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## "CIRCULAR ECONOMY: ARE WE SEIZING THE OPPORTUNITY? ANALYSIS OF THE CONCEPT AND ITS APPLICATION IN THE EUROPEAN AND ITALIAN FRAMEWORK"


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# Summary

## ABSTRACT

L'Economia Circolare è un modello economico che negli ultimi tempi ha ricevuto crescente attenzione sia a livello normativo che manageriale e viene dipinto come una possibile soluzione per raggiungere un'economia più sostenibile, al pari della Green Economy e della Bioeconomia. Infatti, attraverso la reimmissione di materiale e prodotti all'interno della catena del valore, si prefigge di ridurre il continuo e crescente bisogno di estrarre materia prima vergine dalla Natura, riducendo al tempo stesso il problema della gestione dei rifiuti. Grazie all'Economia Circolare, ciò che prima veniva buttato acquisisce ora un nuovo scopo. Il mio studio si rivolge attorno all'analisi del modello sia a livello teorico che pratico, spogliandolo di quell'aura di "panacea" della quale si è ammantato e analizzando se effettivamente si stiano muovendo passi concreti nella sua implementazione. Nel primo capitolo viene affrontato il concetto di Economia Circolare in sé, la sua storia, le sue molteplici definizioni e le differenze che intercorrono con altri simili modelli economici come la Green Economy o la Bioeconomia. Questo capitolo però non si ferma solo ad una sterile ed affrettata presentazione del termine, ma mira sin da subito ad evidenziare come questo sia mutevole e soggetto a diverse imperfezioni teoriche. Il secondo capitolo invece si concentra sulla concreta applicazione dell'Economia Circolare a livello Europeo, le norme che sono state varate finora e le potenzialità che essa racchiude. Uno spazio di riguardo viene lasciato al Pacchetto sull' Economia Circolare del 2015, con i relativi targets e strategie. Il capitolo conclude con una analisi delle sfide che aspettano l'UE, in primis il dover sviluppare un efficiente mercato delle materie prime seconde a seguito della chiusura dei confini cinesi e muoversi da un "economia del riciclo" ad un'economia pienamente circolare. Il terzo capitolo infine considera la situazione italiana e di come un paese così avanzato a livello di riciclo possa venire ostacolato da buchi normativi e lentezza burocratica. A riprova di questo sono presentati alcuni esempi riguardanti il Decreto "Sblocca Cantieri" e il "Decreto End of Waste", soffermandosi in particolare sulle vicende intorno alla FATER Spa e al suo innovativo metodo per riciclare AHPs (Absorbent Hygiene Products).

## INTRODUCTION

*"Our science is a drop, our ignorance a sea"*

William James, 1895 (Klein, 2014)

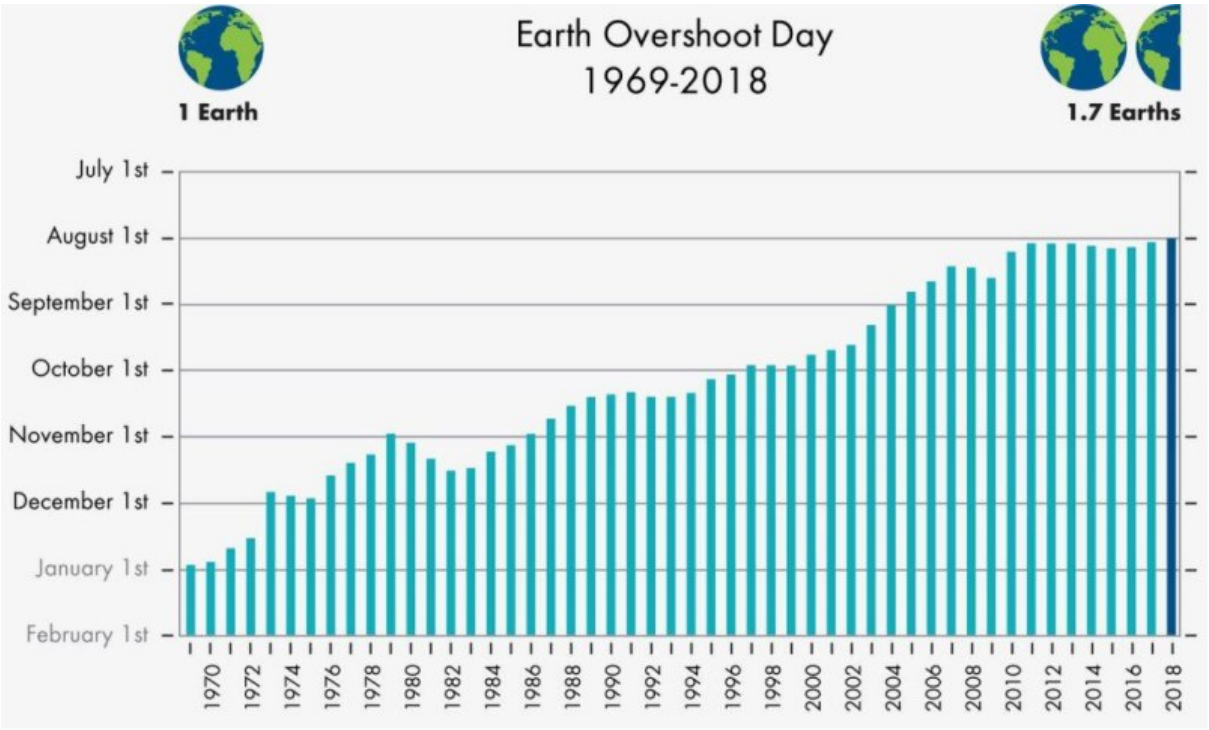
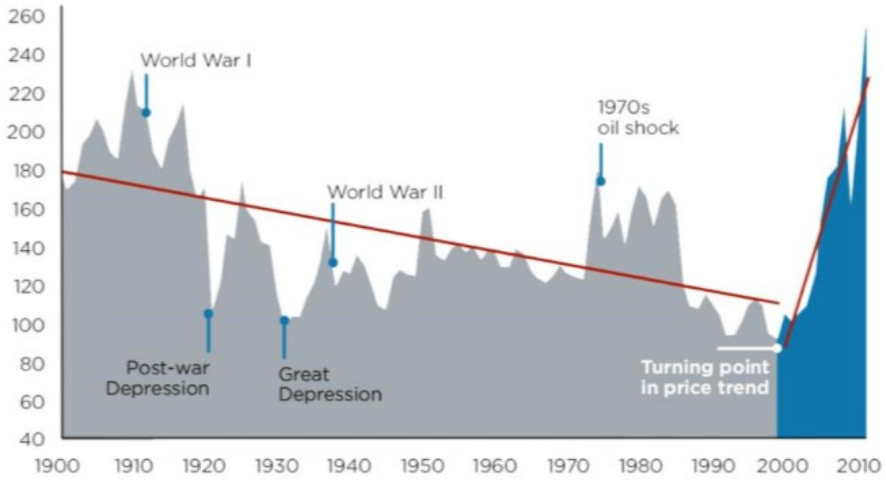



*Figure 1. Source: Global Footprint Network National Footprint Account 2018*

Are we seizing the opportunity given by the Circular Economy (CE)? Are we truly switching to a more sustainable economic model? As this question is posed, the findings below identify and steer the attention towards an explanation and potential solutions. We are currently living in an era where the ever-growing economy consumes the annual global resource budget earlier and earlier, until it starts eroding the capital itself that produces them (Figure 1). McKinsey found that this scarcity of materials, combined with an increase in the demand, has led the prices of commodities to skyrocket since the beginning of the new millennium (Figure 2) (Bompan & Brambilla, 2016) and it will continue. The OECD (2018) has in fact stated that global material use will double from the 79 Gt in 2011 to 167 Gt in 2060 (Figure 3), unless there is a change of pace and CE is implemented on an international level.




**Source: Ellen MacArthur Foundation circular economy team 2012. Based on arithmetic average of 4 commodity sub-indices: food, non-food agricultural items, metals and energy.**

*Figure 2*

In the first chapter, CE is analysed and presented on a theoretical level. This part doesn't want to be a sterile presentation of the concept, but it shows itself how even the terminology and the contents still require a work of polishing by the scholars.

The second chapter highlights the implementation of the CE model in the European scenario, the norms behind it, and the challenges that need to be tackled.

The third chapter uses Italy as an example of a leading figure in the CE approach, but that at the same time is hampered by a dense web of administrative loopholes.

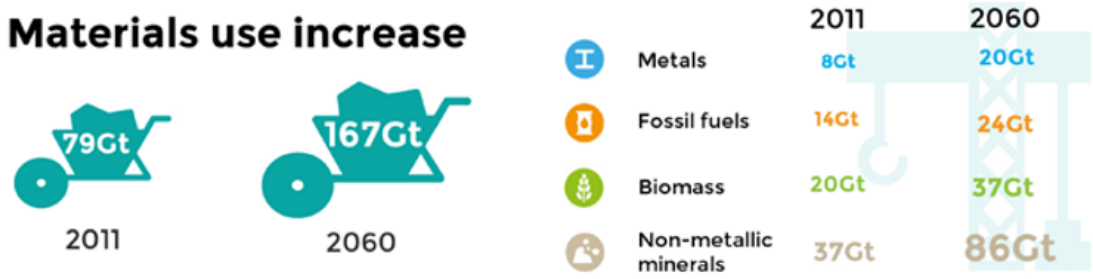



*Figure 3 Source: OECD,2018*

## 1. CIRCULAR ECONOMY: AN ONGOING WORK TOWARDS A GREENER FUTURE

*"On a planet of finite resources, the circular economy is not optional, it is inevitable. Its implementation will provide world economies with unprecedented opportunities, through the*

*creation of reverse logistics networks, new processes, and new industries using the recovered resources. Resource efficiency will allow us to rethink the concept of urban mining. Countries will be able to create industries in fields that were previously not viable. Relatively simple changes to existing legislation can enable this shift in mindset on short timescales. Restructuring economies to become circular will moreover bring with it enormous environmental benefits."*

Hermann Erdmann, CEO, REDISA (EMF, 2015)

## 1.1. THE HISTORY BEHIND CIRCULAR ECONOMY AND ITS LINK WITH SUSTAINABLE DEVELOPMENT.

Even though it may appear that the concept of Circular Economy is just a bud recently taking root in the international stage, it may be argued that it has much older origins. Not, as many could think, limited to the second half of the last century but even further, and not to the CE itself. Extrapolating the concept without considering the history behind it nor the heritage left from other branches of science would be a mistake. It's thus necessary to enlarge the scope of the search and understand it stands on a bigger environmental, social and economic spectrum in relation to Sustainability. Back in the days, when these ideas were still being developed and weren't on the mouth of every policymaker, scientist or economist willing to ride the wave of popularity of this new "panacea", Hans Carl von Carlowitz coined the term *Nachhaltige Entwicklung,* which can be translated as "Sustainable Development" (Bompan & Brambilla, 2016). This concept came to be through the problem of maintaining a constant level of timber reserves in the Kingdom of Saxony. In the same century other authors saw in Quesnay's "Tableau Economique" (1758) and his assumption on surplus value from cyclical inputs the father of CE (Murray et al., 2015). After that, scientific literature will focus again on the broader concept of sustainability with "*An Essay on the Principle of Population*" from T.R. Malthus, describing the difference between the arithmetical and geometrical growth respectively of natural resources and population, leading to the collapse of the system (Bompan & Brambilla, 2016). A theory disproven since it didn't consider neither the possibility of technological development nor the growth of knowledge. Nevertheless, after the 2WW the economic scenario was soon conquered by an era of unbridled consumerism. It is with Kenneth Boulding's "*Economics of the Coming Spaceship Earth*" in 1966 that is defined the need to move from a

"cowboy economy" to an "astronaut economy", characterized by limited resources (Pearce & Turner, 1990). The Seventies see the environmental movement gaining momentum with stepping-stones such as Rachel Carson's "*Silent Spring*" and Barry Commoner's "*The Closing Circle*".

