Introduction

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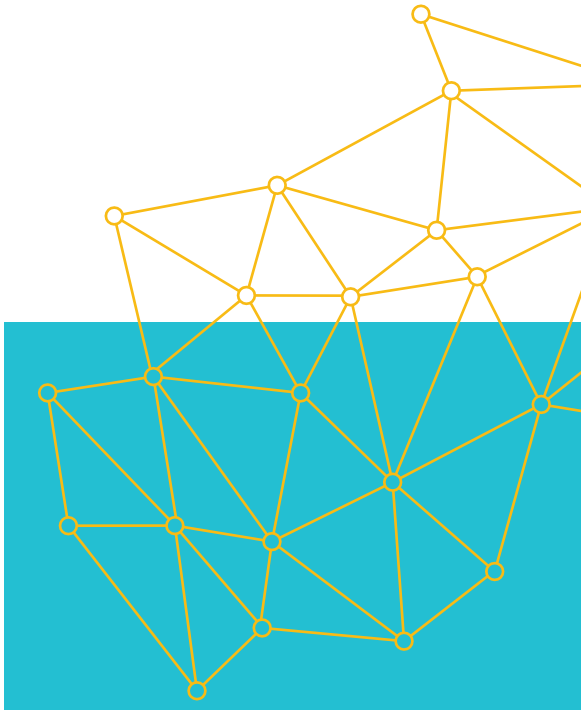

Systemic Design Method Guide for Policymaking:

A Circular Europe on the Way

volume 1

Edited by
Silvia Barbero

Allemandi

Retrace
Interreg Europe

European Union
European Regional
Development Fund

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www.interregeurope.eu/retrace

List of abbreviations

ADEME French Environment and Energy Management Agency

ANR French National Research Agency

BIT National Strategy for Bioeconomy

C2C Cradle to Cradle

C2CN Cradle to Cradle Network

CE Circular Economy

DfD Design for Disassembly

DG Directorate-General

EAP Environment Action Programme

EC European Commission

EcoSD Eco-design of Sustainable Systems

ENEC European Network of Ecodesign Centers

EPA United States Environmental Protection Agency

ERDF European Regional Development Fund

ERT European Round Table of Industrialists

ESF European Social Fund

ETC European Territorial Cooperation

EU European Union

FP7 Seventh Framework Programme

FVs Field Visits

GDP Gross Domestic Product

GODC Slovenian Governament Office for Development and European Cohesion Policy

GPs Good Practices

GPP Green Public Procurement

HD Holistic Diagnosis

ISWA International Solid Waste Association

LP Lead Partner – Politecnico di Torino

LSR Large Scale Retail

JTS Joint Technical Secretariat

MA Managing Authority

MSc Master of Science

MSW Municipal Solid Waste

NGO Non-Governmental Organization

NISP National Industrial Symbiosis Programme

OECD Organisation for Economic Co-operation and Development

OPs Operational Programmes

POR-FESR Regional Operational Program - European Regional Development Fund

PP2 Second Partner – Piedmont Region

PP3 Third Partner – Azaro Foundation

PP4 Fourth Partner – Beaz Bizkaia

PP5 Fifth Partner – Higher School of Advanced Industrial Technology (ESTIA)

PP6 Sixth Partner – Association for Environment and Safety in Aquitaine (APESA)

PP7 Seventh Partner – Slovenian Government Office for Development and European Cohesion Policy

PP8 Eighth Partner – Romanian North-East Regional Development Agency (NERDA)

R&I Research and Innovation

RAPs Regional Action Plans

RES Renewable Energy Source

RIS Regional Innovation Strategies for Smart Specialization

ROP Regional Operational Programme

SD Systemic Design

SG Steering Group

SYDERE Systemic Design Research and Education

SME Small Medium Enterprise

SRIP Strategic Research and Innovation Partnerships

TAA Total Agricultural Area

TEPCV Positive Energy Territory For Green Growth Label

ToR Terms of Reference

UAA Useful Agricultural Area

UNFCCC United Nations Framework Convention on Climate Change

WCED World Commission on Environment and Development

WTO World Trade Organization

ZERI Zero Emissions Research and Initiatives

ZGZD Zero Waste Territories Label

Preface

ERWIN SIWERIS

As Europe is moving towards an accelerated global economy, it is vital to adopt proper governance actions to achieve a sustainable future. In this context, it is necessary that new policies come from the effort and commitment of multidisciplinary teams. Interreg Europe helps regional and local governments across Europe to develop and deliver better policy. Supported by the European Regional Development Fund with 359 million euros from 2014 to 2020, the programme fosters regional policymakers through cooperation projects and policy learning platforms.

In 2016 we introduced the RETRACE Project (A Systemic Approach for Transition towards a Circular Economy)[1] which was financed under the first call for proposals of the Interreg Europe ETC Programme, 4.2 Specific Objective: Improving resource efficient economy policies. This project is a coordinated work between universities, local authorities, government offices, associations and public administration whose main aim is to address the EU challenge of transitioning towards a Circular Economy following the priorities set up by the "Flagship Initiative for a Resource-efficient Europe" for a shift towards a resource-efficient, low-carbon economy to achieve sustainable growth as enshrined in the Europe 2020 strategy and the EC Communication "Towards a Circular Economy: A Zero Waste Programme for Europe".

