESEARCH AND TEACHING PRACTICE Xin Liu, Fang Zhong	1394
TRANSFORMING FOOD SYSTEMS IN CHINA: THE ROLES OF FOOD LITERACY EDUCATION IN ALTERNATIVE FOOD MOVEMENTS Yanxia Li, Hongyi Tao	1400
SUSTAINABILITY AND CREATIVE EDUCATION: DEVELOPING A SUSTAINABILITY CULTURE OF HIGHER EDUCATION IN CHINA Dr Yan Yan Lam, Sheng Feng Duan,	1406



This work is licensed under
a Creative Commons Attribution-Non Commercial-
ShareAlike 4.0 International License.

IS DESIGN PLAYING A ROLE IN THE REALISATION OF CIRCULAR ECONOMY PROJECTS IN EUROPE? A CASE STUDY ANALYSIS.

Chiara Battistoni

Department of Architecture and Design, Politecnico di Torino. Viale mattioli 39, 10125, Torino (IT). Chiara.Battistoni@polito.it

Silvia Barbero

Department of Architecture and Design, Politecnico di Torino. Viale mattioli 39, 10125, Torino (IT). Silvia.Barbero@polito.it

ABSTRACT

Thanks to the strong push coming from the European Union to fight waste production, the Circular Economy (CE) has gained an important role in Europe. Following this trend, many institutions nowadays state to work on the CE implementation or supporting the transition to a CE. However, are they including design approaches and practices? The design phase is starting to be considered the crucial point to obtain a CE as it required a profound radical change from the beginning of the process and at system levels. After framing the CE concept, we performed desk research to identify which are the players in the CE projects implementation. Afterwards, a multiple case study analysis were performed to the most proper one to understand the presence and the role of design in the implementation process. The results placed the actors in a very fragmented framework and seem to lack almost completely the design presence.

Keywords: circular economy, Europe, design, implementation

1. DESIGN AND CIRCULAR ECONOMY

Since 2014, with the relevant statement about the Circular Economy (CE) from the EU with the document EU (2014a), the scientific literature about CE has seen an exponential increase in contributions over many aspects as definition (e.g. Millar et al., 2019), implementation barriers (e.g. Kirchherr et al., 2018), case-studies (e.g. Principato et al., 2018). What seems to miss in this literature review are the actors that are working to support the CE implementation. One of the reason can be little interest by the academic/research sector on this topic or the not involvement of the academic/research sectors. However, the innovation model expects the involvement of three actors: industry, government and academia (triple helix model).

Another gap is the role of design (D) in the transition from the linear to a CE. However, the decision made by designers (Der) can influence all the value chain, so it is the base of the manufacturing sectors. As stated by Garetti and Taisch (2012), the manufacturing sector currently is one of the most involved in this transformation to meet the requirement of sustainability. The D phase is starting to be considered the crucial point to obtain a CE as it required a profound radical change from the beginning of the process and at system levels. As the Ellen MacArthur foundation stated, CE is ‘is restorative and regenerative by design’¹. This foundation, which is playing a very important in the training and in the spreading of the CE concept, with a collaboration with IDEO, an international known D company, has well recognised the role of D as an essential building blocks of CE², along new business models, reverse cycles and enablers and favourable system conditions.

They developed in 2017 the Design Circular Guide following this reason: “ Who we’re designing for has expanded from a solitary user to an intimately connected web of people, spanning the globe ”³. However scientific literature seems to be concentrated in the role of D only related to the product D process and closing circular resources loops (Lieder and Rashid, 2016; Bocken et al., 2016). D has more times demonstrated to the worlds its role in the creation of new opportunities and innovation (e.g Bertola and Teixeira 2003; Franzato and Celaschi, 2017). In the last years also its role in the creation of eco-innovation as demonstrated by different approaches to D for sustainability and the recent review by Ceschin and Gaziulusoy (2016) showing its evolution from product innovation to product-service system innovation to spatio-social innovation and to socio-technical system innovation.

As stated by Go et al. (2015) in fact the D practice in sustainability area has passed from D for life cycle, to the D for environment (preventive) to the whole systems D. The result is that D has changed its role, providing skills and capabilities to sustainability and CE (De los Rios and Charneley, 2017). Moreover, as stated by Celaschi (2008) Der can have the role as mediator between the competences thanks to his/her competences in dealing with many actors for the success of the project.