From now on CE's evolution can be divided in three phases (Reike et al., 2017):

- *CE 1.0 (1970-1990s): Dealing with Waste*:

During this time period the major schools of thought related to CE start moving their first steps (EMF, 2015), even if backwards. Evidently, the majority of measures focus on "the output side", where waste is not prevented but pollution is limited through principles like "polluters pay" and "end-of-pipe" (Gertsakis & Lewis, 2003). It is in this phase that preventive and life-cycle-thinking focused concepts like Cleaner Production and Industrial Ecology (IE) are first introduced and start to contribute to thinking in systems (Gertsakis and Lewis, 2003). In 1972 the Club of Rome publishes the report "The Limits to Growth" (Meadows et al., 1972) where the world and the threats it faces are seen interrelated, thus aiming to a steady-state economy with zero growth (although of great impact at the time, later studies from Beckerman (1992) will argue that "in the longer run, the surest way to improve your environment is to become rich"). A bit later in 1976 Walter R. Stahel drafted for the European Commission the report "Potential Substitution Manpower for Energy", outlining for the first time a new model of economy where goods are repaired and put back again in the flow with a "circular" mindset (Bompan & Brambilla, 2016). The concept will be brought to an industrial level with the introduction of the IE thanks to Robert U. Ayres, to develop closed loops of material flows where what is considered waste for a production process becomes a resource for the other (Bompan & Brambilla, 2016).

- *CE 2.0 (1990s–2010): Connecting Input and Output in Strategies for Eco-Efficiency:*

During this phase the concept of Sustainable Development is finally outlined in the Brundtland Report (WCED, 1987) as an "ability to make development sustainable—to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs". Even the term "Circular Economy" appears with Pearce and Turner in 1990, but it still lacks an official definition. Preventive measures like Design for the Environment are added to output measures (Reike et al., 2017) but the social aspect of innovation is still neglected (Vermeulen, 2006). Economic growth and environmental protection are not seen as conflicting anymore, but in a win-win relation (Bompan & Brambilla, 2016; WCED, 1987). In 1992, the concept of Sustainable Development is brought up again on the world stage in Rio de Janeiro

during The United Nations Conference on Environment and Development (UNCED) (also called "Earth Summit" ), where a declaration of principles and international agreements are issued to face climate change and protect biodiversity (Kates, Parris, Leiserowitz, 2016). The beginning of the new millennium sees the birth of the future school of thoughts that will lay down the foundations of the current circular economy view such as Biomimicry in 1997 and Cradle to Cradle in 2002. (Bompan & Brambilla, 2016, EMF, n.d.).

-*CE 3.0 (2010 ±): Maximizing Value Retention in the Age of Resource Depletion:*

Nowadays CE is seen as the solution to the "decoupling" dilemma between economic growth and resource use (UNEP, 2011). However, there is still a debate on the official definition of the concept. Scholars limit their searches only on "CE requirements, its scope and levels, contrasted it with the linear economy or explained its related concepts" (Reike et al., 2017). To conclude with the highlights of CE's history, only two other steps are worth mentioning: the introduction of "blue economy" in 2010 by Pauli G. and the presence of CE ideas in the UN 12th Sustainable Development Goal.

## 1.2. WHAT IS CIRCULAR ECONOMY?

As seen in the previous section, the concept of CE wasn't created as it is presented today, already crystalized on a single definition. On the contrary, it is the result of a series of adaptation depending on the context, the purpose and even the geography of where it's implemented. Similarly to what happened for the concept of Sustainable Development, this can lead to a situation of theoretical confusion where anybody can bend and redefine the term to fit their vision. Not only the term becomes meaningless, but it can be used to "to disguise or greenwash socially or environmentally destructive activities" (Kates, Parris, Leiserowitz, 2016). Normally reference is made to the definition offered by the Ellen McArthur Foundation, an organisation specifically set up with the goal to spread the knowledge of this new economic model in 2009 and soon become point of reference in the field. Their official definition for CE is "an industrial economy that is restorative by intention' since it is conceived not only to reduce waste, pollutants and consumption of resources and energy, but also to repair the damages caused by the linear model through optimization and innovative design. The ultimate goal is to separate the economic growth from the depletion of natural resources and the environmental degradation" (EMF, 2013).

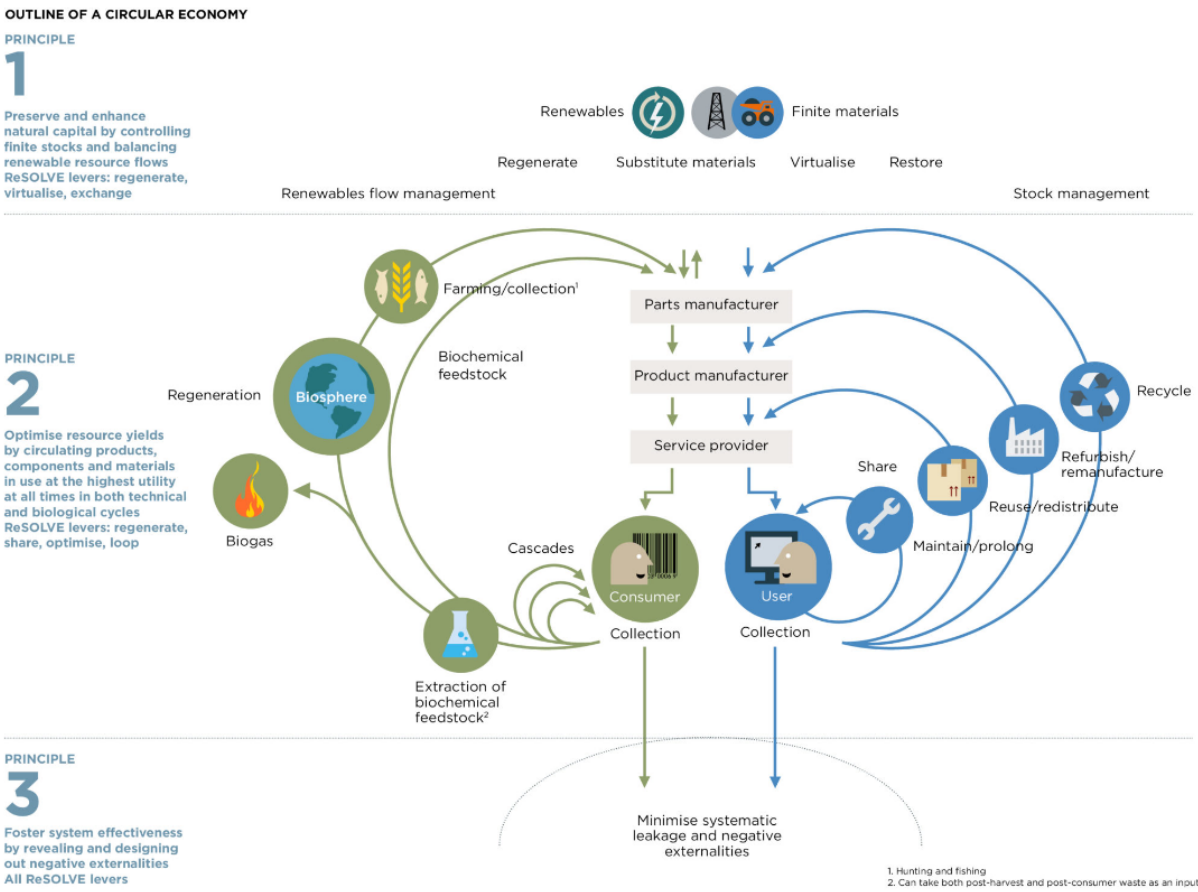



*Figure 4 Source: EMF,n.d.*

However, there are several definitions circulating (Geissdoerfer et al., 2017; EC 2014; Korhonen, 2017), someone gathered even 114 of them (Kirchherr, J. et al., 2017), all very similar and yet with some discrepancies. Even EMF proposed different ones in its works (EMF, 2013; EMF, 2015). Kalmykova et al. (2017) analysed the 8 most popular definition of CE available and found the following similarities:

- Stock optimization, maintaining the value of resources for as long as possible, maximizing value creation in each link in the system, based on the recognition of the limited nature of Earth's resources.
- Eco-Efficiency, not to be confused with the preferable eco-effectiveness.
- Waste prevention, sometimes considered as the main purpose of CE.
- The R-imperatives, i.e. the main environmental strategies that constitute the backbone of CE: Reduce, Reuse, Recycle and Recover (even though as presented below in this paper the number of Rs presented may differ).

It goes without saying that all these definitions propose a model that moves from an unsustainable linear economy model as "take, make, waste" to one of closed material loops (Korhonen, 2017; Nowakowski et al., 2018; Ranta V. et al., 2017).

Having said so, I would personally rely on the description Pearce and Turner gave in their *Economics of Natural Resources and the Environment,* where they used the term "Circular Economy" for the first time in 1990. Description, not definition. It is the theoretical backbone on which all the following studies of CE have based their own assumptions. They first introduce the concept of environmental economics not in conflict but to "expand the horizons of economic thought" (Pearce & Turner, 1990). This is done because if we ignored the environment then the economy would appear to be a linear system. In the following image we see how the Resources (R) are used during Production (P) to produce Consumer goods (C) and Capital goods K, with the purpose to generate Utility (U), or welfare.

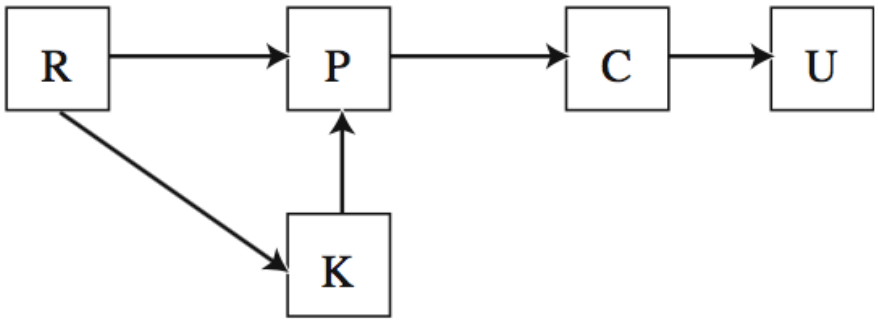



*Figure 5 Source: Pearce&Turner, 1990*

This scheme already introduces the first purpose of Nature as an input source of materials. However, it doesn't consider the production and diffusion of waste in the environment. Being an output receptor or waste assimilator is in fact the second of its functions. Some may argue that the natural system produces waste as well, but it is recycled. It is therefore fair to add this variable to the system without forgetting the presence of the First Law of Thermodynamics. This law basically states that energy and matters cannot be created or destroyed, their amount is constant in a closed environment. Since waste is produced at every stage of the process (if we exclude Capital goods), then the amount of Waste (W) created will be the same as the amount of Resources used:

$$R=W=W_R+W_P+W_C$$

We can now enlarge our linear economic model to a first draft of a circular economic model.