The outcome of the project over the first 16 months has been remarkable, facing stimulating challenges and achieving brilliant results by the eight partners of the project from Italy, Spain, France, Slovenia and Romania. Among the main achievements are:

6 field visits in the five partner regions and in The Netherlands;
48 good practices of Circular Economy and Systemic Design exchanged;
5 Holistic Diagnosis assessing the state of the art of the 5 partner regions in relation to Circular Economy related policies;
5 regional dissemination events, one in each country, with more than 250 attendees;
5 stakeholder groups formed in the partner regions, involving more than 70 entities;
4 videos showing the good practices encountered during the field visits;
2 newsletters sent to over 700 contacts.

This volume entitled *RETRACE Systemic Design for Policymaking: a Circular Economy on the Way* is addressed to regional policymakers and policy managers and is the first of a three book series that the RETRACE Project will deliver across a four-year period (2016–2020). Its main purpose is to illustrate to policymakers the Systemic Design as a tool to define sustainable activities based on Circular Economy.

The Systemic Design methodology and the results achieved in this first phase of the project constitute the main focus of the book which also offers a glimpse on what is expected in the next years with the definition of five Regional Action Plans focused on the development of Circular Economy policies in all partner regions. Eventually, the second phase of the project, from 2018 to 2020, will be devoted to the implementation of these policies.

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Lille, France

[1] www.interregeurope.eu/retrace

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Introduction

SILVIA BARBERO

The Circular Economy concept and terminology has gained *momentum* after the 2012 World Economic Forum, where a report, prepared in collaboration with the Ellen MacArthur Foundation and McKinsey & Company, showed for the first time its convenience and the way to drive a new economic development.[1] However, popularity very often carries disadvantages or risks as, for example, becoming just a buzzword. Some people affirm that the true substance of circular economy is lost in translation and is misunderstood. There are many misconceptions of circular economy such as that it is just another way of describing recycling, or that it encourages people to re-use and keep products for a longer time, therefore it decreases sales since it might be an opportunity for some people, but on the long term will have a negative impact on manufacturers, and so on.

This book aims to clarify the role of circular economy according to a sustainable development and how policymakers can address it in their activities. The main question is: which methodology can policy managers use in order to define a clear path towards a circular economy in their regions?

Effective circular economy policymaking requires the combination of many policy interventions, that do not rely on a "silver bullet" or on blanket solutions (Simon Boas et al., 2015) and on classical borders of a single organization (Frey, 2013). It is necessary to stimulate the cooperation among different actors over networks (Ruggieri et al., 2016).

The path towards circular economy means shifting form a linear and mechanistic approach to a holistic and integrated one, where the number of variables and relations generates a complex environment. So the policies should manage and solve complex problems with new approaches compared to the past. What is required now is a disruptive approach that helps people to "think outside the box" (Considine, 2012). In such a situation the role of design can be crucial because it is used to manage complex environments, find unusual solutions, visualize unexpected future situations, and promote openness and surprises. The thought-process typical of designers is useful and effective to undertake policymaking actions. Hence, this book gives large space to a design method that helps all the actors involved in policymaking processes to define a successful way towards the circular economy. Design policy can be based on the application of design methods and design thinking in order to extend to a new level the design methodologies and use them for policy planning. In policymaking processes many programs are developed by different stakeholders and actors. To face this kind of complexity it is now necessary to use creative and structured innovation processes and approaches. Specifically, the Systemic Design method provides specific tools in order to manage complex situations, to design new relations among the entities of a territory, to visualize the hidden potentialities and to boost proactive collaboration among local actors.

This situation offers a not-to-be-missed opportunity for policymakers to collaborate with businesses that have already started the transition towards a circular economy. In addition, it is essential to cooperate and engage with local society stakeholders, including citizens and consumers, labour unions and environmental organisations. One more aspect of this broad co-design purpose should be taken into account: different government departments (including environment, business and industry, finance...) should collaborate and share the same goals to overcome unexpected policy barriers. Defining policies usually implies a top-down approach that rarely includes final users and citizens. However, in this new era, participatory processes are fundamental to design effective policy strategies. Systemic Design includes design thinking, bottom-up design, human and user-centred design, co-design, participatory design which all have in common a bottom-up approach and the active engagement of users in the designing process, thus the end-user becomes the centre of the policy formulation system, creating a new decisional process (Allio, 2014).

In this new coevolving network, the coordination of the many actors involved and their actions should be guaranteed since it ensures the stability of cooperation over time and avoids freeriding. This book testifies the strong collaboration that distinguish the RETRACE Project, where all partners directly involved in the project[2] and the local stakeholder (about seventy entities) are truly active in developing new strategies and plans. Each partner has curated at least one chapter of this volume based on their interests, experiences and tasks involved in the project. Furthermore, other acknowledged experts in this field enjoy the opportunity to share their knowledge providing a broad range of different points of view. Their contributions are mostly included in the first part of the book dedicated to a general overview on circular economy followed by a second part in which are mostly present contributions by the RETRACE Project partners.

The book opens with a contribution by Erwin Siweris, the Programme Director of the Interreg Europe programme, that funds the RETRACE Project which aims at promoting Systemic Design as a method allowing local and regional policies to move towards a circular economy, according to which waste from one productive process becomes input in another, preventing waste being released into the environment. This book comes after one year and half since the beginning of the project (1st April 2016) and aims to clarify the method that has been adopted to develop this project and to provide other policymakers and policy managers with tools to develop effective regional action plans respectful of sustainable growth. Following the priorities set up by the Europe 2020 strategy and the EC Communication "Towards a Circular Economy: A Zero Waste Programme for Europe", the main challenge of RETRACE — and consequently of this book — is to offer concrete examples and valuable tools to move towards a circular economy.

