Systemic design and policy making. The case of the RETRACE project

https:// doi.org/10.7577/formakademisk.2219

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Abstract

The paradigm shift from a linear to a circular economic model has been increasingly advocated by many, from the scientific community to governments. The benefits of a Circular Economy (CE) are particularly appealing for Europe, considering the issues Europe is currently facing. Even though the European Union (EU) promotes activities to support the transition to a CE, several economic, social and regulatory barriers hinder this. The full potential of a CE can be realised only after these barriers have been overcome. Given the current European context in relation to policymaking for a CE, the paper provides a case study of the RETRACE Interreg Europe project to argue that the methodology of the Systemic Design approach can support the transition to a Circular Economy, thus overcoming existing barriers. The focus of the discussion will be narrowed to the Piedmont region (Italy) to better support the argument.

***Keywords*:** Systemic Design, Policy Making, Circular Economy.

Introduction

As the limits of the traditional linear economic model become clearer, the path toward a Circular Economy (CE) is increasingly identified as the way to ensure sustainable development. A CE has been defined by the Ellen McArthur Foundation (2013) as:

> … an industrial system that is restorative or regenerative by intention and design. It replaces the 'end-of-life' concept with restoration, shifts towards the use of renewable energy, eliminates the use of toxic chemicals, which impair reuse, and aims for the elimination of waste through the superior design of materials, products, systems, and, within this, business models.
>
> (Ellen McArthur Foundation, 2013)

In delineating the approach to developing a new economic paradigm based on the valorisation of output as resources to generate economic activities and reduce waste production, a CE incorporates and shares principles from other disciplines related to sustainable development, such as industrial symbiosis, industrial ecology and cradle to cradle (Ceschin and Gaziulusoy, 2016).

The opportunity offered by a CE is particularly appealing for Europe, which has been affected by a scarcity of raw materials, making it resource dependent, and by an economic crisis, with the attendant social consequences. Besides rising doubts about the economic feasibility of the transition to a CE, the benefits are highlighted in a detailed report by the Ellen MacArthur Foundation et al. (2015) that compares the outcomes of a CE model to those of the current one. Development based on a CE appears particularly appropriate for Europe because it would answer the multiple challenges the EU is currently facing. In addition, it would make use of a large resource, waste. There is much waste in the EU economy. In 2012, 60% of the waste materials produced by an average European was landfilled. Recycling rates remain low, even for paper, steel and Polyethylene terephthalate that lose 30–75% of their material value. The obsolescence of

goods is still high, and manufactured products last on average only nine years (Ellen MacArthur Foundation et al., 2015).

The transition towards a CE would increase Europe's resource productivity by 3% annually, generating an annual benefit of about €1.8 trillion by 2030, with implications for employment and economic welfare (Ellen MacArthur Foundation et al., 2015). To accelerate the process of establishing a CE, Europe has promoted an action plan (European Commission, 2015a) containing several directives to encourage the transition at all levels – from the design of products that last longer and are recyclable to the creation of a regulatory framework that facilitates the change. The core of the document consists of directives concerning waste management aimed at reducing the percentage of waste going to landfills. To achieve this goal, the EU focuses on actions that promote the use of secondary raw materials, which is hampered currently by uncertainty about quality, legislation on harmful chemicals and limits imposed on the cross-border circulation of secondary raw waste in Europe. These directives have been translated into targets to be met by 2030: recycling 65% of municipal waste, recycling 75% of packaging waste and reducing the amount of landfilled waste to a maximum of 10% (European Commission, 2015b).

The potential offered by the transition to a CE model has been increasingly recognized; however, implementation has been hindered by various barriers at the economic level (market failures, unaccounted externalities), social level (lack of experience to identify opportunities) and regulatory level (regulations that hinder exchange of waste) (Ellen MacArthur Foundation, 2015).

The European Commission itself has identified several EU policies that may hamper the development of a CE, and it has stressed the need for policies to support a CE (European Commission, 2014a).