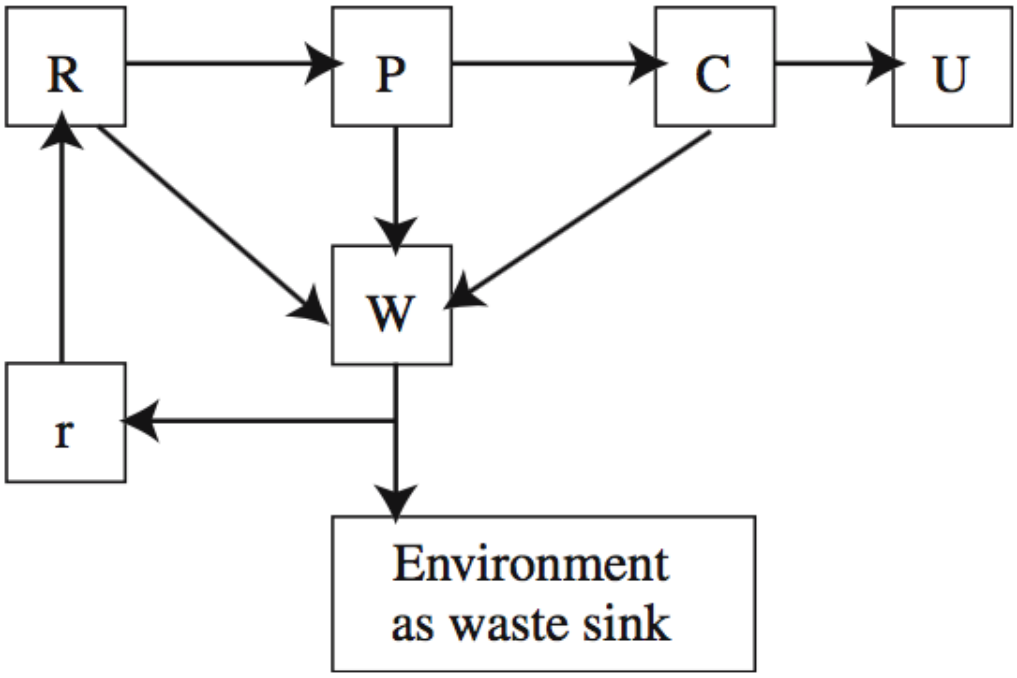



*Figure 6 Source: Pearce&Turner, 1990*

The "r" stands for Recycling. However, not all of the waste produced can return to its original state of resource, thus undermining the possibility to create a perfect closed loop system .Why is that so? Here comes into play the Second Law of Thermodynamics, stating that "the materials that get used in the economy tend to be used entropically - they get dissipated within the economic system" (Pearce & Turner, 1990). Another economist with the name of Nicholas Georgescu-Roegen is mostly known for his works on this problem. It is now possible to introduce the final version of Circular Economy proposed by Pearce and Turner:

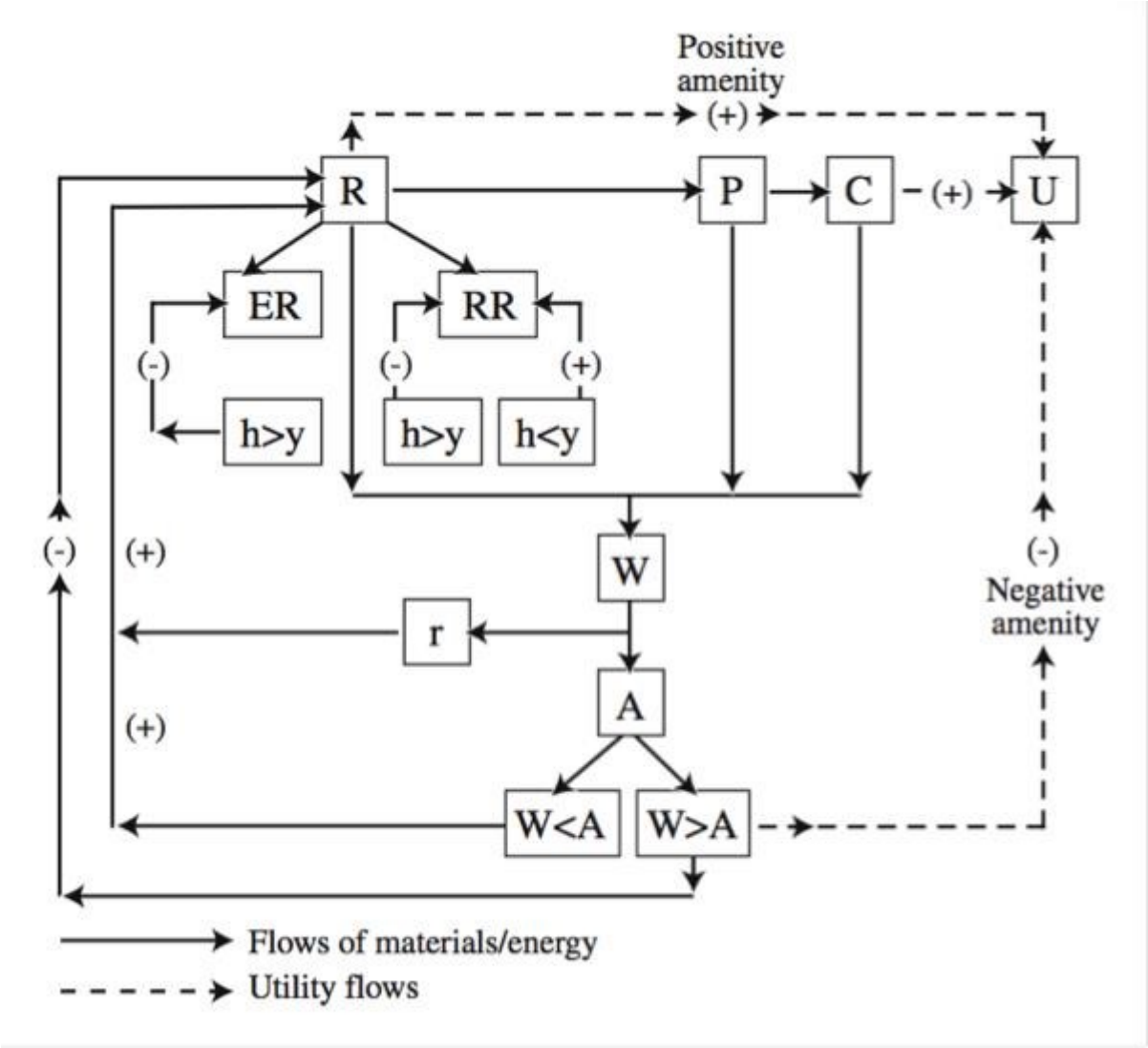



*Figure 7 Source: Pearce&Turner, 1990*

Here the situation gets a little more complex. On the U side it is introduced the third and last function of the environment as a direct source of utily or, in a more poetic way, amenity. In other words this type of U doesn't derive from the intervention of the economic system. On the opposite, it would be counterproductive. However not everybody can see it, as Jason Bostic, Vice President of the West Virginia Coal Association, once said: "What good is a mountain just to have a mountain?" (Klein, 2014). Resources now are divided into Exhaustible (ER) and Renewable (RR). If the rate at which the resources are exploited (h) is inferior to the rate of regeneration, then the resources stock grows (+), otherwise it decreases (-). The model is then complete by considering the Assimilative capacity (A) of the environment that helps human recycling to replenish the Resources (unless W>A).

## 1.3. DIFFERENCES BETWEEN CIRCULAR ECONOMY, GREEN ECONOMY AND BIOECONOMY.

In the current international economic scenario, the CE is not the only model that advocates for a change of patterns from the old unsustainable "business-as-usual". It's not rare to get lost in this intricate tangle of definitions, different under some aspects but similar and interconnected at the same time. If we look at the Ellen MacArthur definition, even the origin of CE itself hasn't been a linear thought from a single organisation or pool of experts, but the result of a combination of school of thoughts as "Cradle to Cradle" from McDonough, Stahel's "Performance Economy", Biomimicry, Hawken and Lovins' "Natural Capitalism", Regenerative Design, Industrial Ecology (IE) and Pauli's "Blue Economy" (EMF, n.d.). A study from D. D'Amato et al. (2017) tries to shed some light on the problem outlining the differences between CE, Green Economy (GE) and Bioeconomy (BE). However, as proof of the uncertainty that stills lingers on the matter, it only considers the aspects of CE coming from the IE root, excluding the social and organisational features that characterize today's common vision of the concept (Reike et al., 2017). Having said so, it's first important to give a brief definition of the other two terms mentioned before:

-UNEP (2011) defines Green Economy as one that results in "improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities."

-Bioeconomy "encompasses the production of renewable biological resources and their conversion into food, feed, bio-based products and bioenergy." (EEA, 2018).

Now that the basis is set, differences can be highlighted. Firstly, even though universal concepts, national disparities in their implementation exist. China has been very prolific in CE literature production and policies development since 2008, thanks to the introduction of a national law regarding recycling in key industries (Murray et al, 2015). CE recently received official recognition in EU as well as BE (EC, 2012; EC 2015), after having been promoted since the early 2000s. BE is also a core point in the US economy and got a national blueprint in 2012. GE on the other hand is the concept with the most international coverage, since UNEP's promotion increased its popularity worldwide (UNEP, 2011).

Content-wise, GE may be seen as an "umbrella concept", since it includes features from CE and BE (e.g. Recycling, re-use, reduction in products life cycle; Biomass and renewables in energy production) and integrates them within a broader frame that contemplates other topics such as green investments, eco-tourism, green jobs, education and conservation against land use. GE can therefore be seen as between the relative decoupling and the green growth philosophy, with a weight on the latter. Moreover, while CE and BE are more resource-focused, GE states the importance of all ecological processes and nature-based solutions in local

contexts, thus embodying a greater variety of disciplinary perspectives. On the social dimension, it considers some aspects as eco-tourism and education and it's the only model to include public participation and justice within the sustainable development frame. In contrast BE is characterized by an emerging discussion around biosecurity and rural policies, while the social side of CE focuses only on the sharing economy.

Remaining on CE's ground, D'Amato et al. see it "revolving around decoupling driven by technological innovation, specifically recycling and eco-efficiency" (D'Amato et al., 2017). They point out that CE's literature has been more homogeneous than GE and BE's within the topics of increasing resource productivity, resource- efficiency and decoupling (They also states that CE lacks social and local features but as said before this is due to the strictly IE-related definition used for CE). In fact, it could be seen as the core of a GE perspective that widens the focus from waste and material use to ecosystem resilience, human health and well-being. (Figure 8) (EEA,2016).

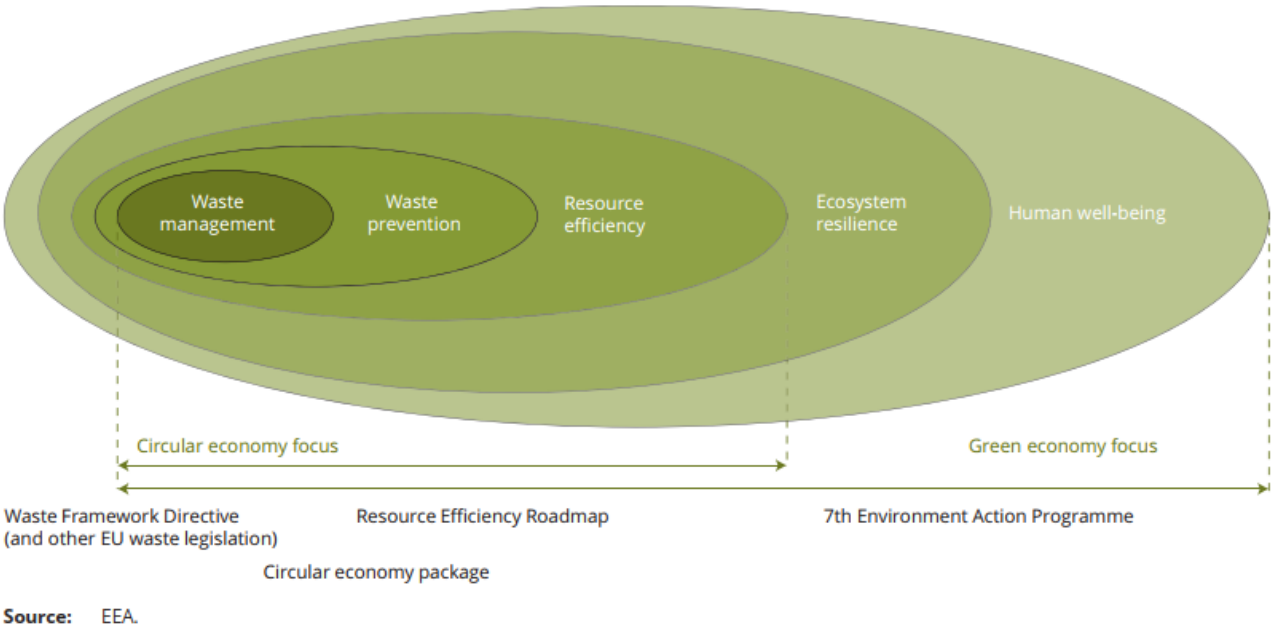



*Figure 8 Source: EEA, 2016*

Compared to BE, CE is focused on how resources are used, as opposed to BE whom is concerned with which resources are used. Plus, BE doesn't exclude eco-efficiency, but it doesn't actively search for it. It doesn't refer to circularity neither. In fact, using bio-renewables instead of non-renewables isn't an assurance for sustainability since, if overused, they can be depleted on the long run too. This is what happened when the boom of first-generation bio-fuels cannibalised crops reserves, skyrocketing prices and bringing Egypt and Ethiopia to the verge of a food crisis (Bompan & Brambilla, 2016). However, it has been recently brought up an

effort from scholars to connect the two models into a new one called “Circular Bioeconomy” (Bonnacorso M. & Ruis I., 2019) that applies CE’s waste hierarchy to biomass resources, prioritizing recover of material before energy production. The EU in 2018 has also supported the idea by issuing a new report last year, “The Circular Economy and Bioeconomy: Partners in Sustainability”, a proof that national institutions are seriously considering it (EEA, 2018).
Having said so, all three concepts must be seen as complementary, not conflicting, and an opportunity for a transition to a more sustainable economy. Another commonality is the fact that none of these questions thoroughly the idea of economic growth, especially because they cannot be defined within the strong sustainability framework.