The first part of the book is dedicated to the evolution of the concept of circular economy, how it has been accepted and performed at European, national and regional level, with special attention to the Interreg programme (both the Interreg IVC and the Interreg Europe) and its policies in that field. The last part of this section leads to the second part of the volume focused on the "design toolkit" for policymakers and managers.

The core of the book is dedicated to the Systemic Design Methodology and how it can support this transition with the description of steps required for the development of complex systems. First, a complementary view on complex and systemic approaches introduces the definition and evolution of Systemic Design, described with a historical approach. Then, a detailed explana-

tion of the steps which need to be followed in the design process of Systemic Design, when it is applied to policy design and it fosters and promotes territorial relationships.
The third part of the book is an in-depth analysis of the RETRACE Project in order to help the reader to better understand the context in which it was developed and its successful results. The project goals, the expected results and the timeline are detailed with a specific attention to the partners and the local stakeholder involved and their role.
The last part of the book merges the theoretical part of the second section on the Systemic Design Methodology with the pragmatic part of the third section dedicated to the RETRACE Project, therefore it describes step-by-step the methodology that has been applied, divided according to its two main activities: the exchange of experiences and the communication/dissemination process. The exchange of experiences among the European regions plays a huge role in RE-TRACE, i.e. the Holistic Diagnosis on different territories, the field visits, how European good practices were selected, and eventually, how the Regional Action Plan and the Policy Brief were conducted. Also the dissemination activities are taken in great consideration because they reveal how to reach a broader audience and achieve collaborative participation from different actors. Due to this reason, the book also exposes the strategies employed to successfully communicate the project and the role held by the European Policy Learning Platform.
This book aims to be the first step of a journey towards a deeper understanding of circular economy and the Systemic Design Methodology, but above all, it can constitute the stimulus for targeted actions. Its scope is to lead the efforts of all those actors, especially policymakers, who want to initiate a sustainable growth in their territories.
Policymakers can play an important role in this process while creating the proper enabling conditions, setting the direction for the transition and fostering the dialogue between public and private entities. They can act immediately fixing market and regulatory failures and, in a longer perspective, actively stimulate the market activity by establishing new targets, changing public procurement policy, designing collaboration platforms and providing financial or technical support to systemic-design-oriented businesses. Moving towards the circular economy offers a unique opportunity for businesses and policymakers to collaborate and, at the same time, to achieve wider societal goals.
For policymakers using the Systemic Design Methodology and a holistic approach can sup-port the creation of more efficient policies for a transition towards a circular economy and find innovative solutions to reinvent and shape a more sustainable economy.
This book is the result of an intense dialogue with many people who present different perspec-tives and seek for a common language which is able to consider the bigger picture of the current complexity in policymaking and designing. The inspiring results of this book are the outcome of all contributors who put their experiences at the service of this broad community, and I am the only one to blame for any mistake there may be.
First of all, I would like to give special thanks to Professor Bistagnino who introduced me to this topic few years ago and constantly encouraged me in doing my best. Most of this work was possible thanks to his support and open mindedness in always being available in discussing with me and showing me the complexity of systems. He also introduced me to Gunter Pauli, who inspires me every time we have the chance to meet together.
I would like to express my sincere gratitude to Erwin Siweris, Director of the Interreg Europe Programme, for the preface of this book as well as for the great chance I was given of coordinat-

ing the RETRACE Project, a challenging and inspiring venture which allows me to broaden the horizon and responsibilities involved in the transition toward a circular economy.

I also would like to thank Daniel Calleja Crespo, the General Director for DG Environment of the European Commission, for his receptiveness and availability; he is able to show, with simple words, the hard decisions that the European Commission has taken with the definition of the Circular Economy Package.

The genuine perspective of Jocelyn Bailey from the University of Brighton on the role of design in policymaking was truly inspiring for me; and above all, for clarifying the original elements that designers and policymakers face nowadays together.

I would also like to express my gratitude to all the people involved in the RETRACE Project, among whom I had the opportunity to become acquainted with many engaged experts who have become hard-working, supporting travel companions. Their passion is testified through all their contributions to this book and the commitment they have taken to a more intense dialogue on the topics addressed in this volume.

Last but not least, I am grateful to my colleagues at Politecnico di Torino, who work with me on this project on a daily base and are always ready and open to discussing and supporting me in every task, especially the most challenging ones.

This book is the result of the collaboration and passion of all these people.

[1] Technical Report, World Economic Forum (2014). Towards the Circular Economy: Accelerating the Scale-up across Global Supply Chains. Avaliable https://www.weforum.org/reports/towards-circular-economy-accelerating-scale-across-global-supply-chains/ (Accessed 4th August 2017)

[2] Politecnico di Torino (IT), Regione Piemonte (IT), Azaro Foundation (ES), Beaz (ES), Higher School of Advanced industrial Technology ESTIA (FR), Association for Environment and Safety in Aquitaine APESA (FR), The Slovenian Government Office for Development and European Cohesion Policy (SI), The Rumanian NorthEast Regional Development Agency (RO).

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Allio, L. (2014). *Design Thinking for Public Service Excellence*. Singapore, Singapore: UNDP Global Centre for Public Service Excellence.