2. IMPLEMENTATION ACTORS

Arguing about who are the ones that support project implementation nowadays, the most recognized are the Business incubators (BIs). This recent phenomenon, mainly American, has emerged in the European framework. They are promoted as accelerators of entrepreneurship and able to create economic development with a bottom-up approach (CSES, 2002) focusing on the creation of new ventures (start-up). Although they are mostly focused on the technological aspects and the economic sustainability of the project, and not the environmental one (Battistoni and Barbero, 2019). Among them, in recent years, many other actors have emerged which performed similar services to BIs as business model review and providing fundings, addressing new projects implementation in existing enterprises.

One example are the regional innovation poles (referring to Europe) which are clusters of innovative start-ups, SMEs, big enterprises and research institutions, and are supporting innovative projects among existing enterprises, but with top-down approaches through institutions of calls. All these actors, are playing an important role in projects implementation, although is not clear enough their role in CE implementation and environmental sustainability. However, its clear the role of the eco-parks, mainly mentioned in the scientific literature, which represent the Industrial Ecology in action.

3. METHODOLOGY

Initially, to find the actors playing a role in the CE implementation was performed a literature review on Scopus database with the keywords “business incubator*” and “CE” in 2018 and, unfortunately, has zero results. For this reason, was also conducted research with more informal methods as desk research on Google and the social media Facebook to find the actors and both the main events related to CE to individuate more actors. A snowball approach was applied. Once the main actors were identified, we perform a multiple case study understanding their central role and which typology of actors they are. Besides, the actors that are focusing mainly on the business im-

¹ <https://www.ellenmacarthurfoundation.org/circular-economy/concept>.

² <https://www.ellenmacarthurfoundation.org/circular-economy/concept/building-blocks>

³ <https://www.circulardesignguide.com/>

plementation on CE where selected for further studies. A format with few answers were sent to them by emails to collect the data that are not present in the website of each actor to understand better their role, the services provided to support the implementation and the presence and the role of D in their services and staff/mentors.

4. RESULTS AND DISCUSSION

4.1. CE IMPLEMENTATION ACTORS

During the review on the CE concept in the document by the EU commission, EU (2014b) mention that the main actors which were just started before the 2014 to support CE implementation in companies are: the Ellen MacArthur Foundation (supported by McKinsey) that were presented some case studies and reports; the cradle2cradle Products Innovation Institute, which was giving the certification on cradle2cradle products considering their entire life-cycle. Another important source of information to find out cases was authors' experience as involvement in BE networks, Systemic D research network⁴, RETRACE project⁵. In addition the event 'Circular Economy Hotspot'(CEH), which took places from 2016 in various places: the Holland in 2016⁶, Luxemburg in 2017⁷ and Scotland in 2018⁸ (SCEH).The last one was attended by authors. The results are represented in figure 1.

The 24 actors, for their principal goal can be divided into main categories:

- Business Incubators for new start-ups: Ville Durable Programme⁹ by Paris&Co. (Google); Blue City 010¹⁰ (authors involvement in BE Network); Circular Economy Transition¹¹ (CEC¹² Group); 2i3t¹³ - university BI (Authors'city); Green Garage¹⁴ (EIT Climate Kic - Europe's leading climate innovation initiative);
- Organizations with services to support existing enterprises: Zero Waste Scotland Limited¹⁵ - Government's Lead Agency (SCEH); Clever¹⁶ - Innovation Pole (Authors'city); Advance London¹⁷ - programme by LWARB (contact in SCEH); Fit 4 Circularity¹⁸ (LCEH) -programme by Lux Innovation cluster; Circular Economy Lab¹⁹ (Authors'country - Not Yet In Action);
- Consultancy: Metabolic²⁰ (Climate Kic summit 2017); Copper 8²¹ (contacts in NL); Circle Economy²² (SCEH) - Circle Design Programme and Nederland Circulair!;
- Communication and training: Ellen Macarthur Foundation²³ (EU, 2014); C-Creators²⁴ (contacts in NL); Circular Glasgow²⁵ (SCEH); Circular London²⁶ (LWARB); Circle Lab²⁷ (mentioned by Circular Glasgow); C-Beta²⁸ - ex Circular Valley²⁹ (RETRACE);
- Network Creation: Circular Change³⁰ (SCEH); Circul'r³¹ (mentioned by Circle Lab);

Particular Cases: Cradle To Cradle Innovation Institute³² (EU, 2014; Braungart, 2003) focus on product certification; Symbiosis Center Denmark³³ (Focus On Industrial Symbiosis).