### 1.4. CIRCULAR ECONOMY, A DIAMOND STILL TO BE POLISHED. ALL THAT GLITTERS IS NOT “GREEN”.

The previous paragraph outlined the multi-faceted history behind CE, its variety of definitions and the similar economic models that sometimes can lead to a bit of confusion. At this point a few considerations have to be made regarding the flaws and theoretical challenges that CE has to deal with. Circular Economy should be seen as a step on a much longer path to the search of a new type of sustainable economy rather than a point of arrival. It’s not the first time it happened, and it won’t be the last. The “Blue Economy” was created by Pauli after being disillusioned that Green Economy could really bring any environmental benefit, since it wasn’t advocating for zero emissions targets, but only to limit them (Bonnacorso M. & Ruis I., 2019). Robert Ayres, father of Industrial Ecology, noted the same thing for its creation when other scholars were loosely associating concepts that weren’t strictly correlated to IE (Reike et al., 2017). Conceptual challenges are common for new ideas when being introduced.

*-Conceptual clarity:*

The first and most pressing problem is to give CE the conceptual clarity it deserves and states clearly where it stands and what its principles are. In fact, “theoretical or paradigmatic clarity regarding the concept of CE has yet to emerge” (Blomsma, F., Brennan, G., 2017). It can even have different definitions based on the country or policy agenda that implements it (Reike et al., 2017; Ranta V. et al., 2017). Reike et al. (2017) distinguished two schools of thoughts, the Reformist and Transformationist (see figure).

| Need for… | Reformist School | Transformationist School |
|---|---|---|
| …absolute resource input reduction | NO | YES |
| …modification to the economic order, i.e. capitalist system | NO | YES |
| …balance among sustainability dimensions | NO | YES |

*Figure 9 Reike et al., 2017*

The former sees CE as fitting with existing ecological modernization initiatives, within the path of healthy growth, rather than a vehicle to change the capitalist system into one fairer and more equal, similar to Lovins' natural capitalism. They search for eco-efficiency instead of eco-effectiveness and support the "win-win" framing popular in the 1990s, even though in this way they fail to recognise the potentiality of CE.

The latter on the other hand advocates for a complete change of the economic philosophy brought up by CE, stating that the only way to reach optimal circularity throughout multiple loops would require a complete transformation of the capitalist system. They state CE is far from new and radical if it doesn't reject the Western patterns of consumption and production.

Another controversy between the two schools is the actual connection between CE and sustainability. The Reformists fail to grasp the entirety of the "Triple Bottom Line", excluding the social aspects and just concentrating on technical issues, such as material flows and technologies (Murray et al., 2015). Having said so, scholars should find a way to a general consensus on the topic because at this point "definitions, degrees of circularity, its normative character, the relation to other sustainability concepts – and to sustainability itself as a concept – all of this is still far from being clear." (Reike et al., 2017).

*-Entropy limitation:*

This flaw has deeper roots than theoretical uncertainty or economic limitations, standing on a more physical level. It was first introduced by Nicholas Georgescu-Roegen, a Romanian economist, mathematicians and statistician considered the father of Bioeconomy (intended as an economy based on the biophysical limits of nature) and known also for the conceptualization of the "degrowth" idea to which the economic system should aim. His conviction was that human economy shouldn't be extrapolated from the surrounding environment but seen as part of it and thus subjected to its laws, one of which is the Second Law of Thermodynamics. His view perfectly fits within the Ecological Economy rather than the Environmental Economy,

since the latter considers the environment in the economic process, but just as a variable (Spangenberg, 2016). According to G-R, Circular Economy is a concept not physically feasible since it will always require energy and generate waste due to an increasing entropy (Korhonen, 2017). The materials are dissipated in the system and cannot be recovered (or it would require too much energy). Based on this supposition, CE cannot support recycling in eternity. However, some scholars have now agreed that G-R was wrong about entropy and if the input of materials in the system is kept to a minimum then the loss would be insignificant (Andersen, 2006).

-*The Rs imperatives:*

The next flaw is one of the results of the lack of conceptual clarity mentioned above and it concerns one of the pillars of CE, the Rs-imperatives or hierarchies. These are a list of loops for the materials/products developed to facilitate the implementation of CE in all its aspects. Normally they are proposed as 3, "reduce, reuse, recycle" and are very popular: "the 're-' in Latin means 'again', 'back', but also 'afresh', 'anew', fairly well expressing the essence of CE"(Sihvonen & Ritola, 2015). However, this is not a universal interpretation. It has been demonstrated that in many cases the Rs-imperatives presented vary greatly, both in numbers (4Rs,5Rs,6Rs…) and in meanings.

Reike et al. (2017) tried to find all the different Rs proposed by scholars and this is the result (alphabetic order): re-assembly, recapture, reconditioning, recollect, recover, recreate, rectify, recycle, redesign, redistribute, reduce, re-envision, refit, refurbish, refuse, remarket, remanufacture, renovate, repair, replacement, reprocess, reproduce, repurpose, resale, resell, re-service, restoration, resynthesize, rethink, retrieve, retrofit, retrograde, return, reuse, reutilise, revenue, reverse and revitalize. They also tried to solve the problem presenting the following 10Rs-hierarchy and adding another R that normally isn't considered, the R0, refuse, stating that prevention is always better:

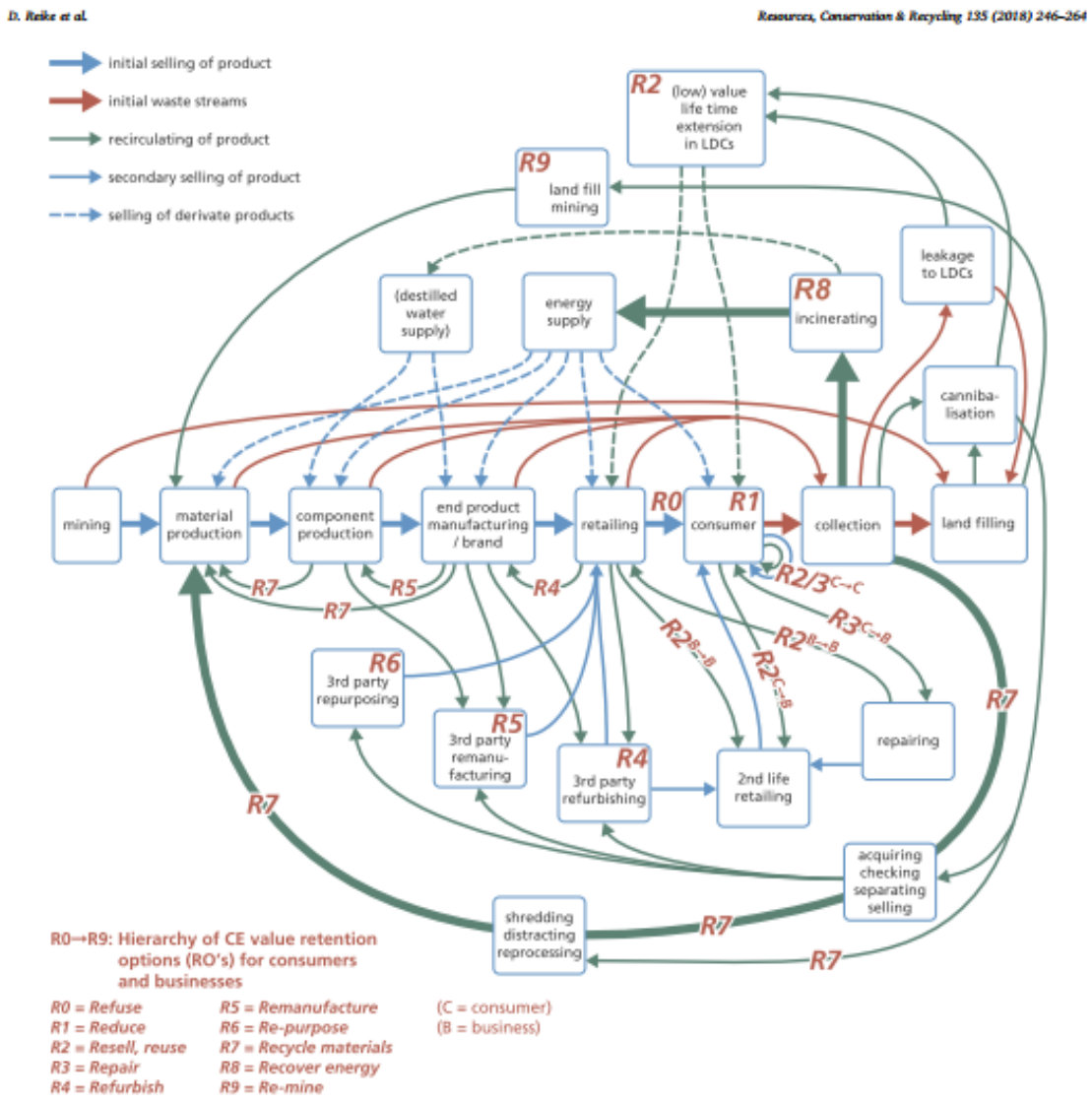



*Figure 10 Source: Reike et al., 2017*

The reasons behind this confusion on Rs number and meaning are various (Reike et al., 2017): as said before CE derives from many schools of thoughts, each with its own particular framing. There is a growing number of academic actors coming from all over the world whose background has been influenced by the publications about CE they had available. It is also constantly used by policymakers, businesses and consultancies for their own personal agenda, and sometimes they tend to simplify the concept for communication purposes. Even supranational organisations like EU, UNEP or OECD have their own definition of the term, often contradictory. Not to mention it can change depending on the scale and supply-chain considered. Having said so, "a clear understanding of the concept has yet to be found" (Reike et al., 2017).

-*The unbalance between loops preferences:*

Remaining on the loops topic, a certain asymmetry in their implementation can be found. Logically, among the different Rs there is an order of preference in favour of the "tight cycles" like reuse and remanufacture, since they require less energy and effort to be implemented. As Stahel (2013) said, "the smaller the loop (activity-wise and geographically) the more profitable and resource efficient it is" (Kalmykova et al., 2017). However, businesses and policies have focused their attention on the most external loop, recycling, where the only thing that is recovered from the original product is the material (Ranta V. et al., 2017; Kalmykova et al.,2017; Korhonen, 2017). Its original purpose isn't restored. This leads to a situation of "downcycling" instead of "upcycling", where the final result would have been a product of even higher value (Bompan, Brambilla, 2016). The origin of the problem can be traced back to the history of CE. As it's said in the first chapter, CE started "backwards", focusing the attention on how to deal with the waste created instead of considering the entire production process from the beginning. This would require a much deeper analysis of the system (an example is seen in the second chapter with the implementation of Ecodesign in the EU).