Considine, M. Thinking Outside the Box? Applying Design Theory to Public Policy. *Politics & Policy*, vol. 40, no. 4, 704–24, 2012. doi: 10.1111/j.1747-1346.2012.00372.x

Frey, M. La green economy come nuovo modello di sviluppo. ImpresaProgetto. *Electron. Journal of Management*, vol. 3, 1–18, 2013.

Ruggieri, A., Braccini, A.M., Poponi, S., Mosconi, E.M. (2016). A Meta-Model of Inter-Organisational Cooperation for the Transition to a Circular Economy. *Sustainability, 8 (1153),* 1-17. doi:10.3390/su8111153.

Glossary

Bioeconomy, Biobased Economy

The part of economy that refers to the conversion of renewable biological resources into products through new efficient biotechnologies is called Bioeconomy. Intensive scientific and research activities have allowed the development of economic activities focused on the creation of vital products such as food and feed, but also bio-based products and bioenergy, starting from the products of land and sea (e.g. crops, forests, fish, animals and micro-organisms).
The term was first mentioned by Juan Enriquez and Rodrigo Martinez (Life Sciences Chief Strategist at IDEO) at the Genomics Seminar in the 1997 AAAS meeting and afterwards an excerpt of the paper was published in *Science Magazine*.
Bioeconomy was considered as a point of interest by Europe and on 13 February 2012 the Europe's Bioeconomy Strategy was launched and adopted under the lead of DG Research and Innovation and co-signed by several other Commission departments (Agriculture and Rural Development, Environment, Maritime Affairs, and Industry and Entrepreneurship). The strategy would like to answer to environmental global challenges such as increasing populations, depletion of natural resources and climate change and the white paper on "Bioeconomy" sets vision 2030 along with policy recommendations.

See: *http://biotechsupportbase.com/2014/02/06/bio-economy/*
See: *https://ec.europa.eu/research/bioeconomy/index.cfm*

Blue Economy

In the European context the Blue Economy can refer to two different conceptions. One is the economy derived from the blue growth, the long term strategy for the marine and maritime sectors by the European Union. The other is the open-source movement lead by Gunter Pauli, a Belgian businessman and former Ecover CEO, who is the action part of ZERI (Zero Emissions research and initiatives). In this publication we refer to the second notion.
Born as a report to the Club of Rome, the book *Blue Economy* by Gunter Pauli firstly presented in November 2009 describes "100 innovations that can create 100 million jobs within the next 10 years." The author demonstrates, taking inspiration from nature, that it is possible to create innovative business models which coexist in harmony according to nature's evolutionary path. The manifesto declares that local systems of production and consumption are able to generate multiple products and services and build social capital based on their own resources.

See: *http://www.theblueeconomy.org/*
See: *http://www.zeri.org/ZERI/About_ZERI.html*
See: *https://ec.europa.eu/maritimeaffairs/policy/blue_growth_en*
See: *https://www.ellenmacarthurfoundation.org/circular-economy/schools-of-thought/blue-economy*

By-Product

Defined in the Cambridge Dictionary as "something that is produced as a result of making something else," in the context of production it is the "output from a joint production process that is minor in quantity and/or Net Realizable Value when compared with the main products" (Wouters, 2012: 535). Its Net Realizable Value usually is not inventoried but "is recognized as 'other income' or as a reduction of joint production processing costs when the by-product is produced" (WTO, 2004).

In December 2005, the European Commission defined the distinction between waste and by-products as part of the Thematic Strategy on the prevention and recycling of waste: "by-product is a production residue that is not a waste" (European Commission, 2007).

See: *http://dictionary.cambridge.org/it/dizionario/inglese/by-product*
See: *http://ec.europa.eu/environment/waste/framework/by_products.htm*
See: *https://en.wikipedia.org/wiki/By-product*
European Commission (2007). Communication from the Commission to the Council and the European Parliament on the Interpretative Communication on Waste and By-Products. Available http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52007DC0059 (Accessed 18th May 2017)
World Trade Organization (2004). United States. Final Dumping Determination on Softwood Lumber from Canada, WT/DS264/AB/R.
Wouters, M., Selto, F.H.; Hilton, R.W.; Maher, M.W. (2012). *Cost Management: Strategies for Business Decisions*. New York City, New York, US: McGraw-Hill.

Cascade Effect

As defined by the Oxford Dictionary, a cascade effect is defined as "a process whereby something, typically information or knowledge, is successively passed on and a succession of devices or stages in a process, each of which triggers or initiates the next." The term is applied to many different contexts, mainly medicine and ecology.

See: *https://en.oxforddictionaries.com/definition/us/cascade*
See: *http://www.encyclopedia.com/science/dictionaries-thesauruses-pictures-and-press-releases/cascade-effect*

Circular Economy

According to the definition provided by the Ellen MacArthur Foundation, Circular Economy is "restorative and regenerative by design. In a circular economy, there are two kinds of material cycles: biological, capable of being reintegrated into the biosphere, and technical, destined to be re-valorized without entering the biosphere. As envisioned by the originators, a circular economy is a continuous positive development cycle that preserves and enhances natural capital, optimises resource yields, and minimises system risks by managing finite stocks and renewable flows. It works effectively at every scale." In a Circular Economy, the use of resources (input) is optimised and the production of by-products or waste (output) is minimised through different kinds of actions that include design for long lasting products, maintenance, reuse, recycling, repair, remanufacturing and refurbishing. This approach is opposed to the linear economy, guided by the "take, make, dispose" production model.