⁴ <https://systemic-design.net/sdrm/>

⁵ <https://www.interregeurope.eu/retrace/>

⁶ <https://hollandcircularhotspot.nl/en/>

⁷ <http://circularhotspot2017.lu/#ui-id-53-148093256354091>

⁸ <http://www.circularconomyhotspot.scot/>

⁹ <http://villedurable.parisandco.paris/Economie-Circulaire/Startups>

¹⁰ www.bluecity.nl

¹¹ https://www.cetransition.ch/?fbclid=IwAR23kZVD42Iux2N_pAc8XHR8gvzi9B2uyOPyIyvoQQ_Qadso1tF_YUATG1

¹² Circular Economy Club

¹³ <http://www.2i3t.it/>

¹⁴ <https://eit.europa.eu/newsroom/climate-kic-green-garage-germany%E2%80%99s-first-climate-innovation-incubator-opens-door>

¹⁵ www.zerowastescotland.org.uk/

¹⁶ <https://www.polo clever.it/it/polo-energy-and-clean-technologies/>

¹⁷ <https://www.lwarb.gov.uk/what-we-do/advance-london/>

¹⁸ <https://www.luxinnovation.lu/innovate-in-luxembourg/performance-programmes/fit-4-circularity/>

¹⁹ <https://www.cariplofactory.it/intesa-sanpaolo-e-fondazione-cariplo-lanciano-il-primolaboratorio-per-la-circular-economy-in-italia/>