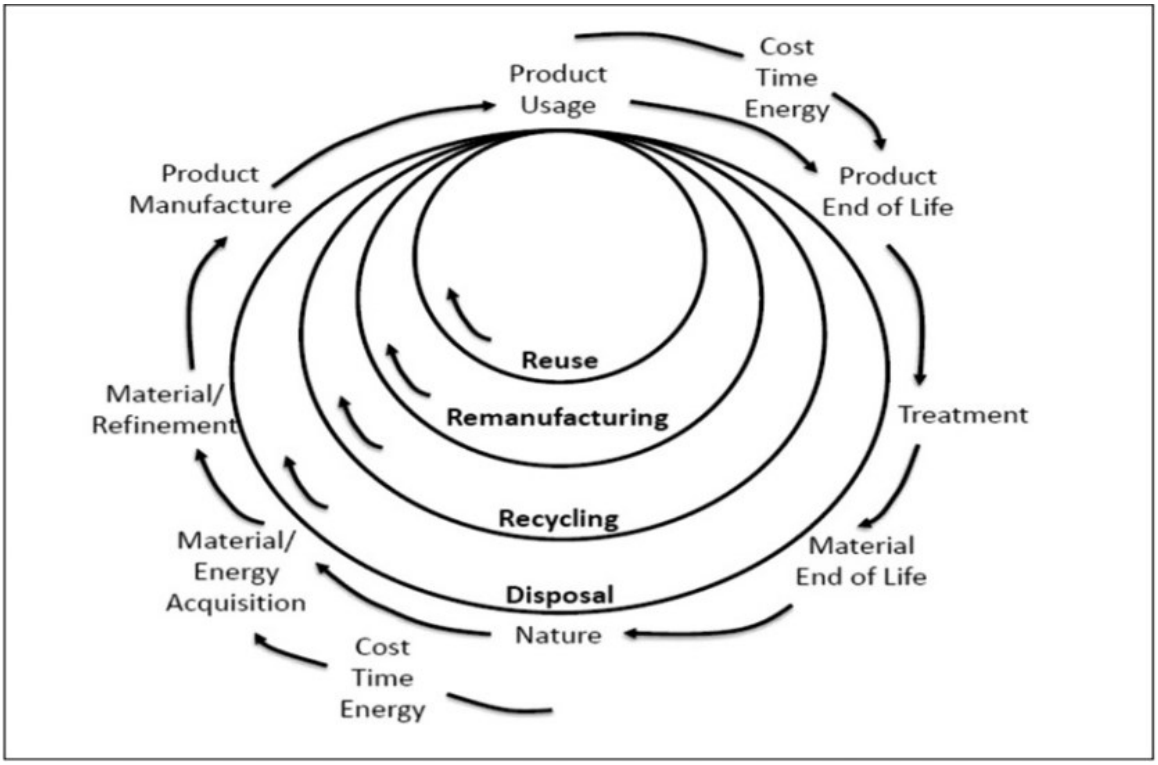



*Figure 11 Source: Korhonen, 2017*

-*Spatial and Temporal System Boundary Limitations:*

This is a more business-oriented flaw that characterizes CE. In a world where the linear production and consumption model is predominant, CE gives companies and institutions the means to be more sustainable. However, as already proven, business visions can often result in very narrow-minded strategies, geographically and temporally speaking. Nowadays supply-

chains are on a global scale with international and inter-regional markets and life cycles, so CE projects should be considered for their contribution to "global net sustainability" (Korhonen, 2017). Even eco-industrial parks that are highly efficient on a local scale can bring devastating effects if violating the biodiversity of the ecosystem in the source country, especially if a developing one. It would be pretty pointless if not counterproductive to focus on the reduction of waste and emissions only within the business, since the burden could be just switched to another area not of their competences. It goes without saying that it would be more difficult to quantify the effective impact on the environment in this case. Another problem would be to choose between intra vs inter-organisational strategies when implementing CE (Korhonen, 2017). A company may want to reduce its waste production, but if this waste in the bigger picture (local or regional) is seen as potential raw material for another industry, wouldn't be then right to maximize its production?

There is also a consideration to be done on a temporal level and it regards product durability, path dependencies and lock in. One of the main problems arisen from today's view is products programmed obsolescence, either for how they are made or due to technological advancements. Extending products durability through reuse or remanufacture seems then a good solution. However, it hampers the potential introduction of new products with less impact on the environment due to path dependencies. This happens as well with already established sustainable business models and technologies not willing to yield their leading positions. CE, playing with the rules of the current economic system, is not exempt from it. Another problem, almost paradoxical, is that when the product life is extended, it subtracts material flows usable through recycling in other productions, making other industries looking for new materials and leading in the end to a general increase of virgin sources use (Korhonen, 2017).

## 2. THE EUROPEAN SITUATION

*"The circular economy should be a central political project for Europe, as it offers the potential to set a strong perspective on renewed competitiveness, positive economic development, and job creation…"*

**Ida Auken,** Member of Parliament, Denmark (EMF,2015)

### 2.1. A BRIEF HISTORY OF CIRCULAR ECONOMY IN EUROPE AND ITS POTENTIALS.

After having outlined the history of CE, its various definitions, and mapped out the flaws and challenges of this "new" economic model on a theoretical level, it's time to see how the European Union is tackling the challenge and has applied the pillars of the concept to its economy. The EU choice to implement the principles of CE are dictated from "making a virtue of need". It is a continent with scarce raw materials, a strong manufacturing sector that accentuates the dependence of its economy to the import from foreign countries and that produces more and more waste. The figure below shows in fact that the amount of imported materials and products is 3.5 tons per capita, almost 3 times superior to the 1.3 tons of exports (this is expressed also by the different sizes of the two graphs). Not to mention the increasing uncertainty on the international political scenario and the reduced availability of some critical materials, threatening EU supplies.

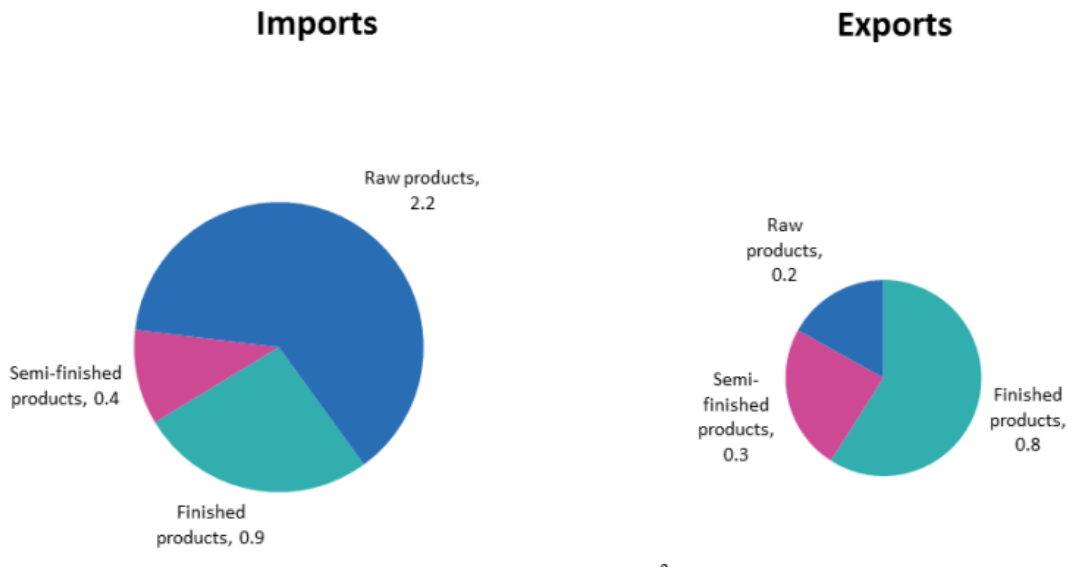



*Figure 12. Imports-Exports of Materia for Production, EU 28, 2017. Tons per capita. Source: Eurostat*

The potentiality for the EU to embark on this journey were very promising. In 2015, the Ellen MacArthur Foundation in its report "Growth Within: a circular economy vision for a competitive Europe" stated that CE "would generate a primary resource benefit of as much as €0.6 trillion per year by 2030 to Europe's economies. In addition, it would generate €1.2 trillion in non-resource and externality benefits, bringing the annual total benefits to around €1.8 trillion versus today. This would translate into a GDP increase of as much as 7 percentage points relative to the current development scenario, with additional positive impacts on employment" (EMF, 2015). Regarding the job market, another report claimed: "Assuming a continuation of the pace of current development in circular economy in Europe there's a potential to create 1.2

million jobs by 2030 with a reduction in unemployment by around 250,000. A more extensive development of circular economy in Europe by 2030 could create 3 million jobs and reduce unemployment by 520,000" (WRAP 2015). Not therefore only a way to change the current economy to a more sustainable one, but also a way to economic growth, in a market even now stagnant.

Despite its European origins, CE has only recently gained the importance it deserves in the EU policies initiatives. However, it would be false to say that before the introduction of the Circular Economy Package in 2015, there hasn't been any regulation or initiative on the matter. It is rather a project that modifies already existing Directives concerning different topics that nowadays go under the "umbrella" of CE. The EU in fact, as well as in other topics, is characterized by different speeds among its nations. First movers were the North-western European countries, in particular the Netherlands in 1979 and Germany in 1986, pioneering the concepts of waste prevention and reduction (Reike et al., 2017). With the interest for this topic growing, in 2005 Eurostat started to collect data on waste production. Afterward, a first common step was made with the 2008 Waste Framework Directive (EC, 2008) that established a five-step waste hierarchy, prioritising the prevention of waste generation. It had to be adopted by States Member by 2013, followed in 2011 by the launch of a flagship initiative named "Roadmap for a resource efficient Europe" (EEA, 2016). The time was ripe, or almost. In 2014 (same year as the introduction of the 7th Environment Action Programme) came out an announcement called "Towards a circular economy: a zero-waste program for Europe", but it was then replaced by the current Circular Economy Package (EUa, n.d.; McDowall et al., 2017).

## 2.2. THE CIRCULAR ECONOMY PACKAGE.

On the 2nd December 2015 the European Commission chaired by Juncker presented a new project composed by 54 actions to incentivize the transition of Europe towards a CE economy: "Closing the loop: An EU action plan for the Circular Economy" (ECa, n.d.;ECb, n.d.; EC, 2015). This proposal is connected to the basic idea of CE: keep materials and value in the loops to minimize losses. It doesn't mention maximization of use, renewable energies and human resources in the specific. Nevertheless, the Package is a good start, even though sometimes it seems little informed on the new developing CE models (Bompan & Brambilla, 2016). In particular, the communication modifies the Directive 1999/31EC (landfills), the Directive 94/62EC (packaging and its waste), the group of Directives 2003/53EC on vehicles at the end of their life, 2006/66EC related to batteries and their waste, 2012/19EC on WEEE (waste of electrical and electronic equipment) and the Waste Framework Directive 2008/98EC.

-*The general framework of the Package*:

The Package revolves around some transversal topics concerning any type of sector (EC, 2015):
-Product: it stresses the importance of improving the efficiency in every step of the value chain and the importance of measures regarding Ecodesign to promote products repairability (or upcycling), durability and recyclability, other than energy efficiency for energy related products.
-Production: the promotion for every industrial sector of the best practices available and the constant updating of the "best available technique reference documents" (BREFs). It is also expressed the willingness to clarify the normative framework about industrial symbiosis processes and the potential advantage for SMEs to adopt the Environmental Audit Scheme EMAS.
-Consumption: the efforts here are concentrated on increasing the awareness of the consumers thanks to the revision of the voluntary labelling ECOLABEL and the creation of a Product Environmental Footprint. Regarding the Ecodesign initiative to fight programmed obsolescence, criteria about product durability will be added in the rules of the Green Public Procurements, since PP in general makes nearly 20% of EU GDP, thus playing an important part in the European economy
-Waste: as mentioned above, it encourages recovery of materials, it reviews the 6 Directives and it also addresses the issue of finding a new way to calculate the recycling waste, common for all States Members. Moreover, it stresses the importance of developing a market for secondary raw materials to encourage the trust of the players in the idea of common market, thanks to new quality indicators and to simplify transnational waste shipments. It also proposes a revision of the regulation regarding fertilizers (to help distinguish between organic ones and those coming from recycled waste) and series of actions for reusing water, including a proposal for minimum re-usage of wastewater.

-*Priority areas:*

The Action Plan then focuses its attention on areas considered critical (EC, 2015):
-Plastics: there is the need for a strategic action on all its value chain to reduce landfilling and incinerators, and its dispersion in the environment.