See: *http://www.c2cproducts.com/detail.aspx?linkid=1&sublink=6*
See: *https://www.ellenmacarthurfoundation.org/circular-economy*
See: *https://en.wikipedia.org/wiki/Circular_economy*

Clean Technology

Clean Technology is a broad term which refers to processes, products and services that, compared to traditional technologies, are characterized by: a lower environmental impact, superior performances and a more responsible and productive use of resources.

European Commission - Business Innovation Observatory (2014). *Clean Technologies. Closed-loop waste management*. Available http://ec.europa.eu/DocsRoom/documents/13396/attachments/2/translations/en/renditions/native (Accessed 18th May 2017)

Cradle to Cradle

The term (also cradle-to-cradle, C2C and cradle-2-cradle) is an evolution of the notion "cradle-to-grave".

Moving from the concept of a linear model for products that consider them from the resources extraction (cradle) to the disposal moment (grave), C2C implies concepts of sustainability, recover, reuse, considering the products from their birth to their re-birth. It started from a design context (cradle-to-cradle design) developing from the biological metabolism a model of "technical metabolism flow of industrial materials." It states that: "product components can be designed for continuous recovery and reutilization as biological and technical nutrients." "The cradle-to-cradle framework moves beyond the traditional goal of reducing the negative impacts of commerce (eco-efficiency), to a new paradigm of increasing its positive impacts (eco-effectiveness)."
The manifesto of this concept is dated 2002: *Cradle-to-Cradle: Remaking the Way We Make Things* by William McDonough and Michael Braungart. Today the terms Cradle to Cradle® and C2C® are registered trademarks of MBDC - McDonough Braungart Design Chemistry, LLC.

McDonough, W., and Braungart, M. (2002). *Cradle to cradle: Remaking the Way We Make Things*. New York City, New York, US: North Point Press.

See: *https://en.wikipedia.org/wiki/Cradle-to-cradle_design*

See: *https://en.wikipedia.org/wiki/Cradle_to_Cradle:_Remaking_the_Way_We_Make_Things*

See: *http://www.c2cproducts.com*

Design by Components

Methodology that focuses on the design of complex products such as large and small household appliances, electrical and electronic equipment, communication tools, work tools...) since the redefinition of its essential internal components. The proposals thus developed, in addition to optimizing the assembly of components, giving rise to innovative expressiveness over the usual image of these products. This methodology allow to give a longer life to the products, facilitating the maintenance and the use of the product.

Bistagnino, L. (2008). *The Outside Shell Seen from the Inside*. Milano, Italy: CEA.

Design for Disassembly

Design for Disassembly (DfD) is a design strategy that aims to reduce the environmental impacts of products, by considering — already in the design phase — the needs to disassemble a product (either for maintenance or for end-of-life treatment) as well as simplifying the dismantling operations and the separation of components and materials.

See: *http://www.core77.com/posts/15799/afterlife-an-essential-guide-to-design-for-disassembly-by-alex-diener-15799*

Ecodesign

Ecodesign is a broad term, defined by the European Union, as the "integration of environmental aspects into product design with the aim of improving the environmental performance of the product throughout its whole life cycle." Focused on reducing the environmental impacts of products, Ecodesign involves different design strategies, such as Design for Disassembly, Design by Components, Systemic Design, Design for Recycling, Design for Environment.

European Union (2009). Directive 2009/125/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy-related products. Available http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32009L0125&from=EN (Accessed 18th May 2017)

Green Economy

Green Economy is an economy aimed at taking into account the environmental impacts of economic activities, minimising them. According to UNEP a green economy is low carbon, socially inclusive and resource efficient. As a result, human well-being is improved and environmental risks are reduced.

UNEP. (2011). Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication - A Synthesis for Policy Makers. Available www.unep.org/greeneconomy (Accessed 18th May 2017)

Happy Degrowth

Latouche, defines degrowth as "a political slogan with theoretical implications", whose function is to open up conceptual and practical opportunities for escaping the impasse and mentality of the current economy. This requires avoiding the trap of getting tangled in economic proposals and an economic idiom when envisioning the transition to a degrowth society, i.e. avoiding the "economism" that characterizes industrial society and which is at the heart of the ideology of development (Latouche, 2010).

Latouche, S. (2010). Regrowth (editorial). *Journal of Cleaner Production*, no. 18, 519–522.

Latouche, S. (2010). La Gauche, peut-elle sortir de l'économisme?, *La Décroissance*, no. 70, 5.

Industrial Ecology

Industrial Ecology is the study of material and energy flows through industrial systems. Focusing on connections between operators within the 'industrial ecosystem', this approach aims at creating closed-loop processes in which waste serves as an input, thus eliminating the notion of an undesirable by-product. Industrial ecology adopts a systemic point of view, designing production processes in accordance with local ecological constraints whilst looking at their global impact from the outset, and attempting to shape them so they perform as close to living systems as possible.

See: *https://www.ellenmacarthurfoundation.org/circular-economy/schools-of-thought/industrial-ecology*

Frosh, R.A., Gallopoulos, N.E. (1989). Strategies for Manufacturing. *Scientific American*, vol. 3, no. 189, 94-102.

Industrial Symbiosis

Industrial Symbiosis represents one of the subsets of Industrial Ecology. Industrial Symbiosis traditionally separates entities in a collective approach to competitive advantage involving physical exchanges of materials, energy, water and by-products (Chertow, 2000). Different industries collaborate among them for mutual economic and environmental benefit, even if partners should be independent ("across the fence"). Someone's waste is one's raw material, in a way that is economically and environmentally profitable. The Industrial Symbiosis is the development of industries in a system to reach improved performance. This is because exchanges enabled through collaborative synergistic connections have the potential to improve resource use efficiencies, thus contributing to the reduction of resource throughput and pollutant generation.