The successful implementation of a CE at the EU level lies in Europe's capacity to overcome these barriers. Given the current European context, this paper examines the RETRACE Interreg Europe project to argue that the methodology of Systemic Design (SD) can support the transition to a CE, overcoming existing barriers. The focus of the discussion will be further narrowed to the Piedmont region (Italy) to better support the argument. RETRACE (Systemic Approach for Regions TRAnsitioning towards a Circular Economy) is expected to contribute to the improvement of the Regional Operational Programme through actions that support the development of CE-oriented policies at the local level.

Systemic Design for a Circular Economy

The RETRACE project involves five regions – the Piedmont region (Italy), Bizkaia (Spain), Nouvelle-Aquitaine (France), the whole country of Slovenia and the North-East Region (Romania). It originated from the recognition that CE, despite being a priority in all regions, was not adequately addressed in some of the policy instruments (all related to European Regional Development Funds/ERDF Operational Programmes) addressed by the project. The aim of RETRACE is thus to promote the transition to a CE even if the term is not explicitly stated (Italian and Spanish policy instruments) or to create better tools to support the change where it is already being planned (French, Slovenian and Romanian policy instruments).

The project involves several stakeholders in each region, ranging from development agencies to innovation clusters, that are actively involved in RETRACE. They are relevant for the development of a proposal grounded in the local context and, together with the managing authorities, the stakeholders are the main beneficiaries.

To achieve this goal, RETRACE applies the methodology of SD, developed by the Department of Architecture and Design at Politecnico di Torino (POLITO), that has its roots in complexity

theories, generative science, system thinking (Barbero, 2015) and ecological economics (Daly, 2007). SD is mentioned in several contexts, but with different meanings. In this case, we refer to the methodology defined by Professor Luigi Bistagnino on whose work the SD research team at POLITO is based. The methodology is built around the key principle that the material and energy output (waste) of a system can become the input (resources) for another, imitating nature (Bistagnino, 2011). These kinds of relationships generate a system of interconnected processes that reduce waste and tend to produce zero emissions. Such a system is strictly connected to the local territory in which the process operates, and it is built around the needs of the people related to it. With the implementation of an SD approach, a new production model is created, generating benefits for the society and the environment (Bistagnino, 2011).

SD methodology consists of five main steps:

1. Quantity and quality analysis (holistic diagnosis)

Holistic Diagnosis (HD) refers to a process of using multiple research methods to analyse the economic, socio-cultural and environmental contexts. The collection of qualitative and quantitative data through desk and field research is coupled with the analysis of the interactions among the data themselves (Battistoni and Giraldo Nohra, 2017). HD is the first phase of the SD process, and the results create the basis for the development of the project. The scope of the HD can vary according to the project as long as all the elements needed to clearly outline the context are collected (Bistagnino, 2011).

The purpose of the HD is to define the context of a project and the state of the social, economic and environmental resources available in a given area, to map key stakeholder groups and identify the actors involved, to highlight the connections between the components of a system and to provide accessible support for the interpretation of the data (Gaiardo, 2016). HD comprises three main phases:

1. Desk research: Qualitative and quantitative information on the economic, socio-cultural and environmental contexts is sought from various sources, ranging from official databases to social media. This phase is related mostly to the research of existing information.
2. Field research: Qualitative and quantitative information is collected through several tools, including recording data and perceptions. This phase complements Phase 1 and is focused on the integration of information missing in the previous step.
3. Research synthesis: This phase aims to build connections between the data collected in the previous two phases. Information design visualization is used to facilitate the understanding and interpretation of the data. This tool is particularly useful not only because it enables the communication of the results of the research but also because it provides the starting point for the development of the project (Gaiardo, 2016).

Even though the phases are consecutive, the analysis process does not follow the three phases linearly. HD is indeed an iterative process that flows recursively between the steps, mainly the initial steps, to continually complement the research by filling gaps or focusing on specific aspects (Gaiardo, 2016). Because HD aims to provide a broad picture of the state of the art of a specific context, an analysis at various levels using several different disciplines is essential (Gaiardo, 2016).