-Food waste: it acts against a lack of indicators to determine the food loss throughout all the chain. It is also announced the launch of a platform that will gather best practices in tackling the problem and the improvement of the expiration labels.
-Critical Raw Materials: it points out the need to recover them from products at the end of their life, especially for WEEE, as well as to promote the exchange of information between producers and recycling companies.
-Construction and demolition: they want to facilitate the assessment of the environmental performance of the building and the recovery of valuable resources during demolitions.
-Biomass and Bio-based products: circular economy principles such as waste hierarchy must be introduced in bioeconomy. They also want to review the previous 2012 Bioeconomy Strategy.
The Plan doesn't stop only on the targets but it also outlines the means to reach and evaluate them. The Horizon 2020 work programme with its initiative "Industry 2020 in the circular economy" will grant over 650 million euro for innovative projects in various sectors. The Commission also has tried successfully to gather monetary sources from Cohesion Policy Funds (EC, 2015).
Up to now it has totalled more than 10 billion in public funding respectively coming:
- €1.4 billion from Horizon 2020 until 2018, of which €350 million allocated to making plastics circular.
- At least €7.1 billion from Cohesion Policies (which fund the development of regions that are less advanced).
- 2.2 billion from other funds of different origins (EU, 2019).
Regarding the will to monitor the status of the progresses, when the Package was approved in 2018 it included a Monitoring Framework for Circular Economy. It integrates the previous two Resource Efficiency (2013) and Resource Materials Scoreboards (2016) and it includes 10 key indicators (EUb, n.d):
For production and consumption:

- Self-sufficiency of raw materials for production in the EU;
- Green public procurements (as an indicator for financing aspects);
- Waste generation (as an indicator for consumption aspects);
- Food waste.

For Waste management:

- Recycling rates (the share of waste which is recycled);

- Specific waste streams (packaging waste, biowaste, e-waste, etc.).

For secondary raw materials:

- Contribution of recycled materials to raw materials demand;
- Trade of recyclable raw materials between the EU Member States and with the rest of the world.

For Competititveness and Innovation:

- Private investments, jobs and gross value added;
- Patents related to recycling and secondary raw materials as a proxy for innovation.

The Package has also an annex with temporal deadlines for its goals.

-*From proposal to implementation:*

Among the several actions undertaken after the issue of the Circular Economy Package, it is worth mentioning in particular the revised legislative framework on waste of 2018 that changes the previous Waste Framework Directive 2008/98 EC. It aims to increase the objectives of reuse and recycle, reinforce prevention, increase the plateau of waste that can be sorted separately, limit landfilling and incineration usage, change the recycling measurement system and make easier "the end of waste" status for many potential secondary raw materials otherwise not recyclable for law (Circular Economy Network, 2019).
Other Key elements of the revised waste proposal include (EUa,n,d,):

- A common EU target for recycling 65% of municipal waste by 2035;
- A common EU target for recycling 70% of packaging waste by 2030;
- There are also recycling targets for specific packaging materials:
    - Paper and cardboard: 85 %
    - Ferrous metals: 80 %
    - Aluminium: 60 %
    - Glass: 75 %
    - Plastic: 55 %
    - Wood: 30 %
- A binding landfill target to reduce landfill to maximum of 10% of municipal waste by 2035;

- Separate collection obligations are strengthened and extended to hazardous household waste (by end 2022), bio-waste (by end 2023), textiles (by end 2025).
- Minimum requirements are established for extended producer responsibility schemes to improve their governance and cost efficiency.
- Prevention objectives are significantly reinforced, in particular, requiring Member States to take specific measures to tackle food waste and marine litter as a contribution to achieve EU commitments to the UN SDGs.

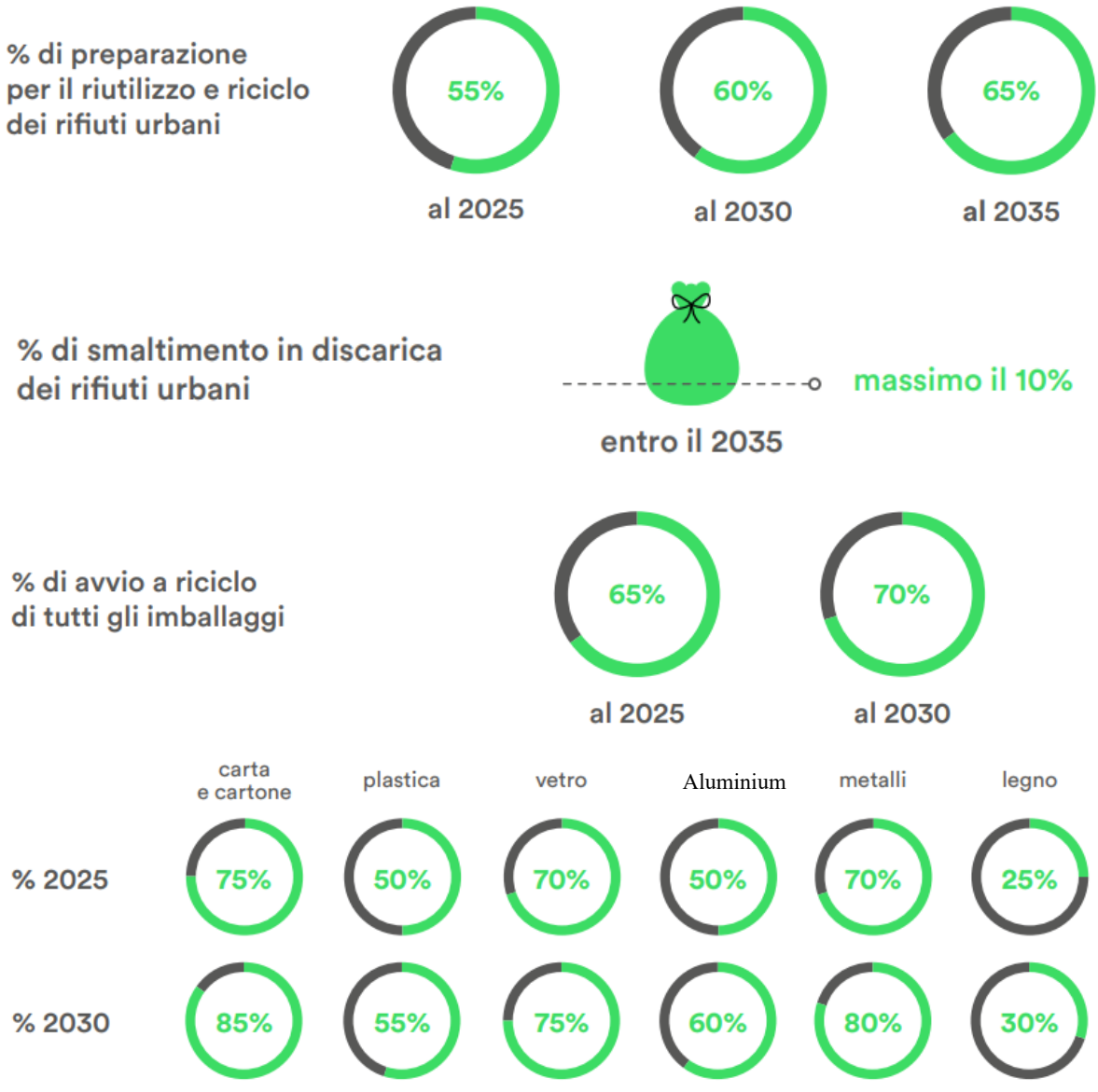



*Figure 13 Source: Rapporto sull'economia circolare in Italia, 2019*

However, there have been some controversies since the objectives have been smoothed from the original draft. There are in fact several weaknesses compared to the one presented by the Commission chaired by Barroso. First of all, the elimination of any target regarding the efficient use of materials (in the first version was – 30% of natural resources used for the same value

produced, in accordance with the efforts to reduce Co2 emissions). But it doesn't end here: the recycling of urban waste objective goes from 70 to 65% (with 7 countries having the possibility of asking an extension); the recycling of packaging drops from 80% to 75%; the maximum of domestic waste that can be sent to landfills increases from 5% to 10% (including now compostable and recyclables); the sorting of the organic fraction will be organised by 2025 where it may seem technically and economically possible (it was mandatory before); for food waste a target is not set anymore (before it was a 30% reduction by 2025 compared to 2017 ) but only a request to harmonise the way to calculate it; there aren't mentioned anymore specific measures for the elimination of harmful substances in the products that can hinder the possibility of recycling them (Bompan & Brambilla, 2016).

Anyhow, a great achievement of the EU efforts on this matter, first of its type, is the EU Strategy for "Plastic in a Circular Economy", a EU-wide policy framework adopting a material-specific lifecycle approach to integrate circular design, use, reuse and recycling activities into plastics value chains (EUc, n,d).

At this point it is right to ask, is the Plan successful?

On 4 March 2019, the European Commission issued a comprehensive report on the implementation of the CE Action Plan. The EU Monitoring Framework for the Circular Economy shows that "the transition has helped put the EU back on a path of job creation. In 2016, sectors relevant to the circular economy employed more than four million workers, a 6% increase compared to 2012. Additional jobs are bound to be created in the coming years in order to meet the expected demand generated by fully functioning markets for secondary raw materials. Circularity has also opened up new business opportunities, given rise to new business models and developed new markets, domestically and outside the EU. In 2016, circular activities such as repair, reuse or recycling generated almost €147 billion in value added while standing for around €17.5 billion worth of investments. In Europe, recycling of municipal waste during the period 2008-2016 has increased and the contribution of recycled materials to the overall materials demand shows continuous improvement. However, on average, recycled materials only meet less than 12 % of the EU demand for materials" (EU, 2019).

## 2.3. THE RELATIONSHIP BETWEEN EUROPE AND CHINA.

It goes without saying that the EU is not the only major player in the global CE scenario. Therefore, I find necessary to briefly switch the focus to another country, China, with which the EU has a strong relationship regarding its waste management and from which it could learn something. CE was introduced in China in the 1990s with the concept of industrial ecology and

cleaner production. It was then adopted in a national development strategy in 2002, later supported by the 2003 Cleaner Production Law and ended up with a pioneering legislation in 2009 with the CE Promotion Law, making it one of the first countries to have a structured program for CE (McDowall et al., 2017; Kalmykova et al.,2017; Ranta et al., 2017). The Law planned 3 function levels for CE implementation: individual businesses, eco-industrial parks and eco-cities/municipalities. It must be noted that the motivations that brought China to implement CE are substantially different from EU's. While the latter saw in it a possibility to relaunch its economy and productivity, the former is more concerned about pollution reduction and sustainable development. Other differences between them include the fact that China isn't very interested in changing the consumption pattern of the population through ecolabels, or in developing ecodesign initiatives, but it focuses mainly on industrial materials and waste emissions (McDowall et al., 2017). This is why they also have a broader array of indicators that EU doesn't include in the CE framework (but that still has). It is also characterized by an extensive informal collecting system and is trying to streamline it on official channels (Kalmykova et al., 2017). Anyhow, the Land of the Rising Sun has recently shocked the international market of secondary raw materials with the enforcement of a new norm in March 2018 to block or limit their introduction in its national borders of "yang laji", i.e. foreign waste. It imposes a 0,5 % ceiling of impurity for waste imported, including plastic, paper (the EU has a 1,5% limit), metals and timber, a percentage very difficult to reach (Di Stefano, 2018; Bianchi, 2019). After just one month from the implementation of the norm, imports of waste have dropped of 54% (Di Stefano, 2018). This material wouldn't have been recycled or used for energy generation in their countries of origin due to their scarce purity. Paper price has dropped from 92,50€ to 22,50€ in less than one year in 2018 (Di Stefano, 2018). This action particularly affects the plastic market. When before 45% of global plastic waste was imported, by 2030 an estimated 111 million tonnes will have nowhere to go (Mortillaro, 2018). And not only in China. This event is having a cascade effect in other countries of the South-East Asia and now Malasya and Philippines are stopping the import of waste from Western countries (Common, 2019). This situation encourages also illegal exports of waste from the EU towards developing countries with weaker environmental regulations, since the official exports channels are now closing (Reike et al., 2017).


*Figure 14 Source: Mortillaro, 2018*

This is a severe blow for the EU and for the world. As said by Joe Hruska from the Canadian Plastic Industry Association, "we all got hooked on a drug called China" (Mortillaro, 2018). Nevertheless, the EU must take this event as a challenge to revise its current status about recycling and energy production through incineration. Moreover, it would be advisable to take inspiration from some of the points that compose the Chinese CE Plan. For example, the more structured approach on a geographical scale, through the designation of zones, regions and cities thus to upscale the transition to CE and not limiting to "niches" situations, and the increase of indicators, possibly linked with other environmental aspects (McDowall et al,2017).