Chertow, M.R. (2000). Industrial Symbiosis: Literature and Taxonomy. *Annual Review of Energy and Environment*, vol. 25, 313-337.

Policy Design

Policies are revealed through texts, practices, and symbols, and discourse that define and deliver values including goods and services as well as regulations, income, status, and other positively or negatively valued attributes. Policy design refers to the content and substance of public policy; blueprints, architecture, discourses, and aesthetics of policy in both is instrumental and symbolic forms.

As an area of study Policy Design engendered a large literature in the 1980s and 1990s with prominent figures in the US, Canada, Europe and Australia. After the early 1990s, however, this literature tailed off and although some writings on policy design have continued to flourish in specific fields such as economics, energy and environmental studies, in the fields of public administration and public policy more generally the idea of 'design' was often replaced by the study of institutional forms and decentralized governance arrangements.

Schneider, A.L., and Ingram, H. (1997). *Policy Design for Democracy*. Kansas City, Missouri, US: University of Kansas Press.

See: *http://archives.ippapublicpolicy.org/Policy~Design~Principles~and*

Policy Instrument

A policy instrument is a means for public intervention. It refers to any policy, strategy, or law developed by public authorities and applied on the ground in order to improve a specific territorial situation. In most cases, financial resources are associated with a policy instrument. However, an instrument can also sometimes refer to a legislative framework with no specific funding.

Interreg Europe (2016). Interreg Europe Programme Manual. Available https://www.interregeurope.eu/fileadmin/user_upload/documents/Call_related_documents/Interreg_Europe_Programme_manual.pdf (Accessed 18th May 2017)

Recycle

As defined by the United States Environmental Protection Agency (EPA), "recycling is the process of collecting and processing materials that would otherwise be thrown away as trash and turning them into new products."
It is a good alternative to "conventional" waste disposal that can valorise material and help lower greenhouse gas emission, in terms of CO_2. The act of recycling prevent the large number of waste of potentially useful materials and reduce the consumption of new raw materials. This is reflected in the reduction of energy usage, air pollution (mainly from incineration), and water pollution (mainly from landfilling).

See: *https://en.wikipedia.org/wiki/Recycling*

See: *https://www.epa.gov/recycle/recycling-basics*

Repair

According to the definition provided by the article of *Product Design in a Circular Economy*, "repair is the correction of specific faults in an obsolete product or in a product that is not working such as at first, bringing the product back to working condition, whereby any warranty on the repaired product generally is less than those of newly manufactured equivalents any may not cover the whole product, but only the component that has been replaced" (Hollander, 2017).

Den Hollander, M.C., Bakker, C.A. and Hultink, E.J. (2017), Product Design in a Circular Economy: Development of a Typology of Key Concepts and Terms. *Journal of Industrial Ecology*, vol. 21, 517–25. doi:10.1111/jiec.12610

Reuse

Reuse is the act or practice of using something a second time. This action helps saving time, money, energy and resources, activating the reprocessing of previously used items. The purpose of reuse can be duple: to maintain the original function of the object (conventional reuse) or to accomplish a different one (creative reuse or repurposing). It is totally different from recycling, which is the despondency of used items to make raw materials for the production of new products.

See: *https://en.wikipedia.org/wiki/Reuse*

Service Design

The asset of planning and organizing people, infrastructure, communication and material components of a service, in order to refine its quality and the interaction between the service provider and its customers is called Service Design.

This category of design may function as a way to provide changes to an existing service or to create a new service entirely. Service design uses methods and tools derived from different disciplines ranging from ethnography to information and management science to interaction design. The purpose of this methodology is to promote best practices for designing services in accordance with both the needs of customers and the competencies and capabilities of service providers. It can be Product-Oriented, Result-Oriented or Use-Oriented.

See: *https://en.wikipedia.org/wiki/Service_design*

Vezzoli, C., Kohtala, C., and Srinivasan A. (2014). *Product-Service System Design for Sustainability*. Oxford, UK: Greenleaf Publishing Limited.

Systemic Design

Systemic Design is a recent initiative in design that integrates systems thinking and human-centered design, with the intention of helping designers cope with complex design projects. The recent challenges to design coming from the increased complexity caused by globalization, migration, sustainability render traditional design methods insufficient. Designers need better ways to design responsibly and to avoid unintended side-effects. Systemic Design intends to develop methodologies and approaches that help to integrate systems thinking with design towards sustainability at environmental, social and economic level. It is a pluralistic initiative where many different approaches are encouraged to thrive and where dialogue and organic development of new practices is central.
In this publication we refer to the methodology defined by Professor Luigi Bistagnino, which is built around the key principle that the material and energy output of a system (waste) can become input for another one (resource), taking inspiration from nature (Bistagnino, 2011). These relationships generate an autopoietic system of interconnected processes where waste is reduced and that tends to produce zero emissions. This system is strictly connected to the local territory in which the process operates and is built around the needs of the people related to it.

See: *https://en.wikipedia.org/wiki/Systemic_design*

Bistagnino, L. (2011). *Systemic Design. Designing the productive and environmental sustainability*. Bra: Slow Food Editore.

Upcycle

Upcycling is the process of transforming by-products, waste and useless materials, and unwanted products into new materials or products characterized by better quality or better environmental value. This process is also known as "creative reuse". Upcycling is the opposite of downcycling, that transforms materials and products into new ones of lesser quality.

See: *https://en.wikipedia.org/wiki/Upcycling*

Authors' Biographies

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Jocelyn Bailey is a designer with particular expertise in social design and policy. She is a senior consultant at service design agency Uscreates, where she works with a range of government and public sector clients on strategic design projects. She is also pursuing a PhD through the Arts & Humanities Research Council's 'Design Star' Doctoral Training Programme. Based at the University of Brighton, her research examines and critiques the growing trend of design being used as a strategic and policy tool by governments, to support the development of practice in this field. In 2014 she was a Visiting Scholar at the V&A, working on a project for the AHRC, mapping social design research and practice. Previously, Jocelyn led the manufacturing, design and innovation team at Westminster think tank Policy Connect. She trained as an architect at Cambridge University, and has an MA in History of Art from Birkbeck College (University of London).

CYRIL BALDACCHINO
Engineer Cyril Baldacchino is an eco-innovation project manager at APESA, where he manages the team and eco-design projects. He holds a master degree in Information System Management, a diploma of IAE Pau / Engineering School of ESTIA and a master degree in Business Management from University of Bordeaux/Engineering School ESTIA. He has been working in the field of innovation and eco-design since 2004 while supervising various eco-design projects in different sectors (e.g. furniture, sport, biomass) with companies and several R&D projects, as the PREBIOM project concerning comparative life cycle assessment of different biomass valorisation routes within the Aquitaine region.

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Silvia Barbero, PhD is an Assistant Professor at Politecnico di Torino (Department of Architecture and Design). She is lecturer of Product Environmental Requirements at the Design and Visual Communication degree and of Systemic Design at the Systemic Design Master degree at Politecnico di Torino. She is also responsible for the stage & job design curriculum and member of the H2020@polito Committee in Advanced Manufacturing and Processing. Her research mainly focuses on Systemic Design applied to agro-food and energy systems. She is scientific coordinator of the RETRACE Project (Interreg Europe – I Call) on the development of local and regional policies moving towards a circular economy, preventing waste being released into the environment. She has been coordinator also of regional project, and team leader of international project.
She is the author of some books on sustainable design, furthermore she wrote more than 100 papers in peer-reviewed journals, book chapters and reviewed international conference proceedings.

CHIARA BATTISTONI
Chiara Battistoni is a systemic designer currently pursuing a PhD in Management Production and Design at Politecnico di Torino, working with the Systemic Design Research Group in the Department of Architecture and Design. Since her bachelor degree in Industrial Design and a Master in Ecodesign, she has been actively interested in Sustainable Environmental Design. Her research focuses on the territorial potentialities reached thanks to the Systemic Design Approach which she started investigating since her master thesis and through collaborative projects as a research fellow.

LUIGI BISTAGNINO

Architect and designer, he lives and works in Torino, Italy. Founder of the research group on Systemic Design at the Politecnico di Torino aimed at developing products and processes in order to obtain zero emission. He was full Professor of Industrial Design and president of Industrial Design Courses at Politecnico di Torino, now he founded the Systemic Approach Foundation. He has contributed with numerous essays and articles to many important national and international reviews.

He designed objects currently in production and won national and international design prizes such as "Il Compasso d'Oro ADI".

Coordinator and member of many national and European researches. Among his main publications: *Systemic Design* (2011); *The Outside Shell Seen from the Inside* (2008); *Design Piemonte* (2007); *Design with a Future* (2003).

EMANUELE BOMPAN

Emanuele Bompan is a journalist and communicator with an international experience and author of numeruos reports on energy, climate change, environment, US politics. He published the book *Che cosa è l'economia circolare* (2016), about the rise of circular economy.

He was awarded the Middlebury Environmental Journalism Fellowship and, four times, The Innovation in Development Reporting Grant. In 2015 he was awarded 1st prize of "Reporter per la Terra". In 2016 he received the DNI Google Award with the newspaper *La Stampa*. He has interviewed prime ministers, industry leaders, environmental gurus, intellectuals, all around the world. He has contributed to the following newspapers and magazines: *Reuters, El Paìs, Die Welt, Al Jazeera, Materia Rinnovabile, Vanity Fair, Donna Moderna, La Stampa, Sole24Ore, Left, Capital, BioEcogeo, Terra, l'Unità, il Fatto Quotidiano, Max, CityFactor, Equilibri.*

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Mr. Calleja is Director General for DG Environment, European Commission and former Director General of DG Internal Market, Industry, Entrepreneurship and SMEs (February 2012 to August 2015).

Prior to that, he worked in the cabinets of several Commissioners, including the President of the European Commission, advising on Transport and Competition matters, State Aids and the application of Community Law. Between 1999 and 2004 he was Head of Cabinet for both Commissioner Oreja and Vice-president Mrs. Loyola de Palacio, in charge of Transport and Energy. Daniel Calleja started his career in the Commission as Member of the Legal Service.

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Tiziana Dell'Olmo is working for the regional government of Piemonte since 2001. As regional coordinator of Interreg Programmes she developed a broad expertise in regional and European programming and development policies. In her current position within the University, Research and Innovation Unit, she supports the implementation of regional innovation policies and the strengthening of regional innovation system at national, European and international level.

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Marjana Dermelj works in the Government Office for Development and European Cohesion Policy, Development Policies Division, at Slovenian Ministry, where she covers environmental issues. Prior to her work as a civil servant, Marjana worked in the non governmental sector (Umanotera, The Slovenian Foundation for Sustainable Development), where she ran several campaigns and eventually managed the fair trade shop 3MUHE. She holds a bachelor degree in Chemistry and successfully accomplished two post-graduate studies related to environmental policy and management.

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Research Fellow on the RETRACE Project at the Politecnico di Torino, her work focuses on the Systemic Design methodology and the circular economy research, coordinating the Exchange of Experience activities across all partners. Prior to that, she worked on Systemic Design research in Latin American context at A Good Foundation in Amsterdam and also in the field of urban sustainability in South Africa with Future Cape Town, a leading African organisation. Since her Master in Ecodesign at Politecnico di Torino, she has been actively interested in sustainable development.

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Emeritus Professor in Business Sciences, he has contributed numerous articles and books on change and innovation applying the approaches of Soft Systemics (Checkland), the Network Theory (Latour) and the Complexity Theory (Morin). He currently applies these theoretical approaches to operational contexts, dealing with responsible entrepreneurship and responsible territorial development. He is also Responsible for a think tank working on societal questions in the Basque Country.

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Iban Lizarralde is specialized in systemic and engineering design and works on the management of innovation through different approaches. Familiar with eco-innovation and creativity tools, he also researches in the field of new sustainable business models and conviviality approaches. He is the project manager of RETRACE for the French partner ESTIA.

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Pier Paolo Peruccio is Associate Professor at Politecnico di Torino, Deputy Dean of the Design Courses, and Representative for International Affairs. He holds a PhD degree in History of Architecture and Urbanism and is lecturer of "History of Visual Communication and Design" at the Design and Visual Communication bachelor's degree, and of "Theory and History of Systemic Design" at the Systemic Design master degree at Politecnico di Torino. He is coordinator of the research "Innovation in Design Education: The Establishment of Innovation in terms of Content and Pedagogical Methods, Design Courses at the École Catholique d'Arts et Métiers de Lyon (Ecam)" that aims at activating in France a degree programme in collaboration with ECAM.
His research is mainly on the history of environmental sustainability related to the field of design. He carried out many research projects in public and private archives, such as the Rockefeller Archive Center at Tarrytown (USA), the MIT at Cambridge (USA) and the Archivio Storico Olivetti in Ivrea.

ESTIBALIZ PLAZA ELORDI

Estibaliz Plaza Elordi holds a degree in Business Administration and Management from the Deusto University. She is currently the Head of the Entrepreneurship Area of Azaro Fundazioa, where she has been working for more than 12 years. Her job is to advise entrepreneurs and companies in the definition and acceleration of business and innovation projects in order to maintain and generate employment in the Region of Lea-Artibai.

MARION REAL

With a strong background in user-centered design, ergonomics & human factor, Marion Real recently conducted a PhD in the field of eco-innovation. She takes part actively in the RETRACE Project applying the Systemic Design methodology in the Nouvelle Aquitaine region. Additionally, she has a strong interest in the recovery of clothing and the design of supply-chains built around natural fibers, recycled clothes and local products. In this same area of competence, she is developing an action research on cosmopolitan fashion localism for fashion.

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Member of the External Cooperation Office in Nord-East Regional Development Agency in Romania, Ramona Tanasă begun her activity in the North-East RDA as Communication Officer for the North-East EUROPE DIRECT Centre, gaining expertise in desk research on European policies, programmes and initiatives and laying the base for identifying cooperation opportunities, information management and European policies and mainstream topics knowledge and awareness. Previously, she was working in banks, in entrepreneurial and economic education and knowledge, as well as in marketing and sales sectors.

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Paolo Tamborrini is Associate Professor and Dean of the Design Courses at Politecnico di Torino. His research focuses on sustainable innovation and interaction design. He contributes to the following newspapers and magazines: *Il Giornale dell'Architettura*, *Domus* and *Il Sole 24 Ore* and is Managing Editor of the online publication *Graphicus*. He has published more than 100 scientific articles, proceedings and is the author of *Design Sostenibile, oggetti, sistemi e comportamenti* (2009).

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Dr. Benjamin Tyl is an eco-innovation research engineer. In 2011, he obtained a PhD degree for his work on eco-innovation, and more specifically on the contribution of creativity in the eco-ideation processes. Benjamin is an active member of the French EcoSD (Eco-design of Sustainable Systems) network, and member of the Design Society. He is currently working at the technological center APESA, where his role is to support the research activity and to develop research projects with both private companies and public laboratories. His main research interests are eco-innovation and eco-ideation but also the local value creation approach in design. Benjamin Tyl was coordinator of two research projects in eco-innovation with both academics and industrials (PSA, Steelcase, Parkeon, etc.), funded by the French National Network in Eco-design (EcoSD). He is currently the scientific leader of a research project on eco-innovation, funded by the French National Research Agency (ANR). Moreover, Benjamin is co-founder of a citizen company (I-ENER) that aims to develop a sustainable and territorial energy project.

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This volume aims at clarifying the role of Circular Economy according to a sustainable development and how policymakers can target it effectively in their activities. It is a guide to Systemic Design as a key methodology to establish sustainable regional action plans towards a Circular Economy.
As the result of an intense dialogue between people who present different perspectives and seek for a common language in the current complexity of policymaking and designing, this is the first of a three book series published across a four-year period (2016–2020) as part of the RETRACE Project funded by the Interreg Europe Programme.

Preface by Erwin Siweris

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