2. Analysis of best practices
In addition to conducting HD, research on the best practices that address the same issues as the issue being addressed by the project is performed. This activity aims to identify best practices from which it is possible to learn and to transfer the relevant elements.

3. Identification of problems
From the framework outlined in the HD, it is possible to identify the major problems to be addressed. They are regarded as leverage for achieving the desired change. The critical issues that emerge are classified according to their relevance and their level of urgency. The connections between them are then mapped and investigated.

4. Creation of a solution
This step refers to the design phase when a solution to the identified problem is drafted. The solution originates from the knowledge acquired through the HD and the problems highlighted in Step 3. The proposal must meet some criteria to be approved. It must:

- be multi-layered in order to be implemented step by step, involving progressively more and more actors and aspects of the system;
- avoid being piecemeal and point to actions, giving preference to interventions that involve and affect the whole system;
- be in line with the natural, cultural and socio-technical contexts in which the solution will be implemented;
- respect the three dimensions of social, economic and environmental sustainability; and
- combine short- and long-term benefits on the system in order to ease the implementation of the project and ensure its durability.

To be approved, the suggested solution is presented to and discussed with the key stakeholders and other actors involved in the project. Their feedback is collected, and the proposal is modified accordingly. This is complemented by a theoretical study of the possible outcomes of the implementation of the project.

5. Implementation
After the solution has been validated through preliminary studies, simulations and discussions with key stakeholders, the project can be implemented. A continuous cycle of feedback from Step 5 to Step 1 enables modification of the project according to changes occurring in the framework. The methodology follows an iterative path where any further step is checked and reviewed according to the feedback received. The implementation proceeds step by step, progressively activating a larger number of actors.

SD methodology shares some principles with other previously developed theories, such as cluster theory (CT), industrial ecology (IE) and eco-design (ED) but includes some distinguishing elements:

- A focus on open cycles to exchange material and energy flows between different sectors. On the contrary, IE and CT mainly promote the establishment of closed loops and the creation of relationships between industries in the main sector aimed at reducing costs.

- A focus on the balance between social, economic and environmental sustainability. In IE, CT and ED, one dimension prevails over the others. IE and CT are focused primarily on economic sustainability, whereas ED devotes more attention to environmental rather than social aspects.
- A focus on the relationship with the local territory beyond the geographical level. SD looks at the territory as a resource to be enhanced through the creation of relations between it and production activities.
  (Ceschin and Gaziulusoy, 2016) (Barbero, 2012)

Systemic Design principles are also similar to those of a CE. However, they expand the CE concepts of reuse, recycle and recover to multiple sectors, rather than keeping them within a single production sector, to create synergies, while keeping the focus on the local dimension of an action and on the needs of the people related to it. The process of breaking down barriers between sectors must be supported at the policymaking level with a shift in the structure of policy instruments towards a more trans-sectoral approach. These are currently created for each sector in a mostly ad hoc manner, leaving few opportunities for interaction among the sectors.

The SD and CE approaches are complementary and functional for the goal of the RETRACE project, which is to support the transition of regions and regional policies to a CE. The relevance of design thinking as a crucial and effective tool in policy making because of its ability to address complexity has been widely recognized (Barbero and Bicocca, 2017; Considine, 2012; Babitch et al., 2005, Mauldin, 2014). These properties are enhanced in Systemic Design.

SD methodology and, in particular, the first step, the HD, truly enable the identification of the untapped potential of a territory. HD offers a different perspective. It considers profitability in economic terms, as well as the material culture, the local history, the traditional knowledge, the local resources and the features of the environment to understand the connections that can be created between processes to ensure sustainable development. The establishment of these relationships is the core of the approach. The connections generate new possibilities (for example, enhancement of outputs, savings on waste management, creation of new products from waste) for the actors involved, creating value at the local level.