²⁰ <https://www.metabolic.nl/our-work/ventures/how-we-work>

²¹ www.copper8.com/en/

²² <https://www.circle-economy.com/>

²³ <https://www.ellenmacarthurfoundation.org/>

²⁴ <https://c-creators.org/>

²⁵ <https://circularglasgow.com/>

²⁶ <https://www.lwarb.gov.uk/what-we-do/circular-london>

²⁷ <https://circle-lab.com/>

²⁸ c-beta.nl

²⁹ <https://www.circularvalley.com/>

³⁰ <https://www.circularchange.com/news/>

³¹ <https://www.circularchange.com/news/>

³² www.c2ccertified.org

³³ <https://symbiosecenter.dk/en/>

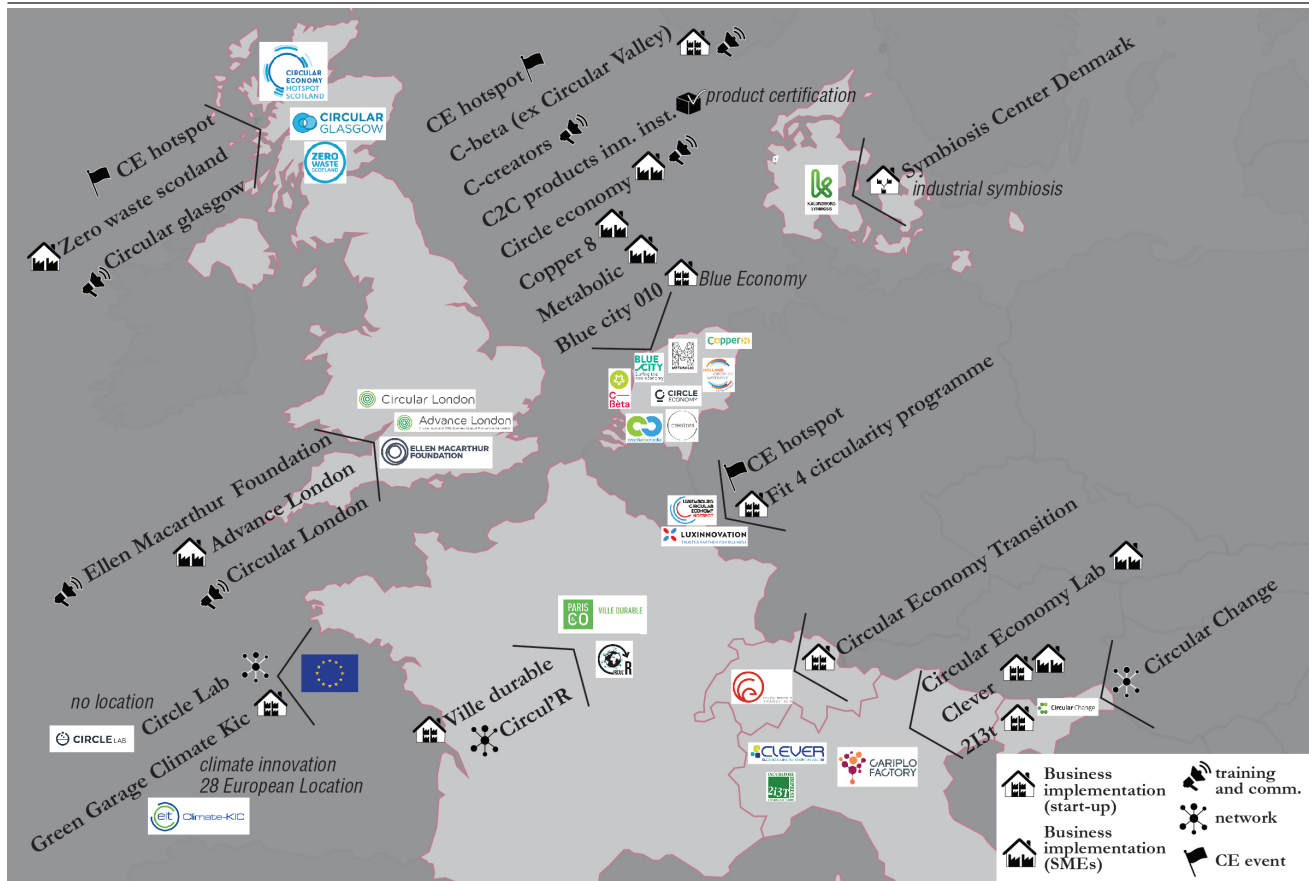


Figure 1 European CE implementation actors

The actors identified (img 1) show a very fragmented framework however, the one in the first two categories can be defined as ‘business implementation’ actor for their goals, although someone concern SMEs and other new ventures/start-ups. Moreover, some actors have a larger focus than CE: 2i3T on technology transfer but has a section on environment and energy; Green Garage on climate innovation; Metabolic on systemic thinking; Copper8 in sustainable breakthrough; Clever on energy and clean technologies however they have a particular section on CE. They were included in this analysis as their goal represent a subsection of CE however, many other realities as they can be present in Europe.

From a first analysis on the services performed by the actors, seems to lack almost the D presence, except for particular cases as the Cradle2Cradle innovation institute (the one that released the cradle2cradle certification for product and materials); Metabolic as a D studio and the Circle Economy which, with its particular programme, spreads circular D thinking. For this reason, was conducted a deeper analysis of the ‘business implementation’ category.

4.2. CE IMPLEMENTATION ACTORS AND DESIGN – DEEP ANALYSIS

To investigate the role of D and Ders in CE implementors, the 10 actors on business implementation were selected and contacted directly by authors. Unfortunately, 6/10 never reply or were not available or did not show any interest in responding. In this case, information was collected from websites. Results are shown in tab 1. The phenomenon, in general, seems to be very recent as the one only focuses on CE were founded after 2014, reflecting the EU behaviour. The results prove that all the actors provided many services to support business, although D is considered just by few actors. However, projects (PR), as the literature demonstrates, should be designed from the beginning to meets really the sustainability requirements of the world current environmental situation, before being implemented. If this is not checked or stimulated by implementation actors, the risk is to support businesses which are not providing a good impact at environmental level. Many Ders have received the education for sustainability, as the Lens conference³⁴ wants to demonstrate, and have the skills both to contribute in eco-D for products both for services and systems. The Ders which are providing services are mainly working in traditional roles as user experience and prototyping, although many answers are missing. Moreover, their presence among the staff is only in 4/10 and between mentors almost. Unfortunately, this answer doesn’t say anything about Der role because only 1 actor specify it as required by the question. Moreover, it wasn’t find any evidence of Der presence in mentors. Another interesting result is the almost wholly unawareness about the presence of Der in the PR implemented. One reason can be found in the not interest shown by actors to map the skills involved in PR. However, this aspect is very interesting to be analysed in the CE phenomenon as it is a multi-disciplinary concept.