## 2.4. OTHER CHALLENGES FOR THE EU AND A FEW FLAWS IN THE CE PLAN.

EU future challenges in the implementation of CE are not just coming from external factors. Another point to be dealt with will be the current situation of a European Union at different speeds into the implementation of CE's principles. A general uniformity and standardisation must be reached in different topics. Just to mention an example, 40% of household waste is actually recycled, but it's an average from ample variations, with values that go from 80% in

some areas to 5% in others (Bompan & Brambilla, 2016). Also, as said above, there is the possibility of a 5 years time extension to increase the recycling rate of some countries and reach the CE Package targets, while countries like Germany, Finland and Austria have already dedicated strategies for resource efficiency and others have introduced resource taxes (McDowall et al., 2017). A review from EEA on municipal waste in 32 State Members shows well the inequalities (2013). Mid and North-western countries generate twice as much waste as in Eastern European countries, but at the same time their recycling rates can even reach 80-90%, while other countries as Rumania, Bulgaria etc. reach a stark 0%. Of course these are data from more than 5 years ago and with the CE Action Plan now things should change, if the nations are capable to incorporate well the Directives. Thanks to that the EU is trying to support the laggards to catch up, while the frontrunner countries are pushing for even stricter targets such as 75% recycling rates. However, even in the best examples there are some flaws. Downcycling rather than upgrading or reducing amounts used is still the rule (Reike et al., 2017). Moreover, reduction of landfilling is normally compensated with an increase of incineration usage rather than recycling (a preferred loop). This derives from the construction of over-capacity incinerators in North-western countries that still requires to burn high quantity of materials to function.

This diverts the attention from the active implementation of shorter loops in the R-hierarchies as mentioned in the first chapter.

Concentrating on those external loops, instead of focusing on tight cycles as reuse, refurbish or remanufacture is an ulterior negative tendency (Ranta V. et al., 2017). A good example is the Ecodesign Directive: Simona Bonafè, responsible for the European Commission proposals on the European Waste Directives, claimed that we are currently missing a complete regulation on ecodesign, since the one included in the 2015 Package regards only energy-related products (“Pacchetto Europeo”, 2018). Original Equipment Manufacturers (OEMs) until now weren’t motivated to implement ecodesign principles in their products since they didn’t have to recycle them (Vanegas et al., 2017), even though things will change with the EPR (Extended Product Responsibilities) mandatory by 2025. There is also is a need of incorporating in the political discussion other models as the “sharing economy”, otherwise they’ll be left behind (EEA, 2017).

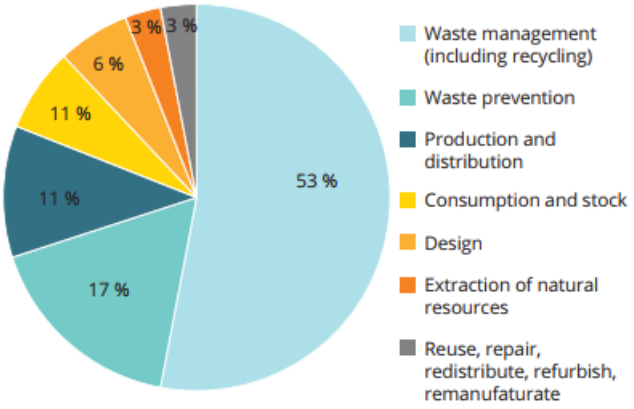



*Figure 15 Distribution of responses on policy approaches to closing material loops in the circular economy across different life-cycle stages Source: EEA 2016*

Another source of confusion is the so called "End of Waste" regulation, meaning the final qualification of waste material in question (Bianchi, 2019). This process has been left mostly to each nations' authorities. The reasons behind this decision instead of creating a universal European regulation were valid, such as an increase of flexibility for local institutions to determine recyclable specific materials if the techniques were available (as it is presented with the Fater example in the next chapter). However, this has already produced a vast array of national criteria that can be conflicting and arising problems in case of trade between different State Members.

## 3. THE ITALIAN SITUATION

**"You gotta lead from the front, nobody is going to start from the grassroots"**

Michael Bloomberg (Klein, 2014)

### 3.1. LIGHTS AND SHADES IN THE ITALIAN CE SCENARIO.

It is now time to focus our attention on Italy, a country that greatly expresses the conflicting scenario that characterizes the European situation. Nevertheless, a great example in the implementation of Circular Economy principles, that was able to detach from the historically imposed second comers' condition, the back marker, to become one of the crown jewels of the CE conversion on a European scale. Italy is in fact the second largest economy by turnover and employment (second only to Germany) in the field of preparing materials for recycling (Bianchi, 2019). Being a country that has always had to take care of the few resources within its borders, it is also one of the few realities in Europe where the balance between imports and exports of waste for the secondary material market has a net import of 3.4 million tons of waste

sent for recycling (and growing), meaning there is an actual impulse for the increase of the national market (Bianchi, 2019). A country where CE is valued "88 billion in turnover and 22 billion in added value, as well as requiring around 575,000 employees. The size of the circular economy in Italy, in terms of added value, is worth little more than 1.5% of national added value. An amount that is basically equivalent to that of the entire energy sector, or that of a traditional industrial sector (such as the textile industry) and an added value that is not too distant from that generated by the agricultural sector." (Bianchi, 2019). Even in the wider perspective of the green economy it is a leading figure: the first one to ban non-biodegradable shoppers, to make mandatory the use of the Green Public Procurements (Venturi, 2018) and to introduce officially the B-Corps, a type of companies that integrates sustainable and social goals to their mission (Cesare & Ezechieli, 2018). A trend that Enel and Symbola Foundation (2018) were able to express in the "100 Italian Circular Stories" report where companies such as Orange Fiber, Greenrail or Aquafil are mentioned.

However, there are still several shadows that obscure the Italian success. The European Court of Justice has already issued two infringements proceedings on Italy for the terrible management of the waste crisis in Campania. It is also the country with the highest consumption of bottled water in the world even if tap-water is one of the best in the world based on the WHO lists. Not to mention the increasing plague of the eco-mafia that affects all the Belpaese, not just the South.

Nevertheless, CE and GE are still considered pivotal assets for the Italian economy. Even in times of political crisis that are harassing the country, the retiring Prime Minister Giuseppe Conte in his resignation speech found time to mention the importance for Italy to continue to invest in a more sustainable economy (LaRepubblica_online, 2019).

### 3.2. CE REGULATION AND CONSORTIUM.

The Italian journey towards CE starts as in all the countries with the development of waste management. Specifically, with the Ronchi Decree (Decreto Ronchi) in 1997, designed to implement the latest European Directives and introduce the concept of waste hierarchy seen above (Fortini & Ramazzini, 2015). However, the path has been long and difficult, with some municipalities still not touched in 2013. Another novelty was the introduction of the principle "polluters pay" in the packaging industry (even though in the end the fee is added to the cost of the final product, so it's the consumer that pays) and of precise quantitative recycling targets. To do so, the Decree included the creation of CONAI (Consorzio Nazionale Imballaggi), a consortium that even now is the backbone of the Italian recycling system. To collect the waste

CONAI also stipulated an agreement with ANCI (Associazione dei Comuni Italiani) and it's divided in the followings depending on the type of material collected:

-Comieco: for paper

-Corepla: for plastic

-Coreve: for glass

-Rilegno: for wood

-Cial: for aluminium

-Ricrea. for steel

-Cic: for organic waste

-Ecodom: for WEEE

-Conou: for oils

Initially there was some opposition from the packaging industry, not willing to participate economically for the support of the program. Moreover, at the beginning packaging was the only item collected, but with the new Directives other types of waste were included (Fortini & Ramazzini, 2015). Another problem that still now concerns CONAI is the position of extreme power of the consortia within the secondary material market, thanks to big entry barriers against other competitors. This even lead to legal proceedings for abuse of position ("AGCM:avviata", 2019). Nevertheless, it is thanks to this consortium if Italy can now claim such optimal recycling rates, like 90% of oils recovered (Bompan & Brambilla, 2016), since it acted as catalyst for positive change in supply chains. Regarding the 2025 European targets, some have already been fully achieved.

After the European CE Action Plan in 2015, the environmental ministry and the ministry for economic development published in 2017 their strategy document: "Towards a circular economy model for Italy" (MA & MSE, 2017). This document however just aims to define the Italian current position on CE, it doesn't have a binding value. It puts the attention on the implementation of elements like ecodesign in products, the introduction of fiscal incentives on renewable materials and the increase of use of the GPPs. Still, things are starting to move and on the 22nd of June of this year it has been announced the creation of a Directorate General of Circular Economy to help its diffusion ("Al Ministero", 2019).

### 3.3. CIRCULAR ECONOMY IN NUMBERS.

In order to have a quick and comprehensive vision of the actual current performance of Italy in CE areas, it can be useful to look at some indicators: the productivity of resources (how many euros of the GDP are produced per kilogram of materials used); the rate of recycling of waste

(how much waste, municipal and non, including exports and imports, are recycled internally); and the rate of circularity of materials in the economy (how many secondary materials are employed out of the total consumption of materials) (Bianchi, 2019):

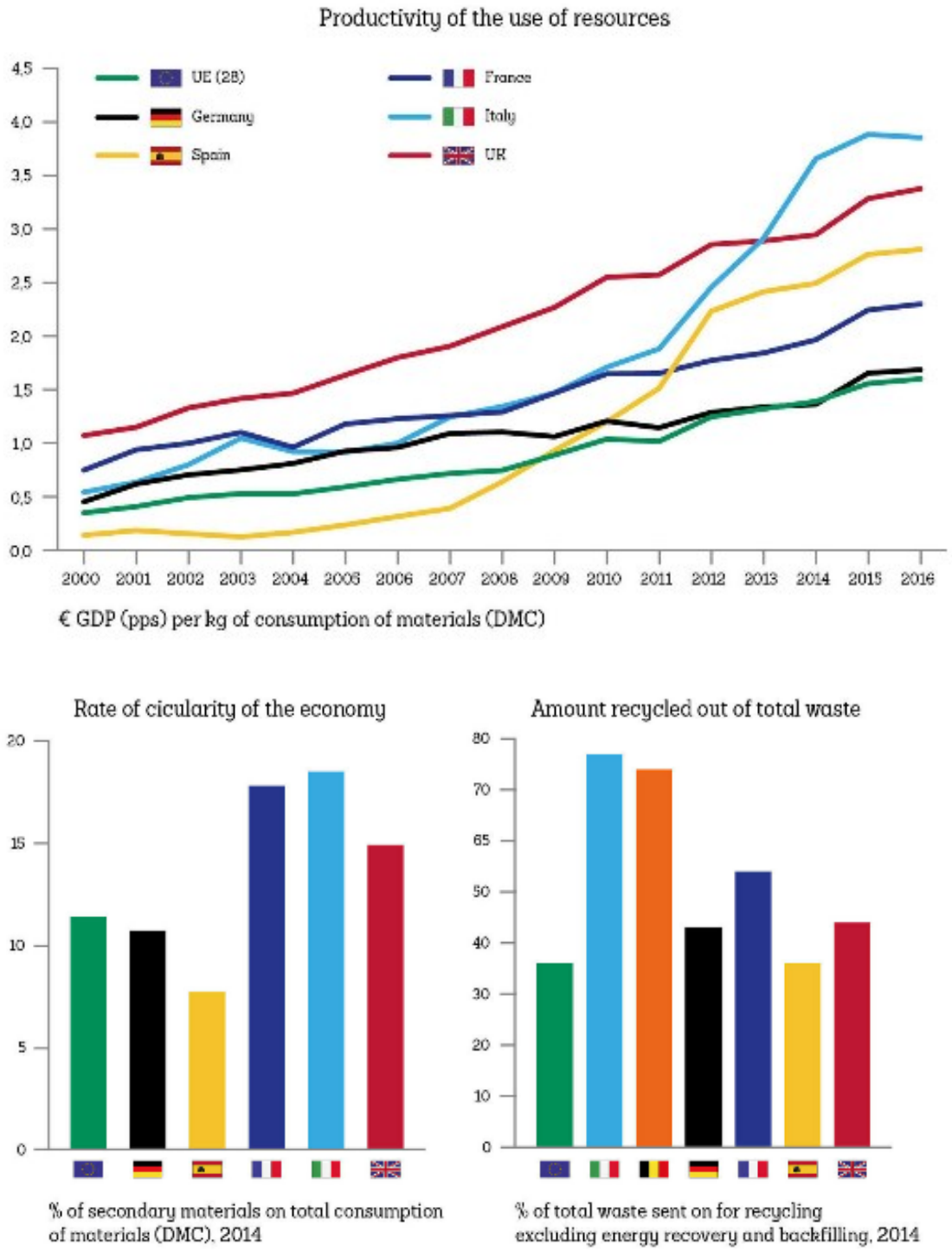



*Figure 16 Source: Bianchi, 2019*

These graphics are pretty self-explanatory and clearly show how Italy stands on a position of dominance in all the categories. It is worth noticing the stark increase in the efficiency of use of resources between 2000 and 2016 (+281% considering PPP) (Bianchi, 2019).

| Table 3. Productivity of resources* | | |
|---|---|---|
| | 2008 | 2016 |
| European Union (28) | 1.58 | 2.24 |
| Belgium | 1.79 | 2.72 |
| Denmark | 1.30 | 1.74 |
| Germany | 1.86 | 2.31 |
| Ireland | 0.99 | 2.34 |
| Spain | 1.50 | 3.19 |
| France | 2.00 | 2.79 |
| Italy | 2.04 | 4.00 |
| Holland | 2.86 | 3.99 |
| Austria | 1.40 | 1.72 |
| Poland | 0.86 | 1.23 |
| Sweden | 1.49 | 1.51 |
| United Kingdom | 2.62 | 3.63 |

* € GDP (in pps) generated per kg of materials consumed (in DMC). The productivity of resources is the Gross Domestic Product (GDP) divided by the consumption of domestic materials (DMC). The DMC measures the total amount of materials used by the economy. It is defined as an annual quantity of raw materials extracted on the national territory of the economy in question, as well as all material imports minus all material exports. The term "consumption", as used in DMC, denotes apparent and not final consumption. The DMC does not include upstream flows relative to imports and exports of raw materials and products outside of the economy in question.

Source: Eurostat 2017.

The rate of circularity presents a very good 18,5% (Ronchi, 2018), especially the industrial production rate of circularity is particularly high: well over 50%. If we exclude landfills, Italy turns out to be also the country with the highest rate of waste sent on recycling out of total waste generated, well over the European average.

| Table 5. Rate of recycling* and total waste management system in some European countries (2014) | | | | | | |
|---|---|---|---|---|---|---|
| | Total mln t | Landfill | Incineration | Energy recovery | Backfilling | Recycle |
| | % | | | | | |
| European Union (28) | 2,319.5 | 47.4 | 1.5 | 4.7 | 10.2 | 36.2 |
| Italy | 129.2 | 16.0 | 5.2 | 1.6 | 0.2 | 76.9 |
| Belgium | 42.8 | 8.2 | 4.3 | 13.6 | 0.0 | 73.9 |
| ... | | | | | | |
| France | 299.7 | 29.3 | 2.0 | 4.5 | 10.7 | 53.6 |
| United Kingdom | 209.0 | 41.5 | 3.6 | 0.9 | 10.4 | 43.6 |
| Germany | 370.7 | 19.2 | 2.3 | 10.5 | 25.3 | 42.7 |
| Spain | 103.4 | 47.9 | 0.0 | 3.4 | 12.6 | 36.1 |

* The rate of recycling is measured on the total waste – include mining waste – and limits the concept of recycling to waste preparation for recycling of materials (including biological treatment), excluding energy recovery and backfilling.

Source: Eurostat, 2017.

By looking at the situation of the different sectors of the CE, there is a big unbalance depending on the efforts profuse (i.e. labour force) and the consequent added value created.

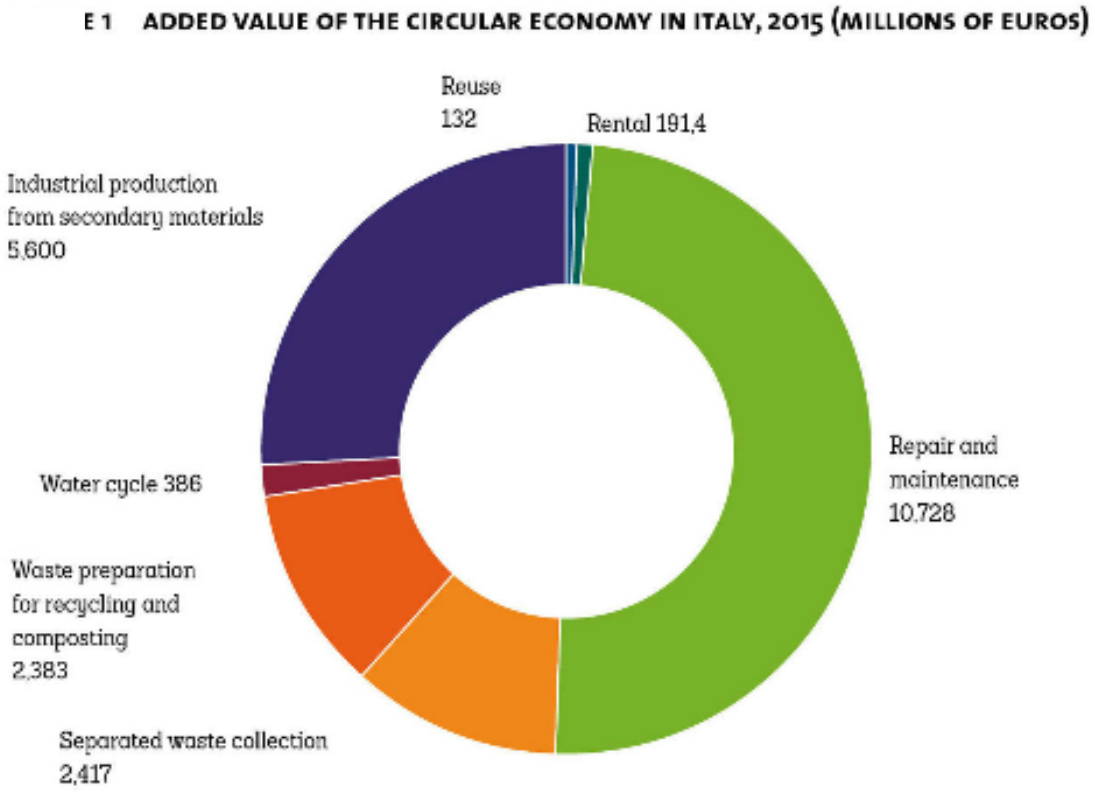



*Figure 17 Source: Bianchi, 2019*

The picture is basically divided between all the sectors regarding Waste Management on one side, and on the other the surprising enormous value that Repair and Maintenance is worth by itself. This is the demonstration of an economy that is moving its first steps towards a future "circular" and not only "recycling-oriented". However, the Reuse and Rental sectors have still a long way to reach acceptable values (Bianchi, 2019).

### 3.4. FLAWS IN THE REGULATION SYSTEM.

The challenges Italy will face in the next year while trying to implement CE are several. Just to mention a few, the performance difference in the recycling sector between North and South or the need to give more importance to shorter loops. However, the most difficult one will certainly be the resolution of several regulations gaps due to bureaucratic slowness and complexity, a flaw that has been a thorn in the side of the Italian administration for decades and that characterizes the entire regulatory system. As Ranta V. et al. (2017) state, a regulatory system can "support a CE by discriminating against wastefulness and motivating circularity, but it can also inhibit CE by, for example, denying the reuse of certain products". This is confirmed in the Italian scenario by a study from the Green Economy Observatory of the Bocconi Research Centre (Conai, 2017).

Sometimes the reason behind is the short-term vision. A great example is the recently approved "Sblocca Cantieri" Decree, where it is indicated that only the "End of Waste" (EoW) decrees issued until 1998 are valid, thus not allowing to recycle several types of materials (like tyres or mixed plastics) and greatly damaging the businesses based on the most innovative recycling systems. 56 business associations lead by Utilitalia, FISE Assoambiente and FISE Unicircular are moving against it since, if this deadlock continues, it will cost 2 billion per year (Carillo, 2019; "il riciclo in Italia", 2019).

Another huge problem is the "EoW" decree itself, and here the cases are infinite. This decree allows an analysis on a case-by-case approach of the actual recyclability of certain products. This was introduced to help States and regional authorities to deal with waste that the EU laws may not have taken into consideration yet. However, the process results still very unclear and slow in its application, generating several impediments (sometimes paradoxical). To mention a few, there is a complete lack of rules for the collection of construction materials ("Rifiuti,senza", 2019), the fact that the complete absence of a marine litter regulation imposes fishermen to throw in the sea the plastic they catch with the nets, because if brought on the shores to be recycled they would get fined (Loiacono, 2018) or the difficulty for Nespresso to collect their coffee capsules since they are not considered as packaging (Nespresso, 2018).

However, things are starting to move and cases with a happy ending are multiplying. In particular, one of them regards a company of the Veneto Region. I'm talking about Fater Smart, a business unit of Fater Spa, joint venture between P&G and "Gruppo Angelini" that produces lines like Pampers. This multi-million-euro project is the only one in the world able to recycle AHPs (Absorbent Hygiene Products) like diapers and tampons and extract from 1 ton of waste 150 kg of pulp, 75 kg of plastic and 75 of super absorbent polymer. A technology that, if spread on national scale, could be worth 300 million of investment and 1000 new job places (FaterSPA, n.d.). They had both the technology and the agreement with the local company Contarina for the collection of the material available since 2015 but it was all blocked because the "EoW" didn't consider AHPs recyclable. Another case where regulations are late compared to the advancement of business and tech. It is only on May 2019 that the Minister of the Environment Sergio Costa has finally solved the solution issuing a "EoW" decree for this type of waste (Formica, 2019). As Korhonen (2017) claims in the study "Circular Economy: the concepts and its limitations", the definition of physical flows (i.e. waste) is temporal, spatial and ever changing, leading to confusion when it comes to establish CE regulations.

## 4. CONCLUSION

*"Why waste what can be used in a sensible manner?"*

Pieter Winsemius, Former Minister of Housing, Spatial Planning, and the Environment in the Netherlands (EMF,2015)

It is now time to draw the strands together and make a few reflections on what it has been delineated in this paper. My original goal was to examine the concept of CE both on a theoretical and applied level in the European and Italian context and to show the various flaws and challenges that it entails. It has been demonstrated that CE isn't a new economic model as many may think, and even so it hasn't reached a conceptual maturity yet (as Reike et al. claimed in 2017, CE is a "refurbished" rather than a virgin concept). This leads to the understanding of why we may see such a vast difference of implementations of the concept. Scholars should find a general consensus among the different school of thoughts to help spread the model and solidify the ideology behind it. Are we really seizing the opportunity? By looking at the European situation, we see that the normative system is just recently taking shape with the CE Action Plan, but more efforts must be made to move away from becoming just a "recycling economy" and focus on tighter loops like reuse and remanufacture. In an ever-more globalised world, the EU should be also aware of the threats and opportunities that the international scenario may present like the Chinese case. Italy at the same time has demonstrated to have a

rightful place among the most advanced economies in terms of recycling, so it must play the role of leader in the European scenario. However, this is mostly thanks to the initiatives of the industrial fabric rather than a structured CE regulation, still lacking (CONAI, 2017). The chronic problem of the complexity of the regulations like the "EoW" might bury a prosperous future if not dealt promptly. During my research I came to the conclusion that finding examples that outline the flaws of the current CE implementation is more difficult and trickier than finding those that defend it. I presume the reason behind it is due to the current mainstream view is supportive towards CE, and these negative cases are considered just as temporary "bumps" along the road for a green future. It's thus my opinion that CE doesn't have to be seen as the point of arrival of the human quest for a sustainable model, rather as a pillar on which we still have to build.

Conteggio finale delle parole: 10374

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