In the case of RETRACE, the application of SD methodology is not aimed at creating a concrete project but, rather, defining new policies and regional action plans (RAP) that support the birth of projects promoting the transition to a CE.

Currently, the first two steps of the methodology, HD and analysis of best practices, are being conducted simultaneously. In the following chapter, the preliminary results of the project, which is in the first half of the second term, will be discussed. The paper focuses on the Piedmont region (Italy) to illustrate the activities RETRACE promotes in the five partner countries.

RETRACE – Outline of the Project

RETRACE is a project financed by the Interreg Europe programme in the first call for proposals. It addresses the issue of the transition to a CE following the priorities set by the "Flagship Initiative for a Resource-efficient Europe" (European Commission, 2011) for 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" (European Commission, 2014b).

The project involves eight private and public partners:

- Two higher education centres: Politecnico di Torino (Lead Partner) (Italy) and Higher School of Advanced Industrial Technology – ESTIA (France)
- Three managing authorities: Piedmont region – Directorate for Regional System Competitiveness (Italy), Government Office for Development and European Cohesion Policy (Slovenia) and North-East Regional Development Agency (Romania)
- One foundation for local economic development: Azaro Foundation (Spain)
- One public company of the Provincial Council of Bizkaia, which supports local enterprises in new projects, innovation and internationalization: BEAZ S.A.U. (Spain)
- One technological centre: Association for Environment and Safety in Aquitaine-APESA (France).

In addition to the partners involved, a stakeholder group has been created in each country. Even though they are not partners, stakeholders are crucial for the proper assessment of the local context and the definition of the Regional Action Plans (RAP). Stakeholders are important recipients of the actions proposed for ensuring that objectives are achieved.

RETRACE officially started on 1 April, 2016 and will end on 31 March, 2020. The project is divided into two main phases lasting two years each (www.interregeurope.eu/retrace). The majority of the work is concentrated in Phase 1 with the two parallel activities of HD and analysis of best practices, which take the form of the exchange of good practices (GPs) on the CE through seven field visits. One visit is made to each partner country, as well as to the Netherlands and Scotland, considered to be two exemplars of CE. While field visits enable the sharing of GPs, the HD identifies policy gaps and barriers at the regional level. The comparison of these two elements leads to the formulation of Regional Action Plans that contain measures to promote the creation of policies in support of a CE. Phase 2 is dedicated to the implementation of RAPs and to monitoring results.

The expected results of the project are:

- Development of five regional (national in the case of Slovenia) HD
- Identification and exchange of 30 GPs in five target policy areas
- Completion of seven field visits
- Definition and agreements on five RAPs (one per country)
- Hosting of 10 regional dissemination events (one per country)
- Hosting of two interregional dissemination events
- Publication of three books detailing the results of the project

In the 8 months, five regional dissemination events have been organized and three field visits have been conducted. In addition, each country has completed the first two of the three HD steps. These activities have generated preliminary results that have provided the first glimpse of the local context for each of the five partner countries. For the purposes of this paper, the analysis of the preliminary outcomes related to the Piedmont region will be discussed in greater detail.

Piedmont Region (Italy)

The HD is divided into three steps. Step 1 is a broad assessment of the current situation in a region. Step 2 is a deep analysis of the policy instruments addressed by the project. Step 3 is the

identification of the main production sectors of a region, highlighting critical issues regarding inputs and outputs and any possible interconnections between the inputs and outputs.

Step 1 required the collection of data on five dimensions of the local territories:

- Geography: An analysis of soil usage, distinguishing between agricultural areas and the built environment, was performed.
- Demography: Information on the dynamics of the population, such as growth trends, economic status and religious affiliation, and immigration rates, was gathered.
- Culture: Data on several aspects of a people's culture – from history to art, food, customs, and languages – were collected.
- Urban centres: This is a detailed analysis of the main urban centres of a region to understand their specific features.
- Economic sectors: Information related to the main economic sectors of a region, including characteristics such as the structure of companies, was gathered.