34.by the LeNSin, the International Learning Network of networks on Sustainability European project (2015-2019). Lens conference <https://lensconference3.org/index.php#about>

Actor	foundation year	n° PR supported	Is D a service?	Is there any service provided by Der	Is there present in staff?	Is Der present in mentors?	Is Der Present in PR founders?	Is Der present in PR team?	Reference
Ville Durable	2016	>28 startups	No	n.d.	No	n.d.	n.d.	n.d.	website
Zero waste Scotland - business support service (depper focus)	2014	13 cases	Yes, improve current product D processors	n.d.	Yes*	n.d.	n.d.	n.d.	website
Advance London	2018	50 SMEs	No	n.d.	No	n.d.	n.d.	n.d.	website
Copper 8	2013	25 PR	No	No	No	No	No	No	contact*
Metabolic (depper focus)	2012	3 ventures	Yes	Yes*	Yes*	n.d.	n.d.	n.d.	website
Blue city 010	2013	8 stratups	No	n.d.	Yes, from Superuse Studios*	n.d.	n.d.	n.d.	website
Green Garage (deeper focus)	2010	> 1500 start-ups	No	No	No	No	No	No	contact*
Clever	2016 (2009 polight)	29° inn. PR	No (Yes from 2009-2015)	Support in new product development *	No	No	Don't know	Don't know	contact*
213t (depper focus)	2007	8 startups/ 82coal startups	Yes	Testing activities, usability. Service and Product implementation on prototyping	Yes, 1 with communication role	PD,C, UX	Don't know	>25 (PD,C, UX)	contact*
Fit 4c.	2014	4 inn. PR (1 in 2017, 3 in 2016)	No	n.d.	No	n.d.	n.d.	n.d.	Website and annual report*

[Table 1] results of the investigation part on business implementation actor

* information deducted

5. CONCLUSIONS

The actors identified show a very fragmented framework, both in their goal and in their categories: from governmental agencies and cities board, to innovation clusters and traditional business incubators, to consulting agencies and digital platforms. However, everyone can be defined CE implementors for their goal, although someone concern SMEs and other new companies/start-ups, someone have a broader goal. An exception is presented by the digital platforms which have the goal to increase the visibility and the relationships between the actors and the exterior. Although also their role its very important in increasing awareness on CE concept about citizens, which seems to lack in many cases. Another research by authors is focused on this aspect (Battistoni et al., 2019).

Although many answers from the deeper analysis are missing, the results show a very interesting picture of the D role. Der in the last years were educated for an active role in meeting sustainability requirements. However this aspects seems not clear outside academia, and in the business world they remain known as the one that can only create beauty (both in product than in graphics).