All these data were collected from reliable regional or national databases and stored in several Microsoft Excel files. While this format allowed the information to be stored in an organized manner, the information was not rendered in a meaningful way for the reader. To increase usability, the data were transformed through a long process of visualization. GIGA-Maps (Figures 1, 2 and three) were created for each section of the HD. The role of GIGA-Mapping in systems-oriented design has been already established (Sevaldson, 2015).

Specific features of the Piedmont region emerged from this first step in the analysis. Mountains make up 43.3% of the region, while hills and flat areas make up 30.3% and 26.4%, respectively (Sistema Piemonte, 2016). Agriculture and its related industries have played an important role in the region's history and economy. Agriculture, including animal and crop farming, accounts for 78% of the total agricultural area (Sistema Piemonte, 2016) and is one of the main economic sectors of the region. The food and beverage subsector of manufacturing is very important because of the number of production plants and the relevance of the brands related to them. The "Made in Piedmont" sector is dominated by three multinational companies (Lavazza, Martini and Ferrero) that produce food and beverages (CUBE Piemonte). In addition, Piedmont is famous for its cuisine.

Other relevant economic sectors are (in order of size) services, manufacturing and construction (Spolti et al., 2013). Important areas of innovation are in mechatronics, green chemistry, the automotive industry (primarily because of FIAT), life sciences and the aerospace industry (Regione Piemonte, 2016).

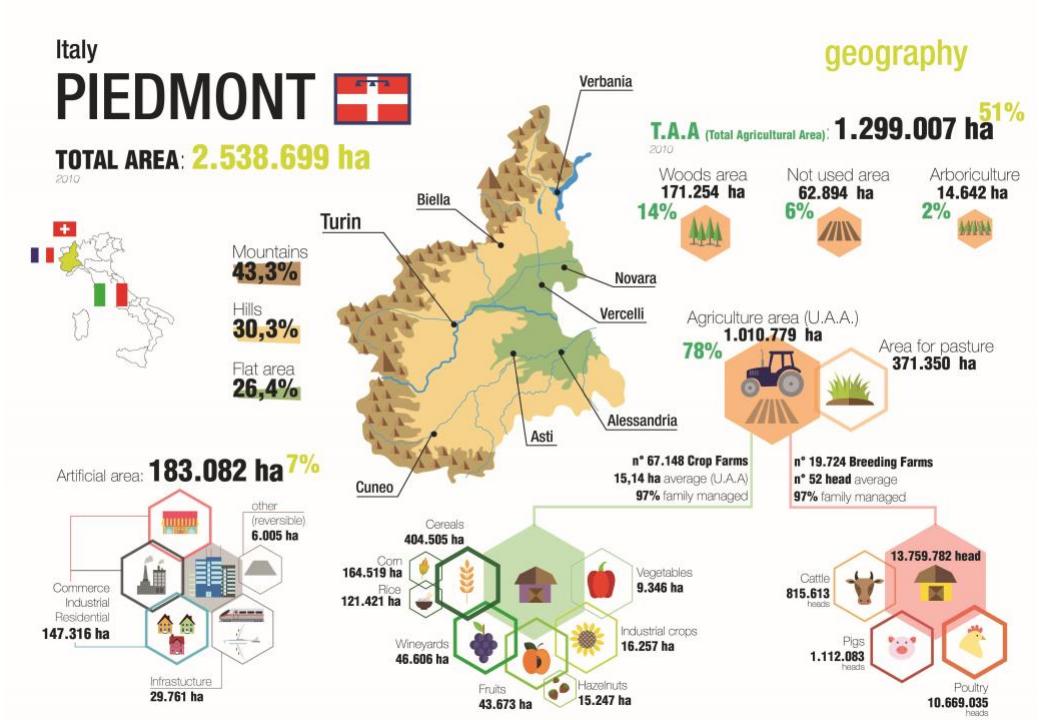

Figure 1: Step 1 of Holistic Diagnosis in Piedmont Region: Geography. Graphic elaboration by Battistoni C. and Giraldo Nohra C., from *RETRACE Systemic Design Method Guide for Policymaking: A Circular Europe on the Way*, by Barbero S. (2017). Torino: Allemandi.

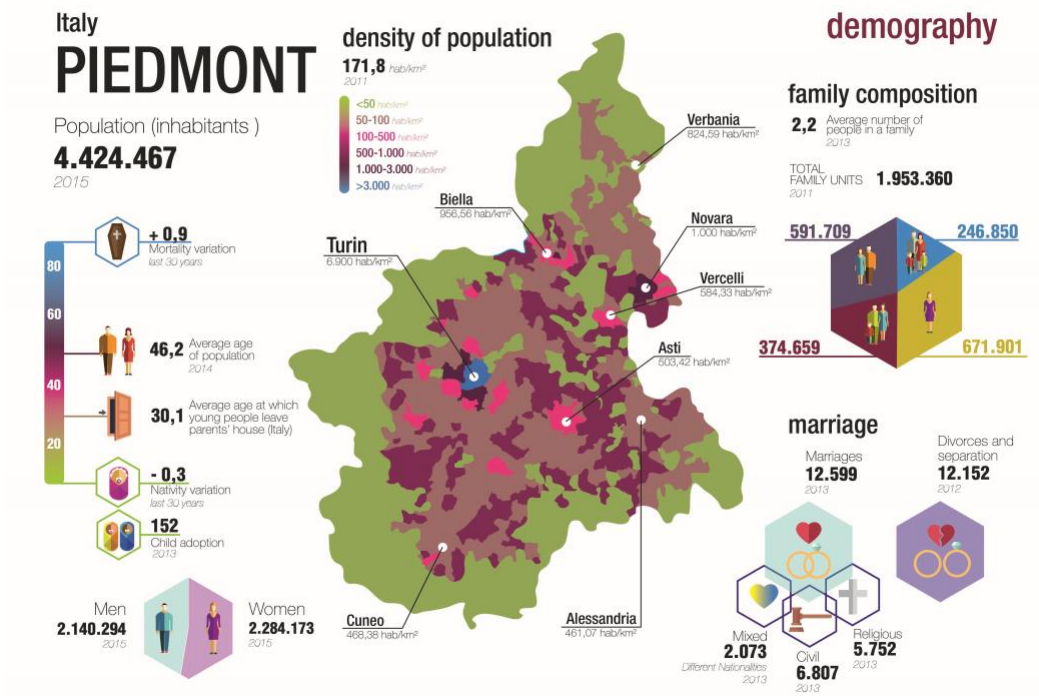

Figure 2: Step 1 of Holistic Diagnosis in Piedmont Region: Demography. Graphic elaboration by Battistoni C. and Giraldo Nohra C., from *RETRACE Systemic Design Method Guide for Policymaking: A Circular Europe on the Way*, by Barbero S. (2017). Torino: Allemandi.

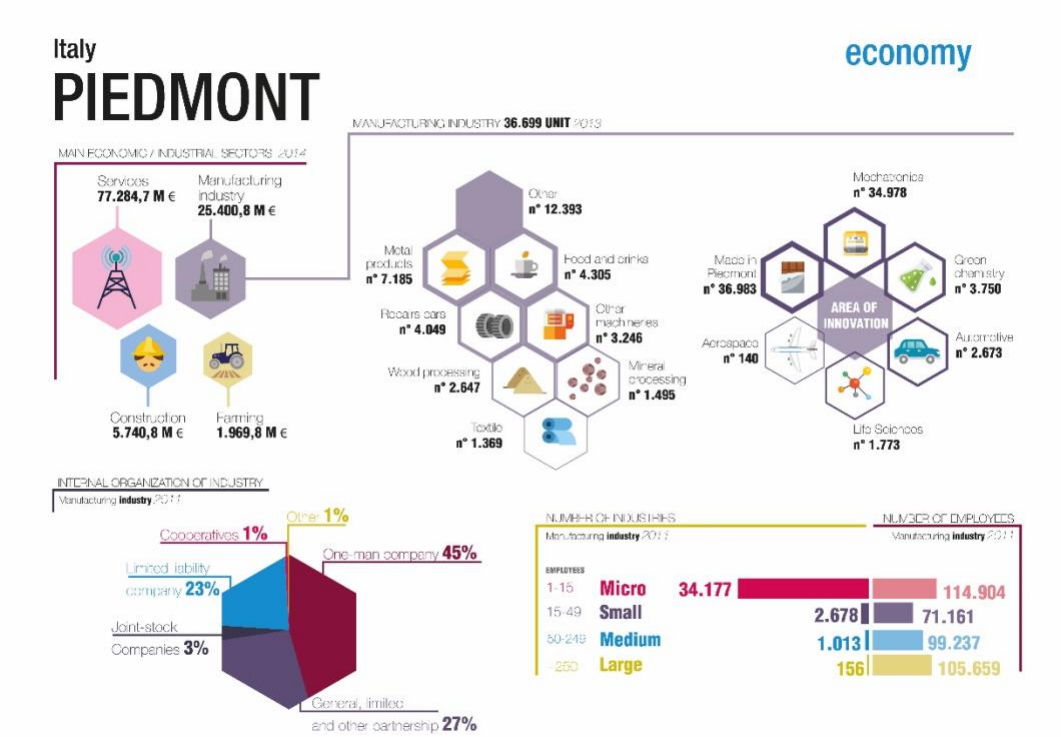

Figure 3: Step 1 of Holistic Diagnosis in Piedmont Region: Economy. Graphic elaboration by Battistoni C. and Giraldo Nohra C., from *RETRACE Systemic Design Method Guide for Policymaking: A Circular Europe on the Way*, by Barbero S. (2017). Torino: Allemandi.

Despite the presence of large multinational companies, the production sector is dominated by micro industries with 1–15 employees. More than 34,000 companies employ about 114,900 people, almost the same number (about 105,660) employed by the 156 large companies (Censimento Industria Servizi).

The population, equally divided between men and women, is aging, and it is concentrated in the main urban centres of Torino and Novara (ISTAT, 2011). The state of employment highlights the persistent negative effects of the recent economic crisis on the region. The rate of unemployment actually increased from 5.3% in 2004 to 10.2% in 2015 (ISTAT, 2016).

On the cultural dimension, the Piedmont region has been influenced by the languages, traditions, religions, cultures and art of the people who have inhabited it. Important traditions have been preserved through the craft districts related to the manufacture of metals and electrical materials, textiles, house wares, gold jewellery, drinks and taps and fittings (Osservatorio Nazionale Distretti Italiani). A majority of the economic and social activities of the region are concentrated around Turin, the main city.

The framework outlined so far shows the Piedmont region as an area rich in cultural and natural resources, with production concentrated in a few key sectors and dominated by micro industries.

The maps represent a significant starting point for understanding how the transition to a CE can be effectively promoted at the local level. The documents will be used to:

- analyse the information gathered about the various aspects of the region (i.e., geography, demography, culture, urban centres and economic sectors) to investigate the interconnections between the categories and to understand the origin of social, economic and environmental dynamics;
- compare the insights gleaned from the analysis (step 1 of the HD) with the priorities highlighted in the RETRACE policy instrument (Step 2 of the HD) to examine whether the elements of the CE are being addressed in the recommendations and whether relationships exist between these insights and the findings from the first step;
- build a dialogue with local actors and stakeholders; in many cases, this is the first time such a wide range of information has been gathered and visualised.

The second step of the HD involved the comparison between the findings of Step 1 and the priorities set forth by RETRACE in the policy instrument.

The three priorities of the policy instrument consider various aspects of environmental sustainability and resource efficiency without explicitly mentioning a CE. Nevertheless, the region has assets – such as solid economic sectors with leading enterprises and capacities related to research, innovation and technological development – that can be the basis for the development of a CE. Some key elements for ensuring the development of a CE in the region are knowledge transfers related to the opportunities offered by a CE, an increase of awareness about these potentialities through the engagement of key stakeholders (such as innovation clusters and research centres) and the redesign of policy actions to support the transition to a CE.

The HD will be completed only after the fulfilment of the third step. Identifying the main economic/industrial sectors of the region and analysing the relevant policies and their relationship to a CE will enable a link to be built between the first two steps of the HD.

In addition to conducting the HD, 15 good CE practices were identified in the Piedmont region. They were evident in several sectors: plastics, special waste, energy, water management, agri-foods, sustainable mobility, fuel production, knowledge transfer and the reusing/recycling of everyday objects (a video explains the best 8: https://goo.gl/yJUuXv). The identification of the GPs was performed in close cooperation with RETRACE stakeholders who suggested, described and evaluated them. Two main findings resulted from this activity and from the discussions with stakeholders. The first is that even though the term CE was not stated explicitly in RETRACE's policy instrument, case studies of activities in the Piedmont region indicate that the principles of the CE have been applied in various sectors. The second finding is the difficulty encountered in the implementation phase for more innovative CE projects. This is mostly a result of, on one side, the gap between the rules imposed by regulations on waste and the technological innovations related to waste treatment and, on the other, the difficulties in to the makret the latest innovations developed in the field of CE. This is particularly relevant for innovations by start-ups that need a high investment in the test phase. Such funding is difficult to obtain.

The preliminary results are interpreted only after all the activities of the analysis phase have been completed (completion of Step 3 of the HD and all seven field visits). The evaluation process will involve local partners and stakeholders, considered crucial in this phase of the project, to define the regional action plans.

Future Developments

Future steps in the RETRACE project will be:

- Fulfilment of Step 3 of the HD in each partner region.

- Completion of all seven field visits with the exchange of the remaining 32 GPs (in addition to the 18 already exchanged) and the identification of the 30 best GPs to be compiled in a publication.
- Identification of policy gaps in each partner region.
- Creation of a matrix to match policy gaps and good practices to find solutions to the identified problems.
- Elaboration of five Regional Action Plans, one in each partner region.
- Implementation and monitoring of the project.

Along with these core activities, five regional and two interregional dissemination events will be held to share the results of the project with key stakeholders (such as policy makers) and the wider public.

In the case of the Piedmont region, RETRACE will produce two different impacts in the short- and long-term. A smaller impact on the current policy instrument is expected in the short term as the priorities have already been defined and concern the period 2016–2020 leaving room for minor changes which RETRACE will boost. A structural change is not feasible; however, RETRACE will have a stronger impact on the next programming period, which can benefit from the results of the current project. During the current period, RETRACE is expected to support the improvement of the Regional Operational Programme through the promotion of funding schemes oriented to supporting a CE, the introduction of new evaluation criteria to encourage the implementation of resource efficiency and CE concepts and the improvement of the dialogue among local actors to increase the awareness and commitment of key regional stakeholders.

Conclusions

The Circular Economy is a topical subject in the discussion concerning sustainable development. Besides promoting a new production and consumption paradigm that can help in addressing the problem of waste generation and management on a global scale, the change from a linear to a Circular Economic model offers opportunities that are particularly appealing for Europe. However, several economic, social and regulatory barriers hinder this transition. The necessity of overcoming these barriers has been discussed in this paper, and the case study of RETRACE Interreg Europe project demonstrates the benefits of using the Systemic Design methodology to support the transition to a Circular Economy. In particular, RETRACE enables an expansion of the concepts of reuse, recycle and recover, which are central to a Circular Economy, to different economic and production sectors in order to establish synergies that can support a sustainable development. Furthermore, Systemic Design promotes the concept of a Circular Economy in which cross-sectoral flows of materials and energy create a network that imitates nature. Directives related to waste management are some of the most important regulatory barriers. Even though RETRACE does not directly address these directives, it aims to stimulate a further review of the regulations to promote modifications that will improve waste management.

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