BIBLIOGRAPHY

1. Bertola, P., & Teixeira, J. C. (2003). Design as a knowledge agent: How design as a knowledge process is embedded into organizations to foster innovation. *Design Studies*, 24(2), 181-194.
2. Battistoni, C., Barbero, S. (2019). Systemic incubator for local eco-entrepreneurship to favour a sustainable local development: guidelines definition. EAD7 conference 2019. In press.
3. Battistoni, C., Lambiase, N., Barbero, S. & Barbera, F. (2019). What really matters? Systemic design, motivations and values of the circular economy companies in Italy. Lens3 conference 2019. In press.
4. Braungart M., McDonough W. (2009). *Cradle to cradle. Re-making the way we make thigs*. London: Vintage books.
5. Bocken, N., de Pauw, I, Bakker, C. & van der Grinten , B.(2016). Product design and business model strategies for a circular economy. *Journal of Industrial and Production Engineering*, 33:5, 308-320, DOI: 10.1080/21681015.2016.1172124
6. Celaschi, F. (2008). Design as a mediation between areas of knowledge. In Bistagnino, L., Celaschi, F., Germak, C., (2008). *Man at the center of the project*. Torino, Italy: Allemandi.
7. Ceschin, F., & Gaziulusoy, I. (2016). Evolution of design for sustainability: From product design to design for system innovations and transitions. *Design Studies*, 47, 118-163.
8. CSES (2002). *Benchmarking of business incubators*. Enterprise Directorate General, European Commission, Brussels. Retrieved online from <http://ec.europa.eu/DocsRoom/documents/2769/attachments/1/translations/en/renditions/pdf>
9. De los Rios, I. C., & Charnley, F. J. (2017). Skills and capabilities for a sustainable and circular economy: The changing role of design. *Journal of Cleaner Production*, 160, 109-122.
10. Ellen MacArthur Foundation (2012). *Towards the Circular Economy: Economic and business rationale for an accelerated transition*. Retrieved online: <https://www.ellenmacarthurfoundation.org>
11. EU (2014a). *Towards a circular economy: A zero waste programme for Europe*. Retrieved online from: https://eur-lex.europa.eu/resource.html?uri=cellar:50edd1fd-01ec-11e4-831f-01aa75ed71a1.0001.01/DOC_1&format=PDF
12. EU (2014b). *Turning waste into a resource Moving towards a 'circular economy'*. Retrieved online from: [http://www.europarl.europa.eu/RegData/etudes/BRIE/2014/545704/EPRS_BRI\(2014\)545704_REV1_EN.pdf](http://www.europarl.europa.eu/RegData/etudes/BRIE/2014/545704/EPRS_BRI(2014)545704_REV1_EN.pdf)
13. Franzato, C., Celaschi, F. (2017). A design-driven innovation process for the exploration of organisational scenarios: action research conducted in a manufacturing company. *Journal of Design Research*, 15(3-4), 309-328.
14. Garetti, M., Taisch, M. (2012) Sustainable manufacturing: trends and research challenges. *Production Planning & Control*, 23:2-3, 83-104, doi:10.1080/09537287.2011.591619
15. Go, T.F, Wahab, D.A., Hishamuddin, H., 2015. Multiple generation life-cycles for product sustainability: the way forward. *Journal of cleaner production*. 95, 16-29.
16. Kirchherr, J., Piscicelli, L., Bour, R., Kostense-Smit, E., Muller, J., Huibrechtse-Truijens, A., & Hekkert, M. (2018). Barriers to the circular economy: evidence from the European Union (EU). *Ecological Economics*, 150, 264-272.
17. Lieder, M., Rashid, A. (2016). Towards circular economy implementation: a comprehensive review in context of manufacturing industry. *Journal of cleaner production*, 115, 36-51.
18. Millar, N., McLaughlin, E., & Börger, T. (2019). The Circular Economy: Swings and Roundabouts?. *Ecological Economics*, 158, 11-19.
19. Principato, L., Ruini, L., Guidi, M., & Secondi, L. (2019). Adopting the circular economy approach on food loss and waste: The case of Italian pasta production. *Resources, Conservation and Recycling*, 144, 82-89.



the Learning Network
on Sustainability

The proceedings are also available at www.lensconference3.org

This work is Licensed under Creative Common Attribution-NonCommercial-ShareAlike CC BY-NC-SA

The conference was organized by:

Politecnico di Milano
Aalto University
Brunel University London
Cape Peninsula University of Technology
Hunan University
Indian Institute of Technology Guwahati
Srishti Institute of Art, Design and Technology

Technische Universiteit Delft
Tsinghua University
Universidad Autónoma Metropolitana
Universidad del Valle de México
Universidade Federal de Pernambuco
Universidade Federal do Paraná
Universiteit Stellenbosch

Other LeNSin associate partners cooperating with the organization are

- Londrina State University, Fluminense Federal University, Federal University of Alagoas, Federal University of Uberlândia, Federal University of Santa Catarina (**Brasil**)
- C.A.R.E. School of Architecture, Pandit Dwarka Prasad Mishra Indian Institute of Information Technology, Indian Institute Of Technology Gandhinagar, Goa College of Architecture, Hunnarshala Foundation for Building Technology & Innovations, Vastu Shilpa Foundation (**India**)
- Wuhan University of Technology, Jiangnan University, The University of Science and Technology Beijing, Beijing Information Science and Technology University, The Hong Kong Polytechnic University, Guangzhou academy of fine arts, Tongji University (**China**)
- Farm and Garden National Trust, Cape Craft and Design Institute NPC (**South Africa**)
- Univesidad National Autónoma Metropolitana, Instituto Tecnológico de Monterrey Campus Ciudad de México (**Mexico**)

Scientific Commetee:

Carlo Vezzoli
Aguinaldo dos Santos
Leonardo Castillo
Claudio Pereira Sampaio

Ranjani Balasubramanian
Ravi Mokashi
Brenda Garcia
Rodrigo Lepez Vela
Ephias Ruhode
Elmarie Costandius

Xin Liu
Jun Zhang
Fabrizio Ceschin
Cindy Kohtala,
Jan Carel Diehl

LeNSin main partners:

