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Circular economy: ethics, challenges and opportunities. The ENEL case.

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Starting point

The topic of environmental sustainability has found his way into the agenda of companies thanks to the growing pressures from the consumers, as well as new technological findings and law enforcement.

Over the debate on which of the paths should lead us to achieve environmental, social and economic sustainability together the circular economy seems to be the light at the end of the tunnel. The purpose of this new discipline is to reinsert the wastes accumulated by the end of the production process in the next production process; the goal is to try to "close the circle" of production and consumption without leaving anything outside, aiming to repair, reuse or recycle every single product.

On this topic, the European Union is currently shaping the new legislative intervention and investment, in order to carry Europe through a new scenario, in which the circular economy can be seen as a factor of growth and global competitiveness. It is not only about reducing the number of wastes or their quality, but rather to adopt a new concept of economic model and growth. The circular economy nudges the managers to rethink the traditional product development, their organization, the management of resources and the relationship with consumers. A new way of innovating, very promising, but that requires the overcoming of bureaucratic constraints and personal ideologies.

The United States of America is also making huge steps forward to the Green New Deal, the long waited legislation aimed to address climate change and economic inequality.

Introduction

The circular economy is a new approach to the production and consumption of goods. It can be seen as a new emerging economic paradigm that differentiates itself completely from the classic linear model, also known as *'take-make-dispose'*; it offers the same goods or services to the consumer, but also it aims to reduce the waste during the production process while looking at the products in a long term view.

The true purpose is to achieve the classic economic profit in parallel with social and environmental results. A necessity, but also a challenge for the whole productive system and the society is to rethink production models and methodologies for new ones more sustainable and environmentally friendly. This need is a consequence of the actual socio-economic scenario, of which the main components are the globalization, the technological processes and the increasing competitivity going on since the second half of the 20th; without taking into account the negative impacts of the linear model, having as consequences pollution, production inefficiencies due to waste and the even more worrying shortage of valuable resource.

The factor listed before together with other elements have a very strong effect on the problems deriving from the managing of a business:

- Globalization, for example, determined the creation of a worldwide market not only for consumers but also for companies; most of them decided to focus on their core activities externalizing the ones that could be delegated to third parties. This increased the competitiveness between firms and as a natural consequence the need for greater efficiencies and lower cost of production; pivoting on maximizing production often turns into a lack of care towards the environmental cause and a waste of resources.
- The fast-paced growth of the technologies and types of machinery reflects in better management of resources, efficiencies, and safety. The downside of this process is that an excess in exploiting the natural resources,

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minimizing the times of production, leads always to overuse of feedstocks and a waste of resources in general.

Furthermore, the forecast of the economic, social and environmental scenarios is quite worrying: the estimations tells us that in 2050 the world population will touch 10 billion, meaning that the number of consumers will dramatically increase and, as a consequence, companies must satisfy the demand from a bigger and bigger middle class. The intrinsic economic variables, as well as the dynamics concerning the global mutations, are bond with the topics of pollution, global warming, the fight against hunger and the sustainability of resources of our planet.

The wrong behavior from most of the companies and the lack of personal responsibility and empathy from the individuals are the main reason behind the current worrying scenario that surrounds the safety of our planet. In the last few years, the circular economy opened its way as one of the most interesting solutions in this concerning situation. The World Commission on Environment and Development identified in 1987 defined sustainability as "development that meets the needs of the present generation without compromising the ability of future generations to meet their needs": the sustainable growth is a long period path in which is essential to recognize that social, economic and environmental values are worth the same.

On the basis of what described before, is essential to analyze the limits of the actual model of production and to realize that is not sustainable in the long term; as a consequence, we must interrogate ourselves on which could be the future possibilities that could allow our society to survive in this everchanging scenario. The circular economy fits perfectly as a solution, in order to switch from an old and obsolete model to a new one, after a solid reconsideration of the production phase and the supply chain management of the raw materials.

Currently, all over the world, a huge wind of change is taking root starting from the USA. Since the Obama administration, has started a long-term plan for the conversion of the United States of America: the plan is to convert the country to a 100% renewable and zero-emission energy source state. The left-wing party presented his plan for the deal, with huge investments in electric cars, high-speed rails; it also includes helps for the vulnerable communities, including in the deal a plan for the universal health care, increased minimum wages, and monopolies prevention.

Italy can be the forerunner of this revolution of business and thought, with multiple companies that since years already believe in the sustainable processes: with executives implementing them in their business operations, creating virtuous procedures in the managing of wastes, from the early prevention to the recycling of materials, even creating facilities designed to recover raw material thanks to the help of citizens that becomes an active part in the circularity of production, making them more responsible and aware of their everyday actions.

To make this happen is necessary a strong steer and coordination on the national level, that implements norms, funds and removes the non-technological barriers for a true circular revolution for Italy and the European Union. In this transition towards a circular economy, the manufacture seen as an activity of transformation of inputs into outputs starting from the innovating processes assumes a fundamental role because it is closely connected to the use of raw materials.

Adopting strategies and models of business, orientated towards the circular economy, the manufacturing businesses will have a key role, redesigning internal processes, supply chain relationships, promoting innovative products connected to new materials or eco-design, as well as the way by which consumers relates to the product or service. ENEL is a company that, through direct involvement, is leading this process of change for a better future. The topic of the wasting of resources and the circular economy has always represented a primary role into the vision and mission of the company; with a strong will of denunciation towards obsolete and non-ecological ways of doing business along with a huge cooperation with citizens, public and private administrations for a smooth transition to an environmental friendly productive system. Their biggest program regarding the circular economy, core of the thesis, is the *Futur-e* project.

It involves 23 power stations and 1 lignite mine for a total of 13 GW of installed capacity: the goal is to reconvert the inactive power stations, nowadays classified as unproductive assets, into valuable resources. It is a concrete approach perfectly representing the circular economy. It is expected to recover the old assets in favor of new and more efficient forms of industrial reuse and material recycling; the mission is to generate value, social and cultural development for the territory thanks to the involvement of the community through the dedicated "*sharing platform*".

Three of these projects, the ones of Alessandria, Porto Tolle, and Carpi, are going to be scanned, in order to obtain the expected value in terms of real estate assets, materials recovered, and social and job development.

CHAPTER 1: The Circular Economy

1.1 The evolution of the Circular Economy over time

The linear economic, described by the model "take, make, dispose of"; originated between the end of the eighteenth century and the beginning of the nineteenth century having fertile ground thanks to mass production.

The first traces of the term Circular Economy may be found in a study of Pearce and Turner, called "*Economics of Natural Resources and environmental*"¹; it addresses the interlinkages between the environment and economic activities². The researchers identify a closed-loop material flow in which the economic system takes place according to the principle "*everything is an input to everything else*"³.

Starting from the '70⁴ has been noticed that the constant flux of extraction and disposal has been and is the main cause of problems like marine and terrestrial pollution, greenhouse emission and the resultant climate change, creating an intense competition towards the control of the raw material⁵. It appears more and more clears

¹D. PEARCE, R. K. TURNER, Economics of natural resources and the environment, 1990.

² M. S. ANDERSEN, An introductory note on the environmental economics of the circular economy 2007.

³ B. SU, A. HESHMATI, Y. GENG, X. YU, A review of the circular economy in China: moving from rhetoric to implementation, 2013.

⁴ D. MEADOWS, D. MEADOWS, J. RANDERS, W. BEHRENS III, The Limits to Growth, 1972.

⁵ J. SINGH, I. ORDOÑEZ, *Resource recovery from post-consumer waste*, 2016; S. SAUVÉ, S. BERNARD, P. SLOAN, *Resource recovery from post-consumer waste*, 2016.

to the researchers and analysts that the economic growth must be paired with a more coherent sustainable development towards the environment and the society.

For these reasons and thanks to growing care and sensibility from the companies towards the environmental and social cause, it is felt the need for an alternative model of production and consumption. It has emerged during the last decade a new paradigm focused on a "circular economy"⁶ as a consequence of an economic movement that has bored in mind the challenges required by the environment⁷. John T. Lyle has been the first to introduce the idea of "*Regenerative Design*" based on the assumption that every existing system could be managed in a regenerative way, so the activities behind it could be able to reproduce the same raw materials used during the process.

One of the pioneers, that also tried to apply the concept of circularity in an empiric way is the swiss architect Walter R. Stahel in 1976 thanks to a system of *"loops cycles"*; he highlights the potentials of this model, able to create new jobs, saving resources, managing the wastes and, of course, to increase economic competitivity. In 1982 he publishes *"The product-life factor⁸"*, one of his most famous publications; Stahel's starting point regards the analysis of the product life cycle deriving from the strong usage of the linear model in those years: the enormous exploiting of raw materials and energy converts itself in the accumulation of the wastes of the final goods into dumps after a very short period of time. What he proposes is to enhance the product life cycle and the research for alternative solutions

⁶ M. GEISSDOERFER, P. SAVAGET, N. M. P. BOCKEN, E. J. HULTINK, The Circular Economy–A new sustainability paradigm?, 2017; K. WEBSTER, *The Circular Economy: A Wealth of Flows*, 2017; S. WITJES, E. LOZANO, *Towards a more Circular Economy: Proposing a framework linking sustainable public procurement and sustainable business models*, 2016.

⁷ E. LOISEAU, L, SAIKKU, R. ANTIKAINEN, N. DROSTE, B. HANSJÜRGEN, K. PITKÄNEN, P. LESKINEN, P. KUIKMAN, *Green Economy*, 2016.

⁸ W. R. Stahel, "Mitchell-Prize winner", *The product-life factor*, 1982.

from the private sector in order to reduce the impact on the surrounding environment and the cancellation of numerous final products, in order to adopt a more sustainable system.



Figure 1 The self-replenishing system (product-life extension). Fonte: STAHEL W. R., 1982. The product-life factor

The draws show a model in which the usage of raw materials, the resources, and the energy does not obstacles the economic growth or technical progress. The first cycle represents the reuse, the possibility to use a second time the same product to get the same results or the change in his field of usage. The second cycle identifies itself with the reparation of the good when it's actually damaged, but with the possibility to get introduced again into the life cycle after specific controls. The third life cycle it's the regeneration of the good, substituting the damaged parts with similar elements. To close the spiral we have the recycle and the upcycling that highlights the predisposition of a good to be disassembled in his fundamental components, with the goal of giving new life to a product or contribute to it; The most the cycle are small, the best the result as Stahel says: "*do not recondition something that can be repaired, do not recycle a product that can be reconditioned economically*"⁹.

⁹ W. R. STAHEL, The product-life factor, 1982.

In the late 90's thanks to Michael Braungart and William McDonough, starts to develop the principle of "*Cradle-to-Cradle*"¹⁰: on the contrary of the well-know linear model, "*from the cradle to the grave*", in which everything that has been created is going to become a waste, the C2C¹¹ model is an innovative approach that seeks to avoid the creation of wastes thanks to a regenerative systems able to recycle resources already used, in order to put them in a second productive cycle with the goal to transform them in a new good. One of the principles of the C2C model is resumed in the equation "*waste* = *food*", in which is summarized the will of the model to generate continuative regenerative cycles with positive side effects for the economy, the society and the environment in the long term.

Later on, it takes hold throughout Europe the stream of researches referable to the Industrial Ecology; according to it, the industrial ecosystem must be considered as a natural one. Therefore, the main actor that operates in the scene of the industrial ecosystem must be educated to better management of wastes, the use of resources and materials at the end of their life cycle, with the goal of reducing the problems that nowadays afflict the planet.

Moreover, the industrial ecology introduces the concepts of "*industrial metabolism*" and "*industrial symbiosis*": with the first one is described the deep analysis of the physical processes involving the raw materials, the energy and the handwork thanks to the studies on the "*Life Cycle Assessment*"; the second one, on the other hand, is the exchange of energy, resources, and products inside a specific geography, in which is located an integrated system of public and private companies that collaborate between each other's with the goal of increasing the competitive advantage thanks to an appropriate usage of raw materials and wastes.

¹⁰ W. MCDONOUGH, M. BRAUNGART, Cradle to cradle: Remaking the way we make things, 2002.

¹¹ Cradle to Cradle

Since 2009 is active in the United Kingdom the Ellen MacArthur Foundation, is a nonprofit organization that focuses on the study of circular economy at global level to favor the diffusion of this new approach to the economy to analyze, study and work constantly towards the improvement of this model and his application thanks to a collaboration with numerous companies that develops circularities.

Lastly in 2010 Gunter Pauli publishes his book called "*The Blue Economy: 10 years, 100 innovations, 100 million jobs*", in which the author after having identified twenty one principles, finds the opportunity to develop the approach towards the green economy: while the green one focuses on the fight to pollution and reducing dangerous emissions, the blue one is based on the innovative economy that is able to turn the environmental challenges in opportunities able to create economic value and to safeguard at the same time the environment; the fastest way to reach this objective is to reconvert previously used products into new items that could be sold in the immediate future.

After this papers and famous publications on the circular economy, more and more researchers are highlighting the positives effects of a circular economy and writing about the obstacles about the implementation of this model; anyways, the recent improvements, theoretical and practical, and the mediatic development around the cause are the true signal of the willingness to develop a new model, more sustainable compared to the current one.

1.2 The limits of the linear Economy and principles of the Circular Economy

In order to solve the negative impacts created by the actual way of doing business, or at least reduce it for next generations is necessary a model thought for a better usage of resources that pushes the whole productive system to a circular approach¹², instead of linear based on the "usage of the products instead of consumption"¹³. The CE gives the possibility to create models able to valorize good that today are considered wastes thanks to actions able to create a virtuous circle of regeneration; the starting point from where we must start is the knowledge of the actual linear model and his weaknesses.

A linear productive model is distinguished by the "*take-make-dispose*", that expects an initial phase of extraction or gathering of resources and raw materials, thanks to the usage of energy and workforce and a third phase of commercialization, selling and use of the product that precedes the end of the life cycle in which the product is going to be thrown in the dump. This type of supply chain contains numerous weak points:

- Economic Inefficiency: every product that ends his life cycle into dumps, becomes automatically an element of waste and subsequentially a lost in potential profit, due to the missed opportunity of valorization.
- Loss of value through the whole supply chain: since the model doesn't care about the sustainability of the business, that base his success on the spread of the product and so on the increase of productivity is obviously destined to the

¹² Waste as a resource

¹³ J. M. ALLWOOD, Squaring the Circular Economy, 2014.

loss of value across the whole supply chain and specifically on the last part in which the good becomes a waste.

- Systematic risks and volatility of the prices: A company that bases his own business on products that could be created exclusively through the gathering of natural resources, for the most part, must take into account the inexorable depleting of resources that have been explained before. Moreover, the deplete of resources into a market, especially in an uncertain one, leads inevitably to an increase in prices and their volatility.
- Erosion of the natural capital: Even though the forecasting is clear about the necessity of a change in our way of doing business, companies continue to ravage the natural capitals with actions such as deforestation, pollution, and reduction of resources.
- Unsustainability in the long period: Relying on what we already said, it's inevitable to state that an economic model based on the maximization of the productivity and the irresponsible use of resources is destined to worsen the actual condition of our environment and that is not compatible with the concept of sustainability.

The CE on the other hand ass is characterized by the valorization of the consumption's wastes, the extension of the life cycle, the sharing of resources, the usage of recyclable raw materials, the usage of renewable sources of energy. It's an economic system featured by a rethinking of the products and the production

processes, thought to renew itself; the flux of the products is divided into two categories¹⁴:

- Biological wastes, able to be reintegrated into the biosphere to aliment new natural capital and contribute to the creation of new cycles;
- Technical wastes, meant to be revalued without entering the biosphere, generally made of non-natural components that could be used to the creation of the next generation of products.

By "closing the cycle"¹⁵ companies may enhance the process of value creation through a multiplication of the inputs generated, extending the life cycle of the products and avoiding emissions. The companies orientated towards the CE, are indeed interested in the monitoring of the usage of their products into the sphere of consumption to amplify the life cycle and reduce the wastes¹⁶.

The CE distinguishes itself by connecting with new business models in which the organization doesn't sell a product, but a service¹⁷. From the consumers' side, the CE is progressively modifying the relationship between the company and the consumers: the involvement of the consumer increases at the moment in which their interests and the vision and mission of the company are aligned towards the sustainability, making them actively participate in the innovation of the product.

¹⁴ M. GEISSDOERFER, P. SAVAGET, N. M. P. BOCKEN, E. J. HULTINK, *The Circular Economy– A new sustainability paradigm?*, 2017.

¹⁵ H.R. KRIKKE, H.M. LE BLANC, S. van de VELDE, Product modularity and the design of closedloop supply chains 2004, N.C.Y. YEO, H. PEPIN, S. S. YANG, Revolutionizing Technology Adoption for the Remanufacturing Industry, 2017.

¹⁶ C. A. BAKKER, F. WANG, J. HUISMAN, M.C. HOLLANDER, *Products that go round: Exploring product life extension through design*, 2014.

¹⁷ A. TUKKER, Product services for a resource-efficient and circular economy - A review, 2015.

The last few years have been developed by the consumers a particular focus on an environmental and social cause¹⁸. Alongside the positive aspect, is anyways still present a strong skepticism, towards the recycled and/or regenerated materials¹⁹. The challenges of the CE don't involve only the improvement of the efficiency of productivity, but also to change of models of consumption, creating a stronger awareness towards the downsides of a certain purchase choice or behavior on the environment or the economy.

The bearing columns of the CE are the following:

- Eliminate the idea of wasting: In a society in which the whole economic system is based on consumption, in which the wasting of good is not yet considered a problem, the idea of eliminating or reducing the wastes on every level of the supply chain appears hard. That being said, on those level, from the first to the last, is possible to use technical and natural components able to create the conditions for a next reuse, recycle or restructuration that would allow the reduction of wastes and to recover a big part of the value that is actually dissipated through the whole industrial chain.
- Change the idea of good: The linear economy and the actual society are based on the concept of pure consumption and possession of the good; for this every single individual prefers to complete propriety of a good, even though this is going to be underused or seen as a single-use product that will eventually become a waste. On the other hand, the circular approach could create a model

¹⁸ P. PLANING, Business Model Innovation in a Circular Economy Reasons for Non-Acceptance of Circular Business Models, 2015.

¹⁹ B. T.HAZEN, D.A. MOLLENKOPF, Y. WANG, *Remanufacturing for the Circular Economy: An Examination of Consumer Switching Behavior*, 2017.

based on the use of the good trough the concept of "servitization"²⁰ or platforms of "sharing economy"²¹ that would allow the consumer to only benefit from the good in a determinate temporal curtain, without being the owner. This type of business could allow to reduce the number of wastes and fight the under-utilization of goods.

- **Build Resilient:** A circular model must be ready to fight eventual difficulties and exploit the actual socio-economic environment like starting point for new projects trough versatility and adaptability that would allow facing our ever-changing scenario.
- **Trust and rely on renewable energies:** Besides the themes of environmental sustainability and safeguard of the environment, renewable energies are essentials for all that companies that would be independent of external sources of energy, during the production phase and logistic one and to be safe from the market volatility.
- **Think systemic:** The circular economy is a system in which every single part is essential to the functionality of the whole. The systemic way of thinking allows us to consider the relationship between environment, infrastructures, social context, politics and economy to manage them together.

²⁰ The progressive mutation of the offer from the companies towards the requests of the consumers. To be more specific the clients today prefers to use the product, as a service, instead of owning it, overcoming the concept of property trough the advent of the functionality.

²¹ The sharing economy is based of the inclination of people of undertaking horizontal relationships trough technological platform, crossing the demand and the offer of a specific good.

• Every waste is a resource: Has already highlighted and contrary to the actual way of thinking in which a useless good becomes waste, in the circular economy every element is recovered from a successive valorization or creation of another productive cycle.

The figure below represents perfectly all the elements of the circular economy mixed together, allowing the creation of the perfect circularity.



Figure 2 The circular economy paradigm. Ellen MacArthur Foundation 2013, p. 69

Over this debate on the CE, more knowledge and experience must be accumulated towards the adoption of "circular" business models, not only considering the perspective of the production processes but also on the marketing side; unfortunately, the majority of studies and researches on this new model is focused on the transformation operations and the investments into manufacture processes²².

In this scenario, may have the strong role the digital technologies, in particular the new ones connected with the 4.0 industry, that may transform the relationship between production and consumption as well as the organization and the control of the production processes internalized by the company and the supply chain. The 4th industrial revolution, connected with the 4.0 industry, thanks to the spreading of digital technologies, is deeply changing the industry and the mechanism trough which has historically been generated value, innovation, jobs, and well-being. The industry 4.0 is configured as a technological mix of robotics, additive manufacture, sensors, global connection able to modify forever the management of companies and their production models.

Thanks to the ability to interconnect and make the resources cooperate, digital technologies can not only increase competitiveness and efficient but also leverage the introduction of new business models, up to the point of overcoming the traditional distinction between product, process and service thanks to the Internet of things²³. Digitalization is considered a relevant asset in the process of transition towards the

²² B. T. HAZEN, D.A, MOLLENKOPF, Y. WANG, *Remanufacturing for the Circular Economy: An Examination of Consumer Switching Behavior*, 2017.

²³ M. DESPEISSE, M. BAUMERS, P. BROWN, F. CHARNLEY, S. J. FORD, A. GARMULEWICZ, S, KNOWLES, T.V. H. MINSHALL, L. MORTARA, F. P. REED-TSOCHAS, J. ROWLEY, Unlocking value for a circular economy through 3D printing: A research agenda, 2017; A. GARMULEWICZ, M. HOLWEG, H. VELDHUIS, A. YANG, Disruptive Technology as an Enabler of the Circular Economy: What Potential Does 3D Printing Hold?, 2018; P. LACY, J. RUTQVIST, Waste to Wealth: The Circular Economy Advantage, 2015.

model of the circular economy: on the business level it will be possible to optimize the consumption of resources, reduce the energy wastes and the ones generated from the production process; the storage management will be made more efficient connecting the requests from the production and the others lines in the supply chain.

Anyways the impact of the industry 4.0 doesn't only affect the business side, it embraces the whole production system, allowing the creation of integrated supply chains of production and recycle; it makes possible the industrial symbiosis as well as a new geography of activities closer to the final consumers²⁴.

1.2.1 The Life Cycle Assessment

To value the cycle of life of the products is a basic accounting skill that allows companies to get information about:

- The whole life cycle of the product and the processes; thanks to them the company controls the details of their activities and can notice loses of value in their assets or strong opportunities for improvement.
- The environmental footprint of their activities; it can be therefore improved or anticipated.

The definition of LCA can be found in a document of the US Environmental Protection Agency²⁵ that for its part has been extracted from the Society of Environmental Toxicology and Chemistry report:

²⁴ O. A. LAPLUME, B. PETERSEN, J. M. PEARCE, Global Value Chains from a 3D Printing Perspective, 2016.

²⁵ "Defining Life Cycle Assessment (LCA)". US Environmental Protection Agency.

"Life Cycle Assessment is a process to evaluate the environmental burdens associated with a product, process, or activity by identifying and quantifying energy and materials used and wastes released to the environment; to assess the impact of those energy and materials used and releases to the environment; and to identify and evaluate opportunities to affect environmental improvements. The assessment includes the entire life cycle of the product, process or activity, encompassing, extracting and processing raw materials; manufacturing, transportation, and distribution; use, re-use, maintenance; recycling, and final disposal"²⁶.

The final value of the impacts is, looking at the definition, comes from a complex study and analysis of the whole life cycle of products. Normally, the phases through which an LCA analysis is completed are:

- 1- Definition of the objectives
- 2- <u>Inventory</u>
- 3- Assessment of the Environmental Impact
- 4- Interpretation and improvement proposals

About the first phase, the objective of the company may be many (explore performances, compare...), but one thing is fundamental: defining a *functional unity*, so to say a measure thanks to we can compare the data collected. It is also important to define the borders of the LCA analysis in order to include only the processes that we are interested in.

The inventory phase consists of the examination of the transformation of the non-elementary flux (products, raw materials, and services) in elementary ones (CO_2 , NO_X , etc.). This process is one of the most valuable because it gives the first reply relative to the impact of the product analyzed.

²⁶ Guidelines for Life-Cycle Assessment: A 'Code of Practice', SETAC, Brussels.

Done with the inventory, we must interpret the numbers we received; the factors may be analyzed by impact factor, so to say the materials and the phases that contributes to a specific impact on the environment or flux of effect, methodology based on the valuation of a substance or a life cycle and his impact on the whole environmental system: for example greenhouse effect, acidification of rains or eutrophication of the waters are some of the voices analyzed.

The last phase allows the companies to confront possible scenarios based on the data collected before and to propose new strategies of changing finalized on the reduction of pollution and environmental impacts.

In conclusion, the LCA is one of the instruments that allow us to increase our responsibility towards pollution and environmental impacts. From the companies' side still remains a good way to increase the internal awareness of the products and services that lean towards an integrated analysis.



Figure 3 Example of LCA in a company of PCs, laptops and audio/tv, Toshiba.

1.3 Analysis of future scenarios

Analyzing what has been said before, it's inevitable to think about the CE as a model that could allow us to reduce and minimize the negative impact of the human activities on the environment while still remaining a very productive system able to satisfy the consumers and the economic objectives of the companies. Unfortunately, is not just a possibility of improvement, it is a strong necessity for the whole society and industrial system. The data and the literature published by the MacArthur Foundation²⁷ and the Organization for Economic Co-operation and Development²⁸ in which are shown and described the future perspective of our planet in the long term are seriously worrying. The main topics touched by the scholars are the increase of the population, biodiversity, climate change, scarcening of resources. In particular, the OECD document analyzes a situation in which, in a potential future situation, small or minimal action towards the environmental safeguard is taken.

The first situation analyzed is the inevitable increase in the world population in the next years.



Figure 4 World population growth by 2100

²⁷ ELLEN MACARTHUR FOUNDATION, *Towards the circular economy 1: economic and business* rationale for an accelerated transition, 2013.

²⁸ OECD (2012), OECD Environmental Outlook to 2050: The Consequences of Inaction.

The numbers show how since 1950 the world population tripled to 2020 and is going to be doubled again for 2100. The consequence of an increase in the world population is obviously the increase in the demand of the base goods such as water, food, basic services as transportations and energy. The biggest growth is registered in the emerging and growing economies.

Population projection by the UN, 2100 Shown is the total population since 1950 and the Medium Variant projections by the UN Population Division until 2100.



Figure 4 a World population division by 2100

OurWorldInData.org/future-population-growth/ • CC BY

The evolution and spread of technologies will require an increase in the use of energies, in fact, the demand is forecasted to increase by over 100% and that more than 70% of the global population will live close to the urban areas in the close future²⁹. That being said, without politics that lean towards the social and environmental cause, the spread of energy resources will remain invariant compared to the actual scenario. For what concerns the urbanization process it must be noticed that even if it will take to a better distribution of services, on the other side it will inevitably increase the level of pollution in those areas.

The global warming and climate change are closely related to our lifestyles and with the energetic necessities; the risks that our environments face all rotate around our consumption of natural capital, exploiting resources and most important the way in which they convert into dangerous substances. Since 1997 has been signed the Kyoto protocol from 192 countries, in order to fight the emissions of gas that accelerate the climate changes: 98% of GHG³⁰ is carbon dioxide (CO₂) methane (CH₄) and nitrous oxide (N₂O).



Figure 5 Different GHG and their influence, divided by type

²⁹ OECD, 2012.

³⁰ Greenhouse gas.

Scenarios for the next 50 years forecast an increase in the demand for energy of 80% and the reaching of 530 parts per notation of CO_2 . Since to keep the increase of global warming inside 2°C is 450 parts per notation of CO_2 this information is particularly worrying, because it could cause an increase of the temperatures from 3° to 5° in case that we miss our corrective measures.

One of the biggest concerns regards the water: the forecast from the OECD tells us that in 2050 almost 4 billion people, half of the global population, will have problems to access and manage their own water. This is related to the increase in the services and the demand for water in the long term.



Figure 6 Increase in water consumption forecasted for 2050

Obviously, the increase in the demographic levels and the market demand are elements that amplify the problems of the availability of resources on our planet, water over the others. The primary sector is the one that uses 70% of the total demand. On the basis of what said before, it is essential to safeguard in the next years the numerous water resources that have been dramatically reduced in the past years. Lastly, atmospheric pollution is one of the most concerning for the healthcare of the individuals, constantly exposed to the damaging substances present in the air of the biggest metropolitan cities. The most dangerous gas present in the air is *particulate*, which may be divided into primary and secondary.

The first is directly sent into the atmosphere like in the case of the black from carbon, the second is formed through the reaction of different gasses present in the atmosphere such as SO_2 or NO_X . The PM10 and PM2.5 are the most dangerous particulate, inasmuch they can directly go through the lungs. Unfortunately, must be noticed how the highest formation of GHG is related to the economic growth of the BRIICS³¹ nations and other developing countries. To fight against the increase of pollution the United Nations created an agenda with the objective of achieving 17 Sustainable Development Goals (SDG) by 2030, divided into 169 targets; the main objectives are to fight the increasing poverty and hunger, the improvement of the healthcare and instruction, reducing the disadvantages between people and, of course, the safeguard of our planet.

The adoption of a circular economic model could allow us to reach many objectives; specifically, the numbers 9 and 12 express the willingness to promote different economic models, sustainable over time.

³¹ Brazil, Russia, India, China, South Africa.



Figure 7 UN objective 9 and 12

Specifically:

- **9.1** Develop quality, reliable, sustainable and resilient infrastructure, including regional and transborder infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all;
- 9.4 By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries taking action in accordance with their respective capabilities;
- **12.1** Implement the 10-year framework of programs on sustainable consumption and production, all countries taking action, with developed countries taking the lead, taking into account the development and capabilities of developing countries;
- 12.2 By 2030, achieve the sustainable management and efficient use of natural resources;
- 12.5 By 2030, substantially reduce waste generation through prevention, reduction, recycling, and reuse;

- **12.6** Encourage companies, especially large and transnational companies, to adopt sustainable practices and to integrate sustainability information into their reporting cycle³².

1.4 Value creation trough the Circular Economy

After having analyzed the big perspective that we face on the circular economy, is time to enter into the details and examine the different models of the circular economy that, even though they belong to the same approach, they differ on the basis of the market, the product and process, everything related to the value creation.

- The optimization of the internal life cycle in order to minimize the use of raw materials into the value chain. This type of value creation consists of the creation of new life cycles that values natural resources or materials that otherwise would have been wasted; it not only creates a saving for the companies but also a sustainable result in terms of environmental preservation.
- 2. Creation of longer life cycles, in order to maximize the number of the processes. This situation aims to extend the life of the products, the material, and the components since a longer life means to delay as long as possible the use of new raw material with high savings in terms of costs and intrinsic value of the product. In order to reach this objective is necessary to do multiples regenerative cycles or to maintain the same cycle as long as possible. The benefits deriving from this approach are translated in lower costs of supply and increase of the operative efficiency; nonetheless is it possible that the costs of

³² https://www.un.org/sustainabledevelopment/sustainable-development-goals/

managing and maintenance will increase, even if in a lower measure compared to the savings.

- 3. Creation of "*cascade effects*" models in order to diversify the reuse over the whole value chain. This model adds a different value compared to the others; in fact, as the others focalize on the circular use of the resources on one specific product, the cascade effect introduces the opportunity to cross manage the products and the components over the whole value chain. So, the benefits regard the reduction of the marginal cost of reuse of the materials over the value chain, compared to the get new supplies from the market.
- 4. Creation of "*pure*" inputs and designs, so the use of uncontaminated and pure material. This phase is connected to the selection of resources that could enter and be part of the circular economy of a company. In a nutshell, this process is an improvement of the others and underlines the importance of having pure and high-level materials into the processes. The optimization of this model is calculated from the beginning and may allow the company to get economies of scale, cost reduction, more efficiency, better design of the product, better revision processes.

The four conditions described before allowing the company to improve their efficiency, saving operative costs and combining between each other's allow to an even higher effect on the value chain. It must be noticed that the economic realities are living a globalization process and, consequently, delocalization of some of their establishments that belongs to the mother company. This is one of the problems with the applicability of the circular economy in a huge geographic context. In fact, the proximity between companies is a crucial factor in a circular project.

The linear economy is reaching his limit in terms of market risks, due to the extreme exploiting of the natural capital, as much as the intrinsic competitivity of

the model itself; in fact, being a model based on the improvement of the efficiency over time in order to gain profits, the intense use of energies as well as the increase in the supply chain risk, is slowly eroding the competitivity of the model. On the other hand, from a long-term perspective, the benefits deriving from a circular economy are different:

- Saving from the volume of raw materials: The core of this model is based on the principle of "the waste is food", that assumes that companies adopt a circular system that is able to valorize useless products that otherwise would have been completely discarded. Adopting the circularity allow to reduce the contractual power of the suppliers and our need to rely on them;
- Less volatility of resources' prices and empowerment of the value chain: Differently from what is going on right now, an economy that doesn't rely on the same raw materials in order to be effective could be able to stabilize the prices and the volatility of the commodities on the market; at the same time a minimization of the wastes and re-think of the processes could allow an increase of efficiency across all the value chain;
- **Increased innovation tendency:** Companies adopting circularity in their business are more careful about the project and the design of their activities: they must create products allowed to be valorized after their normal life cycle, in order to valorize more and more parts in the next cycle. This, and the necessity to re-think productive processes connected to the circularity is a big nudge to the innovation and the research of new solutions;
- Creation of new workplaces: Like every economic system, the circular economy must need new experienced people and managers with specific abilities in order to keep going and innovating. Not only the whole system

must be supervised, but also a small part of it as the creation of new cycles, separation of the products and valorization of secondary cycles;

- Extending the life cycle of the products in a resilient economy: The idea of the circular economy, doesn't affect only the second life of products by not being discarded but valorized, creating new value for the companies, but also the whole economic system benefits from it creating a more resilient and strong base, stable against economic shocks.
- Increase in the productivity and healthcare of the territories and the safeguard of the natural capital: In case that the circular economy would be applied to the agricultural system (that, as said before, is one that has the strongest polluting impact on the ecosystem), new systems and innovative approaches could allow a diminished use of the fertilizers, pesticides and other chemical products; as a consequence, terrains would have a longer life, productivity would increase and able to preserve the natural capital.

The opportunities for growing and economic development in the context of the circular economy are multiple and foresee situations in which every actor in the socioeconomic context would gain something. Companies would receive new and variegated possibilities of profit thanks to the valorization of life cycles and consequential savings in the operative costs and supply chain negotiations; more than this also the creation of less complex products and with a longer life cycle could allow the companies to draw benefits from the marketing side and customer loyalty.

For what concerns the final customer, in fact, they would immensely benefit from the reduction of the planned obsolescence, the increase of the duration of the products and the new business model based on the usage and not the ownership. Lastly, the forecasting by the MacArthur Foundation of the impact on the global economy, in terms of savings, rotates around 380 Billion dollars each year in the case of a slow transition; 600 Billion with a strong movement.

1.5 Main Business Models

The first large difficulty that is found while thinking how to switch from the actual way of doing business to a new circular one, is the status quo bias³³ of the businessmen. Thinking about changing their system that, even if inefficient and soaking with wastes, is still performing and able to reach their desired level of income or profits sound like nonsense that most of the companies wouldn't even think about.

Moreover, an inclination towards the change, that would allow the implementation of circularities still is limited by certain difficulties, like abandoning certain schemes and actions that still are present in the business model and in the actions of the managers. The adoption of a circular approach, on the other hand, assumes a complete separation between the normal habits, because it is not only a way to marginally increase the profits but a completely different way of thinking and doing business. From different studies, in particular, the one from Accenture³⁴, we can

³³ Status quo bias is an emotional bias; a preference for the current state of affairs. The current baseline (or status quo) is taken as a reference point, and any change from that baseline is perceived as a loss.

³⁴ Accenture Strategy, 2014. Circular advantage.

notice five different business model that deviates from the classic way of doing business.



Figure 8 The five circular business models". From: Accenture Strategy, 2014. Circular Advantage

The image represents a system in which the circularity starts in the design phase and the thinking of a sustainable product ("*product design*") and the resulting supply of raw material ("*procurement*") needed to create the good trough the process of transformation ("*manufacturing*"). Starting from this initial phase, it is possible to see two of the analyzed business models: the circular supply and the resource recovery. The first concerns the implementation of sustainability in the supply chain, the second the creation of a second production cycle.

Going on, are described as the classic logistic and distribution activities towards the market, commercialization, and selling; lastly the phase of the utilization of the product by the final consumer. In this context is possible to analyze new business opportunities connected to the emergent sharing economy and the possibility to extend the life cycle of the product thanks to activities like reselling and reparation and upgrade of the existent good. In the last part of the life cycle of the product will be necessary to verify which elements must be eliminated as wastes and which ones could be used again trough action of remanufacturing, after a logistic analysis.

CIRCULAR SUPPLIES

The model of circular supplies is made of a complex system of companies, partners and suppliers that involves all the activities of the supply chain, in particular, the phases of materials gathering and the distribution of resources and goods. The difference of the circular approach can be noticed in the use of renewable energies and technologies and the use of recyclable or biodegradable inputs able to sustain a product's system that avoids the waste of resources and that could be able to autoregenerate itself, at least partially.

The circular supplies tend to be environmentally friendly since the creation of the relationship between companies in the supply chain allows to buy eco-sustainable materials, allowing the reduction of the usage of other dangerous materials. In the long period, this system is mutually beneficial for companies and consumers: the companies gradually see their dependence on volatile and toxic materials reduced, and the consumer will get advantage from lower prices and lower polluting materials. Compared to a linear system, the circular approach fights the inefficiencies, the waste of resources and the CO_2 emissions and also diminishes the risk connected to the volatility of the prices for some commodities.

On the other hand, high switching time, high initial costs due to the precious raw materials, big initial investments for research and development and lastly the creation of a network of companies are some of the obstacles that this new business model could face.
RESOURCE RECOVERY

Usually, at the end of the life cycle of a product, this one is generally tossed in the trash and then his life is considered finished. On the other hand, through a recovering and recycling system, we try to capture completely or partially the utility of the good in order to reinsert it in a new life cycle of production and use. The principal leverage of this business is the advanced technologies and the possibility that some companies would decompose and extract some valuable materials in order to create a new input or product that maintain the quality and functionality equivalent to the initial one.

The C2C platform and the industrial symbiosis are good examples of optimization and obtaining of raw materials that amplify the possibility of recovery and recycle: the main objective of this system is the maximization of the efficiency in the managing of materials, correlated with the creation of new value thanks to the use of circular processes of activities. The philosophy originated from this model concerns the estimation of the waste as a resource and not as a problem like in the linear economy. There are 2 approaches to this model:

- 1. Recovering the materials that are at the end of their life cycle thanks to extraction processes that allow using the material recovered for another life cycle, increasing the value thanks to upcycling techniques. In this phase is important to prepare strong collaborations with final consumers to nudge them to give the product back at the end of the life cycle;
- 2. Recover the material from the production process or other companies' processes in order to valorize them and obtain new resources at price zero.

The effort to put into is relatively low and refers mainly to the mapping of processes and the analysis of the life cycle of the products and the operative flux. The final result, on the other hand, creates enormous benefits for the companies, able to reduce the addiction to virgin raw material and use unconsidered resources; for the consumer, he agrees to discard unused products and to take part in programs that increase his loyalty towards the companies.

To start this process companies must start giving value to present waste and create services for the consumer in order to get back the obsolete products for the recovering of materials.

PRODUCT LIFE EXTENSION

The product life extension is directly correlated with the management of the previous models; the recycle, recovering and reuse activities are synergic in order to extend the life and the durability of a good and to avoid the linear way of accumulating wastes. The main activity is the *remanufacturing* activity: with this action we focus on the practice of reconstruction of the good with the same qualities and functions of the precedent, using the same raw materials obtained by recycling his "ancestor".

Instead of creating a new object, we try to use the discarded materials in order to create a virtuous cycle. This model not only focuses on the mere extension of the life cycle, after the death of the product but also creates designs of products focused on a long-lasting life; more durable, easy to repair, recycle, reuse and reinsert into the market. The will of this approach is to revert completely the actual scheme in which the planned obsolescence and the weak foresight put into the construction of the products are the main causes of the insane number of wastes.

The tentative of introducing a modular design and the product life extension itself is in the long term the two instruments able to maximize the efficiency from the company's point of view and to protect the environment, the society and our surroundings from the increasing pollution. The model has six main activities, to make it applicable:

- Create products with high functionality and quality in order to increase the products life cycle;
- Collect the dead products in order to reconvert them into their original state;
- Collect the old products on the market in order to exchange them with new ones at a competitive price;
- Add to the product new characteristics and functionalities in order to make it appeal fashionable;
- Refill the product as long as it is possible to reuse it before the end of his life cycle;
- Repair the product for the clients who don't want to buy a new one.

Unfortunately, this model has a barrier that we should consider: in the case in which the product belongs to the category of the long-lasting ones, the company will launch it at a higher price, because the revenues are generated not by the volume, but by the longevity. This approach could make the customer upset towards the price, but the company could avoid this scenario: is it possible for example to create a model based on successive updates or add-on that could be sold later on, maintaining a lower base price. Inside this model, to create a long-lasting relationship with the consumer is a must, in order to create possibilities of customer service and specific support.

Lastly, the above-mentioned activities must be supported by an easy possibility of switching malfunctioning parts and modularity; skills that must be absorbed by the company itself.

SHARING PLATFORM

During the last few years has exponentially grown the so-called *sharing economy* with which, thanks to the before-mentioned digitalization and proliferation of new technologies, has been created platforms to share product and cooperation between services operators, consumers, and organizations. This occurrence is the perfect convergence of two needs: on one side the companies or the individual in need of a specific good or product that they do not own. and that is not up to buy; on the other side, the linear model of mass production creates an enormous agglomerate of products that, once acquired, stay unused for the largest part of their life.

The direct result of the above-mentioned situation is reflected in the usage of technologies for the sharing purpose: thanks to the new technologies today is possible to put in contact two users in real-time to satisfy their need and cross the demand and supply perfectly. In this way is possible to allow the consumers to reach their objective and to maximize the value and the utility of the products in terms of efficiency.

Applying the sharing economy to the everyday needs is possible to maximize the correct usage of resources and reduce the environmental impact associated to some types of products and services: just thinking about the reduction of pollution connected to the everyday use of public transportation or the usage of shared vehicles, instead of driving our own car. The sharing economy is based on 3 pillars:

- 1. The possibility for the consumer to amplify his possibilities and of products and possible solutions;
- 2. The usage of a good at a lower price and just in the moment of need;
- 3. The quality of the product and services together with a new experience.

To reach satisfying results is necessary that the model is implemented in the highly populated areas in which is easier to cross demand and supply; moreover, a crucial element of this new approach is the relation of trust between the subject that offers the service and the user.

PRODUCT AS A SERVICE

This approach must be seen inside a larger market dynamic in which has been highlighted the transition of companies from pure product production to a service one: the change is identified thanks to a switch from an economy based on tangible goods towards a context characterized from the increasing importance of the *intangible* factor. This brand-new market, the so-called "*Product Service System*", is born from the need of the companies to be different from the competitors inside the more and more competitive market: a richer proposal from the services side allows to increase the satisfaction of the final client.

The classification of the *product-service system* extends to three main categories, divided by the impact of the additional service to the base good: the service-connected to the product, the service-connected to the use-value and the services connected to the results. The first allows the improvement of the total value of the product thanks to the additional complimentary service that increases the performance or the maintenance; the second allows the valorization of the unused good thanks to the possibilities of leasing or sharing, thanks to it the consumers are allowed to completely use the potentiality of a products, of which the mere possession would be inefficient; the third and last category is referred to the obtaining of the higher possible success for the companies thanks to the functional specialization.

As said before, this model starts by focusing on the loyalty of the clients and their experience more than exploring sustainable solutions. Later on, has been acknowledged how this approach could allow the companies to focus indirectly on the environmental and social sustainability: as an example, let's think about the offer of the service of maintenance and supervision of a brand new car, compared to the sharing possibilities made to maximize the use of the final good. From the previous examples is possible to highlight that, first of all, the increase of benefits for the client but also the possibility to reduce the toxic emissions and to improve the environmental impact of cars, their safety and the maximization of usefulness. Lastly, the product as a service model can be associated increments of value for the environment and the society, more than the maximization of the economic value for the companies.

CHAPTER 2: Law and Politics in support of the Circular Economy

2.1 An overview

The origins of the CE are rooted in the environmental economy and industrial economy; in the emerging economies like China, the CE is promoted as a top-down³⁵ political objective, while in others consolidated economies like the European Union, Japan, and the United States is seen as a bottom-up³⁶ approach to regulating environmental and wastes politics.

The final goal of the CE integration is to create a system in which the growing environmental pressure is not seen as an obstacle to the economic development, instead of as a factor that could link together the safeguard of the climate and the industrial growth. The implementation of the CE all over the world is still in the initial phases, and where it is already implemented is yet to be fully developed; in fact, it is

³⁵ In a top-down approach an overview of the system is formulated, specifying, but not detailing, any first-level subsystems. Each subsystem is then refined in yet greater detail, sometimes in many additional subsystem levels, until the entire specification is reduced to base elements.

³⁶ A bottom-up approach is the piecing together of systems to give rise to more complex systems, thus making the original systems sub-systems of the emergent system.

focused on recycling instead of the reuse. However, it must be noticed how important results have been reached in some sectors, for example, the management of wastes; in some specific countries, especially the northern European ones³⁷, the recycling rate has reached important overall results and even greater ones in specific sectors.

The CE implies the adoption of cleaner models of production at the business level, with an increase of responsibility and consciousness of the consumers and the producers, the use of renewable technologies and raw materials and the adoption of clear, stable and adequate political instruments. The lesson learned from the successful CE realities is that the transition towards a circular economic system is based on the involvement of all the actors of the society and their skills to connect and create adequate models of cooperation and exchange.

The **US** appears to be lacking a relevant federal and political framework on the CE, despite the law 1976 on resource conservation and recovery³⁸ and the 1990 law on pollution's prevention³⁹. The majority of the USA adopted in 1980 a solid hierarchy on the management of wastes that focus on the reduction and reuse of them, starting from the most precious or polluting, listed in the top part of the hierarchy and classified as used oils with a severe prohibition towards the abandon or not controlled dumping⁴⁰.

Every state orientates his politics towards the CE in his own way and the most underdeveloped don't have any law about. The state with the higher number of

³⁷ Norway (34%), Sweden (34%), Ireland (34%), Belgium (31%).

³⁸ EPA, US Environmental Protection Agency, 2013. Resource Conservation and Recovery Act. http://www.epa.gov/agriculture/lrca.html

³⁹ EPA, 2014; US Environmental Protection Agency, 2014. Summary of the Pollution Prevention Act. http://www2.epa.gov/laws-regulations/summarypollution-prevention-act

⁴⁰ J. J. PARK, M. CHERTOW, *Establishing and testing the "reuse potential" indicator for managing waste as resources*, 2014.

information and clear regulatory framework is California that, thanks to his Department of Resources Recycling and Recovery enacted the latest legislative instrument with the political and social goal of recycling, reusing or composting at least the 75% of the solid wastes produced in the state within 2020⁴¹.

Japan, started in 1991 with the law on the efficient use of Recyclables, developed and modified over the last 20 years⁴². Since then, Japan brought into force different legislative frameworks in order to sustain and evolve the CE into the island country; first of all, the law for the Promotion of Effective Utilization of Resources⁴³, act to:

- 1. Enhance measures for recycling goods and resources by implementing the collection and recycling of used products by business entities;
- Reduce waste generation by promoting resource-saving and ensuring longer life of products;
- 3. Newly implementing measures for reusing parts recovered from collected used products and, at the same time as measures to address the reduction of industrial wastes by accelerating the reduction of by-products and recycle.

Then the Fundamental Plan for Establishing a Sound Material-Cycle Society⁴⁴; it gives a complete picture and clarifies the processes (included roles and responsibilities) to overhaul the lifestyles of the society based on the mass EC. The

- ⁴² P. HE, F. LÜ, H. ZHANG, L. SHAO, *Recent developments in the area of waste as a resource, with particular reference to the circular economy as a guiding principle, in waste as a resource, 2013.*
- ⁴³ MINISTRY OF THE ENVIRONMENT JAPAN, Law for the Promotion of Effective Utilization of Resources, Government of Japan, 2000.

⁴¹ California legislature, 2019-2020 regular session act n. 54.

⁴⁴ MINISTRY OF THE ENVIRONMENT JAPAN, Fundamental Plan for Establishing a Sound Material-Cycle Society, Government of Japan, 2013.

regulatory framework gives a general scheme with laws focused on the correct, effective and efficient management of the CE.

It must be highlighted the success of the urban symbiosis of the Eco-Town program that establishes 26 ecological cities characterized by the CE⁴⁵.

Canada, on the other hand, overshadowed the implementation of the CE for a long time emphasizing a national plan on climate change and clean growth⁴⁶; anyways, are emerging more and more research bubbles around the CE, international cooperating activities and initiative undertaken by the public politic. Nevertheless, Canada hasn't implemented any type of integrated and global strategy or cooperation regarding the circular economy that has been fundamental for the development of a circular approach in other countries.

Although, Canada has a small number of initiatives, guided by private societies for example Natural Circular Economy Lab by Natural Step: launched in 2016 is preparing to launch his next initiative focalized on the development of a national strategy for the circular economy for the Canadian State and the National authority on the wastes; instituted in 2013 reunites governmental, private and NGO companies to promote the wastes prevention and the creation of a Canadian circular economy.

This initiative has strong support from the local government, including the six biggest regions of Canada. Also, thanks to a team that works on the adoption of the CE and the creation of a business toolkit⁴⁷.

⁴⁵ R. van BERKEL, T. FUJITA, S. HASHIMOTO, M. FUJII, *Quantitative assessment of urban and industrial symbiosis in Kawasaki, Japan*, 2009.

⁴⁶ T. SINGER, *Business Transformation and the Circular Economy*: a candid look at risks and rewards, Conference Board of Canada, 2017

⁴⁷ J. LORINC, Circular economy on the rise, but Canada lags on repurposing waste, Globe and Mail, 2017.

China, despite the heavy reputation that earned over the years of a polluted and grey country, is one of the most active countries working towards the creation of a green society. About the CE China created the so-called "3R" principles of action: reduction, reuse and recycle⁴⁸. Chinese's law regarding the CE, defines the circular economy as a "generic term for the reduction, reuse and recycle activities operated in the processes of production, circulation, and consumption"⁴⁹, that fits perfectly the chines model imprinted as a close economy. Contrary to Europe, Japan, and the USA, China seems to apply the 3R model just to regulate the wastes problem, while the abovementioned countries seem to spread it to almost any sector. Their objective is the obtainment of the synergic power of the CE to avoid overcrowding of dumps, an easy supplying of resources, reduction of greenhouse gas and management of dangerous wastes.

EUROPE

In Europe, the CE emerged mainly thanks to the intuition of some companies that valued positively the opportunity of obtaining economic benefits exclusively by exchanging used sub-products able to be reused, between the UK, the Netherlands, Finland, Germany, Austria, Italy and successively France and Denmark⁵⁰. Thanks to the creation of many environmentally sustainable industrial parks, mainly subsidized by the states, in countries like the UK, the Netherlands, Finland Germany, and Italy

⁴⁸ A. FENG, N. YAN, *Putting a circular economy into practice in China*, 2017.

⁴⁹ F. PRESTON, A Global Redesign Shaping the Circular Economy, 2012.

⁵⁰ M.TARANTINI, A. DI PAOLO, A. DOMINICI, A. PERUZZI, M. DELL'ISOLA, *Linee guida per l'insediamento e la gestione di aree produttive sostenibili*, 2007.

experimentation on the CE took place. The EIP⁵¹ of Kaludndborg in Denmark is one the most iconic case in the international literature on the CE⁵².

The EIP parks, created exclusively to exploit economic benefits deriving from the exchange and the selling of sub-products, reduction of transportation costs and waste management. Later on, has been acknowledged by the companies how this model of production, exchange, and consumption created a big and positive financial flux: flexibility, circumvent of the investments, increase in the supply chain of raw material, better industrial esteem, technological innovation, operative resilience and capacity of attraction and retention of qualified human resources⁵³.

The various members of the EU, in a scattered order, since 1975 exclusively for the management of wastes and due to the first European instruction regarding it (the first directive is the 75/442/Cee of the July 15, 1975 council, preceded by the directive 75/439/Cee of the June 16, 1975 council on the disposal of the used oils. Followed eventually by the 76/403/Cee April 6, 1976, and 78/319/Cee March 20, 1978, regarding the disposal of polychlorinated biphenyl and the toxic wastes) started introducing various laws associated with the CE. Originally the definition circular economy was used to define some perspective of the use of recycled materials; later on, it was found out that the simplest and first variants of material recycle have some economical advantage, while successive benefits become harder and harder to get⁵⁴.

⁵¹ Eco-Industrial Park

⁵² da ultimo J. A. MATHEWS, H. TAN, *Progress towards a circular economy: the drivers and inhibitors of eco-industrial initiative*, 2011.

⁵³ V. VELEVA, S. TODOROVA, P. LOWITT, N. ANGUS, Understanding and addressing business needs and sustainability challenges: lessons from Devens eco-industrial park, 2015.

⁵⁴ N. B. JACOBSEN, Industrial symbiosis in Kalundborg Denmark: A quantitative assessment of economic and environmental aspects, 2006.

This states that the mere recycling of materials gets inefficient both economically and for the downgrading of materials. In normal economic conditions, the recycle may be interesting and so of spread use only in the case of use by the private economic sector, being economically convenient, only after a precise costbenefit analysis. Only after, with the specific attention of external factors, in particular to the depletion of natural resources and the environmental damage, has been started to see not only as an economic-related factor but also a social and environmental one⁵⁵.

Only thanks to the European directive on waster 2008/98 the environmental damage has been included in the equation; the directive establishes some measures intended to protect the environment and the human well-being by preventing or reducing the negative impact of the production and management of wastes, also increasing its efficacy and efficiency.

Also, even though the directive doesn't speak specifically of "*circular economy*", it defines the circularity of sub-products that must be used directly, without any other process, that should be used as integrating part of the next process of production or product; moreover, the reuse is regulated: the substance or object satisfies, for the specific use, all the requirements asked by the health and protection authorities and won't carry negative impacts nor on the economy nor on the human safety⁵⁶.

In Europe, anyways, even after the directive, every single country seems to proceed on his own path without a common vision. The actions are unitary and aimed at a certain field, depending also on the sensibility of the country to the theme of the

⁵⁵ M. S. ANDERSEN, An introductory note on the environmental economics of the circular economy 2007.

⁵⁶ H. PINJING, L. FAN, Z. HUA, S. LIMING, *Recent developments in the area of waste as a resource, with particular reference to the circular economy as a guiding principle, in waste as a resource, 2013.*

environmental safeguard. For example, Denmark and Sweden are pushing themselves so far, up to the point of complete divorce from fossil-fuels, Slovenia to the complete separation of wastes, France and Germany to the reduction of soil. Everything this, unfortunately, without a coordinated action could hardly lead to a real reduction of raw materials or an increase of the economic income deriving from the CE⁵⁷.

We have seen an increase in the political importance of the CE with the publication of the "*Manifest for a Resource-efficient Europe*"⁵⁸, the "*European Resource Efficiency Platform Manifesto*"⁵⁹ and the European circular economy pack⁶⁰. Nowadays the European Union is having a central role in the international negotiations for what concerns the environment and the circular economy, by promoting, taking part in numerous deals and actions of sensibilization of the politics at a global scale, national and regional. The schedule for an efficient Europe in the management of resources and the package of agreements on the circular economy should invert the trend transforming the economy of the European Union into a sustainable one within 2050.

As for now 16 tons of materials each year are produced, of which 10 tons are allocated for the material stock (infrastructures, houses, long-lasting goods) and 6 tons come out as wastes. One-third of the wastes of the urban wastes are decomposed in

⁵⁷ G. FRANCO, Commentary on Directive 2008/98 / EC on waste, 2009.

⁵⁸ European Commission, 17/12/2012. Manifesto for a Resource-efficient Europe. MEMO 12/989, http://europa.eu/rapid/press-release_MEMO-12-989_en.htm

⁵⁹ European Resource Efficiency Platform manifesto 2012.

⁶⁰ European Commission, 2014. MEMO, Questions and Answers on the Commission Communication "Towards a Circular Economy" and the Waste Targets Review. http://europa.eu/rapid/press-release_MEMO-14-450_en.htm e European Commission, 2014. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. Towards a Circular Economy: a Zero Waste Programme for Europe.

the junkyard and less than half of it is recycled, with the great difference between the member States⁶¹.

The objective of the action program for the safeguard of the environment has as central pillar the creation of a circular economy⁶², unlocking the latent economic potential of the European Union in order to make it more competitive, thanks to the use of fewer resources and the economic advantages deriving from the conversion to the circular system; lamentably, the bureaucratic machine is slowly making signs of progress.

During December 2015 the European Commission presented a plan of action on the CE and four different proposals, adopted during May 2018 after some negotiations between the European Parliament and the European Council⁶³. The adopted proposals are used in order to harmonize the previous legislation over the matter and set common objectives and deadlines; even though the directives are focused on the management of waster there is a huge guidance over on the adoption of concrete measures in order to promote the reuse and stimulate the industrial symbiosis, to transform the sub-product of an industry in the raw material another company; moreover it extends the responsibility to the next manufacturers, since they must introduce an ecological product in the market that also sustain recover and recycle systems⁶⁴.

The previously discussed European directives are, like in the rest of the world, with a concept of a circular economy still developing, still focused exclusively on the

⁶¹ http://www.europarl.europa.eu/factsheets/it/sheet/76/efficienza-delle-risorse-ed-economia-circolare

⁶² Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions - Roadmap to a Resource Efficient Europe.

⁶³ (UE) 2018/849, (UE) 2018/850, (UE) 2018/851 e (UE) 2018/852 https://eur-lex.europa.eu/legal

⁶⁴ G. AMANATIDIS, Resource efficiency and the circular economy, 2019.

concepts of environmental economy and industrial ecology with strong attention to the technological innovation and the reuse instead of the recycling.

2.2 Italy

The Italian laws about the CE must be related to a wider normative framework deriving from the European Union that, coherently with the article 11 of the constitution, forcing the country to conform to the communitarian rules. For what concerns the laws about the green economy and circular economy, the Italian framework is complicated with a clear challenge for the companies to conform to it. The main sources to consider are the following: the legislative decree 152 of 2016 (Testo Unico Ambientale) and the recent law 221 of 2015 on the "Dispositions about the environment to promote the green economy and the contentment of excessive raw material usage".

The most relevant content of the norms, as well as the bigger obstacle for the companies that intend to operate in the CE regime, is the wastes management and the bad coordination of the norm and the hard interpretation of the articles 183 of the D.lgs. 152/2006 about the difference of what, for the law, is mandatorily considered waste and what cannot be considered that. The problem is already seen in other European countries. Overall the decree of 2006 focalizes on the junk's management and the reclamation of polluted areas.

For the first, the norm follows some base principles like efficacy, efficiency, costeffectiveness, and clarity. The hierarchic order of the waste's management follows this order:

- Prevention: Environmental balance-statements, life-cycle analysis, public's opinion sensibilization;
- Preparation for the reuse: Insert products on the market conceived to reduce their quantity, in order to be reused;
- Recycle: Increasing the environmental education and promotion of recycling at a local level;
- Different recovers: Using the wastes as an alternative method for energy production;
- Disposal: used as last resort;

The definition of "*waste*" is what creates many obstacles for companies. "*[si intende per rifiuto] qualsiasi sostanza od oggetto di cui il detentore si disfi o abbia l'intenzione o abbia l'obbligo di disfarsi*⁶⁵". This law creates on the head of the subject two regimes of responsibility: the willingness or the obligation of disposing of determined substances, so almost all of the elements fall in this category. The 90% of these substances are treated as wastes while only 10% are optimized to follow a different path of reuse and valorization⁶⁶ and considered:

- Sub product;
- Non-waste;
- Second raw material;
- Co-Product;

The sub-product, for example, following the article 184-bis of the D.lgs. 152/2006 is described as follow;

⁶⁵ D.lgs. 152/2006, articolo 183, comma 1, lettera a. "Waste is any substance or object that the owner dispose of or intends to dispose of".

⁶⁶ Comunità Europea. (2019) EUROSTAT.

- Is originated by a process of which, the main goal, is not the production of that object;
- The substance or object will be used in the same or in another process of production;
- The substance can be used without further treatments;
- The reuse must be done accordingly to the protection of human health and environmental standards;

The CE must operate in these four residual notions and it is easy to comprehend how hard it is for the companies that want to use this economic model to face the complexity of the norms in order to valorize the discard of productions. The crucial part consists in the necessity to offer to the substances or products to be recovered and give them a second life cycle (as asked from the points 2 and 3); to make so is inevitable to implement the possibility to cease the wideness of the term "*waste*" and create new rules in order to compare the recover substance to the virgin raw materials creating conditions for the constitution of a new marketable to uniform the offer, the commercialization and the use of these substances in order to profit the whole economic system and safeguard the environment and to reduce the wastes⁶⁷.

Following the European directives, in article 16 are promoted actions used to favor green subcontracts, using the mark Ecolabel UE⁶⁸. During 2015 the law number 221 introduces some elements of the circular economy in the legislative impact and arranges a lot of measures to support the green economy and the environment. Before, article 13 spoke explicitly of the circular economy, referring to the possibility for some sub-products to be inserted inside new life cycles bond to biomasses and/or

⁶⁷ P. FICCO, Rivista Rifiuti, Bollettino di informazione normativa, 2017.

⁶⁸ Italian Government (2018). Ministry of the Environment and the Protection of the Territory and the Sea

biogas for the electric production. Do some following articles contain dispositions that incentivize the creation of products made by used material, but are those wastes junk?

The disassembling of complex products, thanks to an agreement with the Public Authority, is described by the article 183 D.lgs. 152/2006. Then the article 32 establish strong rules in order to increase the recycle and article 45 helps the municipalities and the regions in order to increase the recycle and minimize the wastes' volume. Moreover, it introduces some sensibilization campaigns, for the reuse and recycles thanks to collaborations with universities and public Authorities.

The law contains more directives like the article 72 that propose some green community strategies in which are inserted themes like the valorization of the agroindustry, the management of the hydric resources, the production of energy through renewable sources, the energetic efficiency through "zero waste strategies".

Even though in the last few years have been introduced a lot of norms regarding the circular economy, it is evident that the normative picture is still far to be defined as organized or detailed. Numerous remains the obstacles in order to smoothly proceed to the recycling of materials and the valorization of the used product, thanks to the previously mentioned article 183 D.lgs 152/2006 that recognizes them as wastes. Still, the result insufficient the legislative initiatives for the effective implementation of a model that resembles the CE one; the country is trained by the strong will of the European Union that foresee ambitious and hard measures in order to make it real as soon as possible.

The politics represented at a regional and lower level don't really help the spread of consciousness between the citizens and the companies.

Even if lacking at a juridical level, the virtuous initiative coming from consolidated companies like Enel S.p.A. and the foundation Symbola⁶⁹ is not lacking. In July 2017

⁶⁹ SYMBOLA FOUNDATION, & ENEL S.P.A., 100 Italian Circular Economy Stories, 2018.

the Italian government publishes a road map the soon will be presented at ONU, the beginning of a new politic⁷⁰, which is considered informative asymmetries, market barriers habits, and culture⁷¹, that could cause delays during the transition. Then Enel and Intesa Sanpaolo with Confindustria published a "*manifesto*"⁷² to nudge the government to accelerate the transition towards a circular model; the manifesto signed by many "*made in Italy*" international companies.

Meanwhile, Confindustria is creating his own programmatic document in order to give to the associates a larger view of the efficient use of resources⁷³. Confindustria also created a contest to choose the best Italian performer companies in the circular economy, with the collaboration of LUISS Business School and ENEL X⁷⁴ awarding the first ranked and their initiative in the EXCO2019. In this context the companies are developing new circular formats, recycle associations; companies that operate in the fields of bioplastics, mineral waters, pampers, providers of multi-utility services are all working to cooperate towards a Circular Economy Network. Even the catholic world is creating his own circular world: "Saint Francis from Assisi: create a sustainable and circular religious community" and the monumental complex of Assisi

⁷⁰ Ministry of the Environment and the Protection of the Territory and the Sea. (2017). Towards a circular economy model for Italy

⁷¹ F. IRALDO, Green Economy Observatory, IEFE Bocconi. 2016.

⁷² Confindustria, Enel e Intesa Sanpaolo. (2017). L'Alleanza per l'Economia Circolare.

https://corporate.enel.it/it/storie/a/2017/12/economia-circolare-manifesto-alleanza-aziende-enel-intesa-sanpaolo

⁷³ CONFIDUSTRIA, *Il ruolo dell'industria italiana nell'economia circolare*, 2018. https://www.confindustria.it/wcm/connect/b13312a2-c733-4eae-939b-04613f0086f2/Rapporto+Economia+Circolare+Confindustria+Ottobre+2018.pdf?MOD=AJPERES&CACHE ID=ROOTWORKSPACE-b13312a2-c733-4eae-939b-04613f0086f2-mvbuzpZ

⁷⁴ CONFIDUSTRIA, Concorso Best Performer Dell'economia Circolare, 2019.

http://economiacircolare.confindustria.it/confindustria-premia-i-best-performer-delleconomia-circolare/

is stimulating the circular economic projects in order to push the circularity to favor all the civil society⁷⁵.

Italy has a virtuous behavior in Europa, a well-planned model for the reuse of the productive cycles, and a nice reputation for the complexity of the circular activities⁷⁶. Even though then reports are only based on the overall quantity, while the results are the consequence of combinations of strategies, the eco-design, and the lifecycle-based approach. Like for the aluminum: The Italian recovery system confirms his leadership at a European level, especially for the packaging recover, the low cost of the operation and the quantity: over 900 thousand tons in 2017, coming from a 100% recovery strategy⁷⁷. Specifically, the 23% of the recovery is given by the extraction and the 67% of the refinement⁷⁸; the purer the quality of the flux, the higher is the added value produced by the circular economy⁷⁹.

Our country is mainly a transformation country and the industrial sector is responsible for a variety of environmental dangers like the greenhouse effect emission, the hydric emissions, the contamination of the soil. Moreover, it must be careful of some specific substances like mercury, which could be extremely dangerous

⁷⁵ ASSISI COMPLESSO MONUMENTALE, Frà Sole in the European Circular Economy

Stakeholder Platform, 2018. https://www.frasole.org/fra-sole-nella-european-circular-economy-stakeholder-platform/

⁷⁶ ENEA, Rapporto Nazionale sull'Economia Circolare In Italia, 2019. https://circulareconomynetwork.it/wp-content/uploads/2019/02/Rapporto-sulleconomia-circolare-in-Italia-2019.pdf

⁷⁷ CIAL ITALIAN CONSORTIUM FOR ALUMINIUM PACKAGING, L'economia Circolare In Italia 2018. http://www.cial.it/ricerca-2018-leconomia-circolare-in-italia/

⁷⁸ P. NUSS, M.J. ECKELMAN, Life Cycle Assessment of Metals: A Scientific Synthesis, 2014.

⁷⁹ S. SAUVÉ, S. BERNARD, P. SLOAN, *Environmental sciences, sustainable development and circular economy: Alternative concepts for trans-disciplinary research*, 2016.

and create irreversible damages⁸⁰. Are recognized between the various circular startups, some global level examples like Ecoplasteam⁸¹, chosen between the first six Green Alley Awards⁸², that created an enveloping system that could be 100% recycled. Anyways, in order to work in Italy, the circular economy needs the support of companies, workers, investors and more than everything public policies⁸³ since the companies must face the market threads and be competitive internally, in terms of prices and research and development, and externally in terms of competitivity towards the competitors⁸⁴.

The concrete goal of the companies should be the one of "*minimizing the impact* of their activities on the environment and the people, without sacrificing the profitability"⁸⁵ and develop a long-term vision that considers the environment, the profits, and the collectiveness. The managers should adopt strategies that go along the need of the stakeholders of today and at the same time defend the human capital. The Pope, talking to managers and the participants to a conference on the mining activities in the Vatican City said: "For 'extractivist' we talk about a tendency of the economic system that tends to transform the good of nature into capital. The action of 'extraction' as many goods as possible in the shortest time, convert them in raw materials and productive factors that the industry will use, will be transformed in

https://www.ecoplasteam.com/

⁸⁰ T.E. NORGATE, S. JAHANSHAHI, W. J. RANKIN, Assessing the environmental impact of metal production processes, 2007.

⁸¹ Ecoplasteam, EcoAllene®. Produzione di una materia prima seconda, 2018.

⁸² Europe's First Startup Prize For The Circular Economy, 2019.

https://www.eu-startups.com/2019/06/creating-a-circular-economy-if-youre-a-startup-reducing-waste-apply-for-the-greeny-alley-award-now-and-win-e25k-sponsored/

⁸³ F. VIGNI, Circular Economy Network, 2018.

⁸⁴ M. J. EPSTEIN, Making Sustainability Work: Best Practices in Managing and Measuring Corporate Social, Environmental, and Economic Impacts, 2018.

⁸⁵ A. STOCCHETTI, The Sustainable Firm, from Principles to Practice, 2012.

products and services that the others will commercialize, the society will consume and then the environment will receive as toxic wastes is the consuming circuit that we have created^{"86}.

In the same speech, offered by the dicastery for the human development in the mining industry⁸⁷ the Pope affirmed that we must: "*Nudge the development of a circular economy, especially in the field of the mining activities*" because the earth that gives us the possibility of "*mining*, as any other economic activity must be at the service of the whole human community and must be at the service of the people, not the contrary", and still words from the Pope Francis: "*The industrial system, at the end of the production and consumption cycle, hasn't developed the capacity of absorbing and reuse junks and slugs. We still haven't developed a circular model of production that ensures resources for everybody and for the next generations and that requires to limit the use of non-renewable resources, moderate consumptions and maximize the efficiency of extraction, reuse and recycle⁸⁸". Still, the Pontifex, to the volunteers of Food Bank of Europe⁸⁹: "A circular economy is not to procrastinate anymore. The waste can't be the inheritance given to the next generations".*

The words of the Pope addressed not only to the managers but also to the legislators that must realize trough the law the bases for a circularity, thanks to a collaboration between public and private sectors, authorities and societies in order to support the SME, core of our country.

⁸⁶ CONSEJO EPISCOPAL LATINOAMERICANO, CELAM, Carta Pastoral Del Consejo Episcopal Latinoamericano. Discernimiento a la luz de la encíclica Laudato Si, 2018.

⁸⁷ Città del vaticano, Dicastero per il Servizio dello Sviluppo Umano Integrale, 2019

⁸⁸ Papa FRANCESCO – J. M. BERGOGLIO, *Lettera Enciclica Laudato Si' Del Santo Padre Francesco Sulla Cura Della Casa Comune*, 2015.

⁸⁹ Papa FRANCESCO – J. M. BERGOGLIO, Discorso all'udienza ai Membri della Federazione Europea dei Banchi Alimentari, 2019.

2.2.1 Regions Of Italy

The overview of the regional circular economy is, paradoxically, full of interventions by the presidents of the various regions and declarations of actions, but from the legislative point of view, the regions that issued specific laws are few. The CE is intended by the various regions as an obligation imposed in order to reduce the wastes: a common politic held by the government is lacking and that's the only way to develop a circularity.

Specifically, the region Friuli Venezia Giulia has been introduced to the topic thanks to the law about the "organic discipline on the wastes' management and principles of the circular economy⁹⁰". Has been created the Forum for the CE, in order to be side by side with the permanent table for the circular economy, a technic table formed by the people interested that may propose ideas useful for the diffusion of the good CE habits. The University of Trieste is creating his own incubator and the Confindustria Udine considers the CE as "a pop concept, a model that goes beyond the mere ideas and that became established between the whole population" even though "the companies don't have the information and the trust in the normative context to adopt CE solutions⁹¹"

⁹⁰ Regione Friuli Venezia Giulia, Legge regionale n. 34/2017

⁹¹ Confindustria Udine, *L'economia circolare è oramai un concetto pop*, 2019.

https://www.confindustria.ud.it/schede/scheda/10797/quot-l-economia-circolare-egrave-oramai-un-concetto-pop-quot

The region Veneto inserted some CE rules in the deliberations for the reorganizations of the wastes' disposal⁹² and, later on, with the law on the environmental efficiency and green building⁹³. In Veneto the circular economy is faced differently by the people: many are the people promoting it, many the companies and the prizes for the good behaviors of the managers⁹⁴. Consciousness spread to the Venetian municipalities, like Padova, that won the award "*Towards a circular economy*⁹⁵"

Way more active in the region Lombardia that addressed its politics towards the CE. The last of many politics is the approval of the council for a plan towards the circular economy⁹⁶. The region is dynamic in the promotion of the CE, with the collaboration of Unioncamere Lombardia⁹⁷ is working for a transition of the SME to a protocol able to promote the circularity in the region and at the same time low carbos emissions⁹⁸. The region is active in the formation of the municipal administrators'

⁹² Regione Veneto, Deliberazione Della Giunta Regionale n. 120 del 07 febbraio 2018

⁹³ Regione Veneto, Legge regionale n. 14/2019

⁹⁴ CONFINDUSTRIA VENETO, Promuovere l'economia circolare Premio Compraverde Veneto, 2018. http://www.confindustria.veneto.it/confindustria/veneto/contents.nsf/printnews/691130EDB431F5EEC12582 4A004F942F?opendocument

⁹⁵ COMUNE DI PADOVA, *La creazione di sinergie circolari per un mercato efficiente*, 2018. http://www.padovanet.it/informazione/progetto-opportunit%C3%A0

⁹⁶ Regione Lombardia, Nuovo Piano Rifiuti e Bonifiche Atto Indirizzo Economia Circolare, 2019. https://www.recoverweb.it/regione-lombardia-la-giunta-adotta-il-piano-rifiuti-che-guarda-alleconomiacircolare/

⁹⁷ UNIONE DELLE CAMERE DI COMMERCIO DELLA LOMBARDIA, *Innovazione Delle Filiere Di Economia Circolare In Lombardia*, 2019. https://www.milomb.camcom.it/bando-innovazione-delle-filiere-di-economia-circolare-in-lombardia

⁹⁸ ENI, *Intesa per la Sostenibilità e l'Economia Circolare*, 2019. https://www.eni.com/it_IT/media/2019/07/eni-e-regione-lombardia-intesa-per-la-sostenibilita-e-leconomiacircolare

thanks to the project EUSALP⁹⁹ and also thanks to the collaboration with ANCI the region will educate the local managers to the circular models¹⁰⁰.

As an example, there is the activism of the local authorities: the municipality of Brescia with the collaboration with LUISS Business School is organizing workshops¹⁰¹ on the CE. Moreover, the municipality of Milan adopted the program CE100¹⁰² of the Ellen Macarthur Foundation and, the same municipality also supports the managers that want to build reuse centers¹⁰³.

The region Piemonte, thanks to the regional law n.1/2018 for the reorganization and the management of the urban wastes endorses the principles of the CE as decided by the European Parliament 1386/2013/UE. The region itself is not really active in the proposals that sustain the circularity. Few initiatives from Authorities like ARPA Piemonte¹⁰⁴ insert proposal to develop the CE.

The region Emilia Romagna is very active, full of ideas, and adopted the CE almost as a "religion". The first laws about the CE can be seen already in 2015¹⁰⁵ with

- ¹⁰⁰ ANCI LOMBARDIA, L'economia circolare per promuovere la crescita macroregionale sostenibile, 2019
- ¹⁰¹ CONFINDUSTRIA BRESCIA, *Management e imprese alla sfida dell'Economia Circolare*, 2018. http://economiacircolare.confindustria.it/evento/brescia/

¹⁰³ CITTÀ METROPOLITA DI MILANO, Economia circolare e riuso, 2016.

⁹⁹ EUSALP, EU Strategy for the Alpine region, 2019. https://www.alpine-region.eu/

¹⁰² COMUNE DI MILANO, *Economia circolare. Il Comune entra nel programma CE100 della Ellen Macarthur foundation*, 2019. https://www.comune.milano.it/-/economia-circolare.-il-comune-entra-nelprogramma-ce100-della-ellen-macarthur-foundation

 $http://www.cittametropolitana.mi.it/ambiente/progetti_per_l_ambiente/Economia_circolare_e_riuso/index.html$

¹⁰⁴ ARPA PIEMONTE, *Economia circolare in Piemonte, tra rifiuti e progetti di sostenibilità*, 2018. http://www.arpa.piemonte.it/news/economia-circolare-in-piemonte-tra-rifiuti-e-progetti-di-sostenibilita

¹⁰⁵ REGIONE EMILIA ROMAGNA, Legge regionale n.16/2015 disposizioni a sostegno dell'economia circolare.

the creation of the "*Permanent forum on the circular economy*¹⁰⁶". Numerous are the initiatives of this region, even the ones for the professional people in order to stay updated like the: "*professional updating on the Circular Economy, for the perspective of the education on sustainability*¹⁰⁷". The founds of the region are dedicated to the reuse centers thanks to the dedicated agency ARTESIR¹⁰⁸.

In order to extend the circular politics to the furthest municipalities, distant from the cities, the region instituted founds given via ranking, based on the objectives of the Agenda 2030. The entrepreneurs are actively working in order to convert the SME of the regions to the CE dimension¹⁰⁹, with numerous companies and startups already fully converted to it, also thanks to the project Interreg TRIS¹¹⁰ and its partnership with the region. The municipality of Bologna is sustaining the SME thanks to the use of small good practices like cost-benefit analysis and the exchange of politics and support instruments¹¹¹.

¹⁰⁶ REGIONE EMILIA ROMAGNA, *La Regione sceglie l'economia circolare*, 2019.

¹⁰⁸ ARTESIR, Centri Comunali del riuso, 2019.

¹¹⁰ TRIS, Transition Regions towards Industrial Symbiosis Circular, 2019.

https://www.interregeurope.eu/tris/

¹¹¹ CITTÀ METROPOLITANA DI BOLOGNA, *Economia circolare per le piccole e medie imprese*, 2016.

https://www.cittametropolitana.bo.it/portale/Comunicazione/Archivio_news/Economia_circolare_per_le_picc ole_e_medie_imprese

https://ambiente.regione.emilia-romagna.it/it/notizie/attualita/2019/marzo/rifiuti-la-regione-sceglie-12019economia-circolare

¹⁰⁷ REGIONE EMILIA ROMAGNA, *Corso di Economia circolare. Dalla teoria alle pratiche didattiche per la sostenibilità*, 2018. https://www.regione.emilia-romagna.it/infeas/focus-formazione/2018/corso-di-economia-circolare

¹⁰⁹ CONFINDUSTRIA ROMAGNA, *Competitività e sostenibilità del sistema produttivo – dai principi alla realtà*, 2019. https://www.confindustriaromagna.it/it/workshop-economia-circolare-competitivit-e-sostenibilit-del-sistema-produttivo-dai-principi-alla-realt.html

The region Toscana is really active and careful about the socio-economic principles of the CE and trough the law n.48/2018¹¹² it created a good channel for the SME in order to convert to the circular economy. It is a really active region and is working towards the full circularity in 2030, thanks to the creation of a permanent regional table¹¹³ for sustainable development¹¹⁴, specifically for the reuse of wastes, recover and recycle thanks to the help of companies, universities, and research institutes. The region created its own initiative amongst the municipalities the "*Covenant of mayors*"¹¹⁵.

The initiatives come also from the single municipalities like Capannori¹¹⁶ that created a competition to transform the local companies into circular ones thanks to the reuse of the production's wastes; or Rosignano¹¹⁷ that signed a program with the CNR and the Scuola Superiore Sant'Anna for the creation of a center for the circular economy in Toscana. The Camera di Commercio of Firenze¹¹⁸, in collaboration with

/asset_publisher/Iu8th6SDkBj8/content/economia-circolare-nasce-il-tavolo-regionale-per-reimpiegare-irifiuti-dei-cicli-produttivi;jsessionid=1E9D2273CB0D94DA30FED6B155E95FBA.web-rt-as01-p2

¹¹² REGIONE TOSCANA, Norme in materia di economia circolare, 2018.

¹¹³ REGIONE TOSCANA, *Economia Circolare Reimpiego Rifiuti Dei Cicli Produttivi*, 2018. http://www.regione.toscana.it/en/a-meta-dell-opera/ricerca-e-competitivita/-

¹¹⁴ REGIONE TOSCANA, *Sviluppo Sostenibile Ed Economia Circolare Agenda 2030*, 2019. http://www.regione.toscana.it/-/agenda-2030-verso-una-toscana-sostenibile

¹¹⁵ REGIONE TOSCANA *Il Patto dei Sindaci in Toscana per un'Economia Circolare*, 2019. http://www.regione.toscana.it/-/il-patto-dei-sindaci-in-toscana

¹¹⁶ COMUNE DI CAPANNORI, Economia Circolare, 2018

http://old-www.comune.capannori.lu.it/categorie/tags/economia_circolare

¹¹⁷ COMUNE DI ROSIGNANO MARITTIMO, Economia Circolare, 2019.

https://www.scapigliato.it/economia-circolare/

¹¹⁸ CAMERA COMMERCIO FIRENZE, Economia Circolare, 2019.

https://www.fi.camcom.gov.it/registri-albi-e-certificazioni/ambiente/economia-circolare

the local university, created a course of management for the local companies in order to create industrial synergies with the circular economy.

The region Marche inaugurated a program called: "*circular supply chain, recover and recycle, product life cycle extension and sharing platforms for the eco-sustainability: Marche believes in the sustainability*¹¹⁹". Thanks to the law n.25/2018¹²⁰ the region develops its program for the circular economy thanks to tax relief on the new technologies for the regeneration and reuse of the goods. The circularity is at the core of the four regional pillars: manufacturing, e-living, agri-food, and furniture. This law points to the directions that the region wants to follow, also thanks to initiatives and events¹²¹, collaborations with other regions¹²² authorities¹²³ and associations¹²⁴.

¹²⁰ CONSIGLIO REGIONALE MARCHE, Impresa 4.0 Innovazione Ricerca Formazione Sviluppo Economia Circolare, 2019.

¹²¹ REGIONE MARCHE, Promuovere L'economia Circolare, 2019 http://www.regioni.it/dalleregioni/2019/03/08/marche-eu-industry-day-alla-mole-vanvitelliana-di-anconapromuovere-leconomia-circolare-nella-regione-marche-ceriscioli-innovazione-legata-allambiente-bora-595678/

¹²² REGIONE MARCHE, *Tavola rotonda sulle proposte delle Regioni Emilia-Romagna e Marche*, 2019. https://www.regione.marche.it/News-ed-Eventi/Categorie/Post/50941/Innovazione-e-sostenibilit%C3%A0-il-futuro-della-manifattura-All-Istao-Tavola-rotonda-sulle-proposte-delle-Regioni-Emilia-Romagna-e-Marche

¹²³ CAMERA COMMERCI ANCONA, *Economia Circolare a Partire Dai Rifiuti Agricoli*, 2019. http://www.an.camcom.it/20190703/economia-circolare-partire-dai-rifiuti-agricoli

¹¹⁹ M. ROMANO. Il sole 24 Ore, 2019. https://www.ilsole24ore.com/art/le-marche-puntano-sull-economia-circolare-ABds6JcB

 ¹²⁴ CONFINDUSTRIA MARCHE. (2018). Management e imprese alla sfida dell'economia eircolare,
2018. http://confindustria.marche.it/sp/at_ambiente_sicurezza_energia/management-e-imprese-alla-sfida-delleconomia-circolare.3sp

The region Lazio, after they presented their guide-law¹²⁵, is approving the regional plan on wastes 2019-2-2025: from a linear economy to a circular one. Few are the other initiatives because the actual main problem of the region is the junk and the wastes. Many are the declarations, but few are the actual and real politics.

For what concerns the other regions, they only have plans for wastes management.

2.3 The Rest of Europe In Details

The newly elected president of European Commission Ursula von der Leyen declared¹²⁶ that Europe by 2050 will be the first climate-neutral continent in the world because it is clear that the traditional paradigm, based on the exploit of natural resources is not anymore a path that can be walked. Europe must run and lead the transition towards a circular future and obviously is not acceptable to the patchy development of the CE in our continent.

The regions already missing a high level of technology regarding the circular economy must be helped, guiding them through an energy transition based on the recover and recycle. Helping them accelerate this transition must be considered a help for the environmental, economic, and social sustainability towards the less developed states and the next generations. It means to activate political processes of democratic participation for the planning and the development of the transition measures, activate public and private investments, realize a common CE reform, valid for the whole

¹²⁵ REGIONE LAZIO, Piano regionale rifiuti 2019-2025 da un'economia lineare a un'economia circolare, 2019 https://www.regione.lazio.it/rl_main/?vw=newsDettaglio&id=4777

¹²⁶ U. G. von der LEYEN, Presidente della Commissione Europea. *Discorso di apertura della seduta plenaria del Parlamento europeo*, 2019.

Europe, in order to make them less sensible countries may fully understand the unsustainability of the linear model. The exiting European Commission, with a mere investment of 17,5 billion euros, generated a value of 147 billion¹²⁷, by increasing the recycle quote, reducing the dump yards and reduce the energy, water and resource waste. All of this, creating 4 million jobs, 6% more compared to 2012¹²⁸.

Many companies, including Enel, are going to lead the transition towards the creation of a fully circular Europe, but unfortunately, the juridical picture of the other European states is completely different and varied from the Italian one and between each other.

In order to clarify how they are different and to catch the opportunities that the future offers to the market of the circular economy, the juridical picture of the single states must be analyzed.

Austria

Austria, with nine Länder¹²⁹, and every single one with his own legislative authority, is applying his politics on the CE following the European directives; certainly can be awarded as an innovative country thanks to his "Green Tech" and "Clean Tech" clusters, located in the northern part of the country¹³⁰. Specifically, Austria has a strong and consolidated recycling industry that reaches the highest levels in Europe and represents a solid base for a future transformation of the country in a circular economy.

 ¹²⁷ COMMISSIONE EUROPEA, *European Circular Economy Stakeholder Platform*, 2019.
¹²⁸ EUROSTAT, 2019.

¹²⁹ AUSTRIAN FEDERATION STATE

¹³⁰ AUSTRIAN BUSINESS AGENCY, Environmental Clusters in Austria, 2019.

https://investinaustria.at/en/sectors/environmental-technologies/clusters.php

Moreover, Austria started some politics addressed to some specific aspects of the circular economy, like the Austrian regulation on the construction materials and the new Bundes-Abfallwirtschaftsplan¹³¹ on the management of wastes. More initiatives aimed to promote the circular economy are coming from the NGO, like the repair network of Vienna¹³², or the Austrian net for reuse and repair¹³³ or the Circular Economy Platform¹³⁴ used to create knowledge and to inform the interested parties.

Austria voted positively to every recent proposal made by the EU regarding the Ecodesign, plastic and single-use wastes, demonstrating leadership and ambition into guiding the European circular economy agenda during 2018 and has been praised for the directive on the single-use plastic wastes. Nonetheless, even though it is demonstrating a strong interest in the CE, Austria lacks a strong public debate towards it; the circular economy is not inside the agenda of the Austrian government. They are only focused on the management of wastes and the environmental problems, without thinking of the economic possibilities of the circular economy.

Belgium

Belgium is formed by three main regions that form the "first-level" of the country, governed by a federal system. The three regions (Fiandre, Vallonia, Bruxelles) in short times created legislative prohibitions against the incinerator rubbish dumps, a large installation for the collection, separation and recycle and a

¹³¹ AUSTRIAN FEDERAL GOVERNMENT.

https://www.bmnt.gv.at/umwelt/abfall-ressourcen/bundes-abfallwirtschaftsplan/BAWP2017-Final.html

¹³² EUROPEAN CIRCULAR ECONOMY STAKEHOLDER PLATFORM, *Repair Network Vienna*. *Good Practices*, 2019. https://circulareconomy.europa.eu/platform/en/good-practices/repairnetwork-vienna

¹³³ RepaNet, 2019. https://www.repanet.at

¹³⁴ CIRCULAR FUTURES, Circular Economy Platform Austria 2019.

https://www.circularfutures.at/ueber-uns/english-language-summary/

chain of reuse centers, subsidized by the government¹³⁵, with tons of initiatives about circular economy managed by the regions like "*Circular Fiandre*".

Belgium hosts a lot of highly innovative companies that adopted circular economy politics; supported by the government, connected to the government, companies and the citizens¹³⁶. The government published in 2014 a roadmap about the circular economy, with a shared burden between the federal public authority of health, environment, and economy¹³⁷. Wallon's government in 2018 adopted the "*Waste-Resource*" plan, in order to implement good practices for the CE and to increase the recycle.

The three regions identified a common tool to estimate the environmental impact of construction politics. Even if Belgium highly supports practices about the circular economy, it still has to face problems that slow down the development, like the independent politics of the single regions.

Bulgaria

Bulgaria has a long way to walk in order to reach the precursors of the circular economy in Europe. The first law regarding the wastes has been seen in 1997, included in the law for environmental protection. There is almost no coherence in the collection and valorization, in fact, the activities and the management of wastes are following the directives of the 1997 law.

¹³⁵ VITO, 2012-2019 *Navigator Wetgeving Leefmilieu, Natuur en Energie*. https://navigator.emis.vito.be/mijn-navigator?woId=44165

¹³⁶ ECO-INNOVATION OBSERVATORY, *Research efficiency outcomes. Country profiles for all eu member states*, 2019. https://ec.europa.eu/environment/ecoap/indicators/resource-efficiency-outcomes_en

¹³⁷ SANTÉ PUBLIQUE, Vers une Belgique pionnière de l'économie circulaire. Sécurité de la Chaîne alimentaire et Environnement, SPF Economie, P.M.E., Classes moyennes et Energie, 2014. https://economie.fgov.be/fr/publicaties/vers-une-belgique-pionniere-de

In 2003 Bulgaria, during the negotiations to join Europe, had to modify and update his legislation and adapt it to European standards. Only in 2012 entered into force a new law¹³⁸ on the management of wastes that follows the 2008/98 CE directives and introduce the concepts of "*the polluter pays*", "*responsibility extended to the producer*" and a "*hierarchy on the management of wastes*".

Nowadays, the indicators of efficiency of this Bulgaria, regarding both the circular economy and the more general recycling and green economy, are basically red flags; there is almost no intention of minimizing the production of wastes from the SME¹³⁹ and the allocation of resources is inefficient. The main obstacles are the limited financial resources for the companies, both private and public and the absent long-term vision of the government.

Croatia

In Croatia, the low income per capita, the regional topography, the absence of foresight and political commitment towards durable environmental sustainability doesn't allow the introduction of a solid CE.

Almost no projects on circular economy are undertaken, but the government is working on a sustainable collecting of wastes alongside the touristic part of the coast; tourism is the main income of the Croatian GDP¹⁴⁰, for this reason, the Croatian government decided to clean the main areas, forecasting for the years 2017-2022 a recycle of 50%¹⁴¹, unfortunately with huge differences between the regions of the

¹³⁸ NATIONAL ASSEMBLY OF THE REPUBLIC OF BULGARIA. 2012.

https://www.parliament.bg/bg/plenaryst/ns/7/ID/2760

¹³⁹ Small-Medium Enterprises.

¹⁴⁰ WORLD TRAVEL & TOURISM COUNCIL, Economic impact 2018 Croatia.

¹⁴¹ CROATIAN GOVERNMENT, Croatian waste management, 2018.

country¹⁴². The government is trying to increase awareness. The government is also trying to increase the strength of the ECO-OZRA¹⁴³ association to attract European funds for the SME.

Cyprus

Cyprus is a small island in the Mediterranean Sea, partially shared with Turkey; the industrial activities are mostly nonexistent, and they focalized on the CE for an image gain, more than any other virtuous intention.

The circular economy is intended, by the Cyprus government, as an incentive for the renewable energies, solar and eolic; they are trying to substitute the normal vehicles with electric ones¹⁴⁴ and digitalize all the public documents also thanks to their very active portal "*Ariadni*"¹⁴⁵. The lack of initiative by the government and some structural factors are the main issues to the creation of a circular economy.

Czech Republic

In the Czech Republic, the material recycling started in 1997 thanks to the substitution of the public company EKO-KOM¹⁴⁶ with the use of administrative

¹⁴² CROATIAN AGENCY FOR ENVIRONMENT AND NATURE, report on waste management in croatia, 2017

http://www.haop.hr/sites/default/files/uploads/dokumenti/021_otpad/Izvjesca/komunalni/OTP_Izvje%C5%A 1%C4%87e%200%20komunalnom%20otpadu_2016..pdf

¹⁴³ VLADA REPUBLIKE HRVATSKE, croatian corporate council for sustainable development (ECO-OZRA), 2018

¹⁴⁴ CYPRIOT GOVERNMENT, challenges for the islands in the era of circular economy, 2019. https://circle2019.eu/

 ¹⁴⁵ THE GOVERNMENT GATEWAY PORTAL, (ARIADNI). https://cge.cyprus.gov.cy/re/public/
¹⁴⁶ EKO-KOM SYSTEM, 1997. https://www.ekokom.cz/en/other/system-results

measures on the local and national level; this influenced positively the recycle rates and the profits of the local administrations¹⁴⁷, creating big collection centers for the material recycling.

The support of the government is pretty high, and the politics and economy of the country are aligned with the environmental objectives, receiving big support from the institutions and universities¹⁴⁸; moreover, they started to work on a national strategy for the circular economy called "*Circular Czechia 2040*"¹⁴⁹.

Another very strong government action is the "*Dostybyloplastu*" (literally "enough plastic") against the single-use plastic products¹⁵⁰. At a local level there is also a strong interest; Prague¹⁵¹, for example, has been improved thanks to a high-tech economy based on the circularity in order to improve and stimulate innovation.

Denmark

The circular economy proposal in Denmark is high in terms of quantity and quality. Recently the government published the Danish strategy for the circular

¹⁴⁷ J. SLAVIK, J. PAVEL, Do the variable charges really increase the effectiveness and economy of waste management? A case study of the Czech Republic, 2013.

¹⁴⁸ CZECH REPUBLIC, national SWOT analysis on eco-innovation, 2018.

https://ec.europa.eu/environment/ecoap/czech-republic_en

¹⁴⁹ CZECH REPUBLIC, Circular Czechia, 2018.

https://www.directpeople.com/wp-content/uploads/2019/03/Cirkularni-Cesko-Direct-People-a-INCIEN-English.pdf

¹⁵⁰ CZECH REPUBLIC, Chech Ministry of the Environment, 2019 Dostybyloplastu.

http://www.dostbyloplastu.cz/

¹⁵¹ CIRCULAR PRAGUE. Circular City Scan Prague, 2019.

https://circulareconomy.europa.eu/platform/sites/default/files/prague-final-report-20190406_mr.pdf

economy¹⁵², focusing on the reduction of consumptions, on the productive cycles of materials and the eco-innovation of the SME.

The CE is a highly studied field in the Danish technology institute, focused on the best usage of the resource, a better environment and so better economic results for the companies. Regional governments and companies are nudged by the consciousness of the population and by the possibility of destroying the incinerator business, highly spread on the territory.

Guided by the Technical University of Denmark¹⁵³, the project CIRCit, also sustained by the "*Nordic Green Growth Initiative*"¹⁵⁴ to which participate all the five Nordic countries, is trying to implement the knowledge on the circular economy inside the society, included methods and instruments useful to create a clean transition towards a complete circular economy. Also, the capital, Copenhagen, has the aspiration of becoming the first carbon-free capital in the world; it started an ambitious plan in order to convert the city by 2025¹⁵⁵.

Anyways, the most precious example is the city of Kalundborg. Korean, Chinese, American and European peoples are following the example of this example. The site is an example of perfect industrial ecology, at a global level. The visitors, the managers, and the politician are trying to transpose on their countries; between six managers and the Danish town have been stipulated 26 contracts for the exchange of

¹⁵² DANISH GOVERNMENT, Ministry of the Environment and Food State of Green, *New national Danish strategy for circular economy*, 2019. https://mfvm.dk/miljoe/strategi-for-cirkulaer-oekonomi/

¹⁵³ TECHNICAL UNIVERSITY OF DENMARK, CIRCit, 2019.

https://www.dtu.dk/english/resultat?qt=NetmesterSearch&fr=1&sw=CIRCit%20#tabs

¹⁵⁴ NORDIC GREEN GROWTH INITIATIVE, 2019. https://www.nordforsk.org/en/programmes-and-projects/programmes/green-growth

¹⁵⁵ NORDIC GREEN GROWTH INITIATIVE, 2019. https://www.nordforsk.org/en/programmes-and-projects/programmes/green-growth
material, water, and energy allowing to save every year 20.000 tons of oil and 200.000 tons of plaster. This exceptional model has been possible thanks to the effort of the managers and some positive conditions like belonging to the same town, not being competitors and being part of the same Rotary Club.

Estonia

Started in Estonia, the project Let's Do It 2008 became the World Cleanup Day, a worldwide even to which participated in 157 countries and 18 million people. During the last 10 years, the strong ecological consciousness of the country made possible the creation of a strong CE reality.

In the whole country, there are a lot of initiatives to make the country fully circular and in 2018 has been created the Circular Economy Forum thanks to the Authority of the Environmental Affairs. Moreover, the next green public procurement will be invested on a national scale strategy in order to improve the functionality of the Estonian CE, thanks to the collaboration with the Tallinn TTK University¹⁵⁶. Estonia is, moreover, one of the main actors in the market of start-up, recycle and eco-innovation.

Finland

Finland, like the rest of the northern European countries, is one of the leaders of the circular economy; the initiatives are consolidated and well-coordinated. Already in 2014 was an example since thanks to the CE Finland created growth,

¹⁵⁶ TTK UNIVERSITY OF APPLIED SCIENCES, Institute of Circular Economy and Technology, 2019.

employment and being competitive thanks to the use of raw materials with high added value¹⁵⁷.

Nowadays the Finnish Parliament is enabling a program for the innovation and the circular economy, specifically for the SME, with the collaboration of the Sitra Found ¹⁵⁸ that has a strong background in support and innovation. The circular economy is seen as an opportunity for the traditional Finnish companies and, in order to lead them towards the full circularization the Sitra found is heading different initiatives like programs the materials' efficiency, voluntary Green Deals, a national program for the recycle of nutrients, a special ranking of more than100 virtuous examples of circular economy¹⁵⁹, a "playbook" for the SME¹⁶⁰.

Sitra, longa manus of the government is leading the annual World Circular Economy Forum¹⁶¹ that reunites all the main actors and thinkers about the circular economy from all over the world. The forum, during the year 2019 will focus on the new era that is growing and the way of creating the transition towards this new model. Moreover, following the Finnish belief that the circularity is not only about recycling, but about the whole value chain (life extension, and circulation of materials), in 2019 Business Finland launched a program¹⁶² that aims to make the country the world

¹⁵⁷ G. DEL MARMOL, Sans plus attendre!, 2014.

¹⁵⁸ https://www.sitra.fi/en/

¹⁵⁹ SITRA, *The most interesting companies in the circular economy*, 2019.

https://www.sitra.fi/en/projects/interesting-companies-circular-economy-finland/#business-examples

¹⁶⁰ Sitra. (2019). The tools for the manufacturing industry due to the transition towards the circular economy. https://www.sitra.fi/en/cases/tools-manufacturing-industry-help-companies-make-transition-circular-economy-business/

¹⁶¹ WORLD CIRCULAR ECONOMY FORUM, 2019. https://www.sitra.fi/en/projects/world-circular-economy-forum-2019/

¹⁶² BIO AND CIRCULAR FINLAND, 2019.

https://www.businessfinland.fi/suomalaisille-asiakkaille/palvelut/ohjelmat/bio-and-circular-finland/

leader in the circular economy. Also, the government¹⁶³, thanks to a Competence Center for the public contract is nudging every single company to lean towards a circular approach.

France

The debate over the circular economy in France started in 2009 with the publication of the first book on the circular economy¹⁶⁴ creating a strong political debate during the next years; the enacting of the energy transition for the green growth law¹⁶⁵, the 17 of August 2015 enshrined the transformation of the country towards a circular economy as a national objective and as pillar for a sustainable development. The law¹⁶⁶ says: "*La transition vers une économie circulaire vise à dépasser le modèle économique linéaire consistant à extraire, fabriquer, consommer et jeter en appelant à une consommation sobre et responsable des ressources naturelles et des matières premières primaires ainsi que, par ordre de priorité, à la prévention de la production de déchets, notamment par le réemploi des produits, et, suivant la hiérarchie des modes de traitement des déchets, à une réutilisation, à un recyclage ou, à défaut, à une valorisation des déchets¹⁶⁷".*

¹⁶³ MINISTRY OF THE ENVIRONMENT. 2019.

https://www.ym.fi/fi-FI/Ajankohtaista/Tiedotteet/Osaamiskeskus_vauhdittamaan_kestavia_ja_(46270)

 ¹⁶⁴ J. C. LÉVY, L'économie circulaire: l'urgence écologique? Monde en transe, Chine en transit, 2009.
¹⁶⁵ Law 2015-992 August 17, 2015

¹⁶⁶

https://www.legifrance.gouv.fr/affichTexteArticle.do;jsessionid=AFCF930498C727FE296FD98D611C82B7. tplgfr30s_2?idArticle=JORFARTI000031044647&cidTexte=JORFTEXT000031044385&dateTexte=299901 01&categorieLien=id

¹⁶⁷ The transition towards a circular economy aims to move beyond the linear economic model of extracting, manufacturing, consuming and disposing by aiming for a sober and responsible consumption of natural resources and primary raw materials and, in order of priority, to prevent the production of waste, in

Publishing the roadmap on the circular economy¹⁶⁸ during April 2018, created by the Minister of ecology and the Minister of Economic and Finance, France aims to reach aspirational objectives by introducing concrete actions; the creation of 800.000 workplaces by consolidating industrial activities thanks to the circular economy, the creation of reparation and reuse labs that could generate 25 times more working activities compared to the common dumping grounds¹⁶⁹.

All of this may be possible by involving the industrial and the economic actors of a specific sector or activity and helping them through the public authorities in order to accelerate the conversion towards a circular economy by identifying and removing their specific restraints¹⁷⁰. The managers and public authorities sign mutual contract commitments that could generate strong progress in terms of environmental safety and economic development¹⁷¹. Moreover, France's government is preparing a draft law for "*A circular economy and better waste management¹⁷²*" that will soon be on the agenda of the parliament.

particular through the reuse of products, and, depending on the hierarchy of waste treatment methods, reuse, recycling or, failing that, waste recovery.

¹⁶⁸ MINISTRY FOR AN ECOLOGICAL AND SOLIDARY TRANSITION, & MINISTRY FOR THE ECONOMY AND FINANCE, *Roadmap*, *50 measures for a 100% circular economy*, 2018. https://www.ecologiquesolidaire.gouv.fr/leconomie-circulaire

¹⁶⁹ GOUVERNEMENT FRANCE, *L'économie circulaire, combien d'emplois?*, 2016. www.strategie.gouv.fr

¹⁷⁰ INSTITUT NATIONAL DE L'ÉCONOMIE CIRCULAIRE (INEC), Advocacy for circular economy, 2018 https://institut-economie-circulaire.fr/plaidoyer-pour-leconomie-circulaire

¹⁷¹ INSTITUT NATIONAL DE LA STATISTIQUE ET DES ÉTUDES ÉCONOMIQUES, *10 indicateurs clés pour suivre l'économie circulaire*, 2019. www.statistiques.developpement-durable.gouv.fr

¹⁷² Ordre du jour du 14 février 2019: petit-déjeuner sur l'état actuel de la législation relative aux déchets (projet de loi sur l'économie circulaire et une meilleure gestion des déchets) http://www.arnaudgossement.com/archive/2019/01/23/economie-circulaire-et-dechets-analyse-du-projet-de-loi-6123254.html

During the press release, the government declared the will to create a label for the domestic electronic reparation, the reduction of the VAT¹⁷³ for the recycle and reuse foster the change of mentality in order to establish new objectives for circular use and repair¹⁷⁴. Moreover, will be established new and heavy sanctions for the non-recycled plastic materials. France supports the CE financing research and development trough agencies like ADEME¹⁷⁵, offering exemptions from VAT for the companies who collect and sell used goods. This law is making his way through national regulation, the first country to absorb European law on the circular economy into the national system. The explicative memorandum of this draft law underlines the necessity to promote a new system that supports the circularity and ends the linear way of consumption trough:

- Better information for the consumers, better quality and characteristics of the products in order to reach a responsible buy informing them of the possibility to repair, recycle and reuse. The transgression of this law may apply sanctions for 3000€ to 15000€ It will be introduced from the 1st of January 2020 a *"repair index"* for electronic devices.
- Facilitation and reduction of the repair costs thanks also to the obligation for the producer to make available the repair in 20 days from the request.
- Prohibits every marketing action against the reuse.

¹⁷³ Value-Added Tax

¹⁷⁴ INSTITUT NATIONAL DE L'ÉCONOMIE CIRCULAIRE PERSPECTIVES OF EVOLUTION (INEC), 2019.

https://instituteconomie-circulaire.fr/focus-leconomie-circulaire-dans-les-filieres-a-responsabilite-elargies-desproducteurs-rep-perceptives-devolutions/

¹⁷⁵ AGENCE DE L'ENVIRONNEMENT ET DE LA MAÎTRISE DE L'ENERGIE, *Eco-innovation Observatory. Country profiles EU*, 2018. https://ec.europa.eu/environment/ecoap/indicators/resource-efficiency-outcomes_en

There is still a lot that France could do in order to harmonize the legislative procedures, in particular in the real estate business, because the actual legislation, hard to interpret, could deviate managers from the use of the CE.

Germany

In Germany, the CE developed quickly, especially in the political area between all the parties. Like in the rest of the world, the dominant affair is the management of the wastes. In Germany since the 70's there is a law for the separation and recycling of wastes, but only in 1994 has been implemented a system that allows specifying the rules for every Länder; this gave the burden of the recycle to the municipalities and the responsibility to the producers (obligation deriving from the ex-law on the closecycle management of wastes).

At a national level, there are plans of administration that compare the creation of the wastes and their sorting through the various treatment centers. Eventually, their management must be administrated by single municipalities. At a national level is lacking specific legislation on the circular economy, since the law is almost only centered on the wastes; they want to fix this lack by closing the material cycles by 2020¹⁷⁶.

A full picture, given by the European Union that should have pushed the CE to a new level and create new jobs and a sustainable growth¹⁷⁷ and that should have Europeanized the sector since the industry of transformation of the recycled materials

¹⁷⁶ Bundesministerium für Umwelt, Naturschutz, Bau und Reaktorsicherheit (BMUB 2016). Deutsches Ressourceneffizienzprogramm II: Programm zur nachhaltigen Nutzung und zum Schutz der natürlichen Ressourcen, Berlin

¹⁷⁷ EUROPÄISCHE KOMMISSION, Closing the Loop: An EU Action Plan for the Circular Economy, Mitteilung der Kommission 2015/0614 final, Brüssel, 2015.

https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52015DC0614

need standard inputs that are too high for the single municipalities¹⁷⁸, but affordable for an association; unfortunately this hasn't produced any stimulus, in order to address the Bundesverband der Deutschen Industrie (Federation of German Industries) towards a circular economy will require new structures and, in particular, new actors.

This is worth because the development of the CE would help Germany in the long term production and in the usage of secondary raw materials (for example the Indium¹⁷⁹) as inputs of production: this is not only a saving but also a necessity for the Germany that relies more and more on the import of these materials and is hard hit by their price fluctuations¹⁸⁰.

It must be assumed that the German final consumers will benefit from the reuse and share instead of the mere possession: the costs on mobility, accommodations, and food could drop by 25% by 2030¹⁸¹. The Green Start-ups are well represented, but the one with disruptive business models seems grasping in order to overcome the lack of political help, highly influenced by the lobbying of the landfills. The circular economy needs a clear legislative picture, by all the main actors of the country. The discussion about saving money could defeat the players of the actual linear economy system. Junk management itself is worth more than 50 billion euros every year in Germany. Luckily, the last European elections were really clear about what the population thinks about the green economy and the circular economy.

¹⁷⁸ H. WILTS, Germany on the road to a circular economy, 2016.

¹⁷⁹ Produced by refining the scraps of the zinc.

¹⁸⁰ L. ERDMANN, Kritische Rohstoffe für Deutschland, 2013.

¹⁸¹ M.R. STUCHTEY, Circular Economy: Werte schöpfen, Kreisläufe schließen, 2016.

https://www.mckinsey.de/sites/mck_files/files/20160125_ circular_economy_germany.pdf

The initiatives on the CE are increasing in number and are getting coordinated at a national level. Like the program ProgRess¹⁸² that aims to preserve the whole value chain through a project based on the circular economy. Moreover, a partnership between the industry of fashion and the government created the sustainable textiles called Textilbündnis¹⁸³ in order to involve as much as possible the SME.

Greece

The circular economy in Greece is nonexistent; the recent economic crisis that struck the country bring down not only the economy but the whole Hellenic population. Greece is slowly reacting to it. At the end of 2018, the government published the "National Circular Economy Strategy¹⁸⁴". In this document is said that the model of the circular economy can be easily adapted to the Greek economy and that the government is acting a long-term plan for a healthy CE community, penetrating the SME system, giving specific funds and creating an executive for the circular economy¹⁸⁵.

The Social Economic Institute¹⁸⁶ trough City Plus is exploiting the public capital and involving the population to the CE; moreover, the Technological Education Institute of Thessaly is collaborating with the SME of the real estate

¹⁸² BMUB, Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety, 2016.

GERMAN RESOURCE EFFICIENCY PROGRAMME II, Programme for the sustainable use and conservation of natural resources.

¹⁸³ TEXTILBÜNDNIS, The Textiles Partnership, 2019. https://www.textilbuendnis.com/en/

¹⁸⁴ GREEK GOVERNMENT, Hellenic Republic - Ministry of Environment & Energy, 2018. http://www.ypeka.gr/LinkClick.aspx?fileticket=pYSLQXgjjOU%3D&tabid=37&language=en-US

¹⁸⁵ CIRCULAR ECONOMY CLUB, Greece National Action Plan on Circular Economy, 2018. https://www.circulareconomyclub.com/listings/strategies/greece-national-action-plan-oncircular-economy/

¹⁸⁶ SOCIAL ECONOMY INSTITUTE (GREECE), City PLUS, 2019. https://www.social-economy.com/

business in order to spread the circular economy and get back strong revenues in the future.

Hungary

Hungary is late, compared to the other components of the EU, in the CE field. There are many obstacles: the absence of a political vision, the lack of a national strategy, research structures. In order to get the communitarian founds the govern is trying to design a better development for the circular economy.

The actual economic system that sees a lot of public intervention in private sectors, with the creation of unpredictable and unexpected laws in order to favor some specific actor, discourage the companies to venture into new businesses like the CE. Only in 2018, the Circular Economy Platform¹⁸⁷ has been created by the Netherlands and the UK, in order to create a sharing platform to exchange information and knowhow in order to access the UE, founds for the period 2014-2020.

Ireland

Ireland gives his example in 2002 when with a tax on the plastic bags reduced their use by 90% in 10 years, is a worldwide example¹⁸⁸. Ireland has low taxation, attracting to the country many startups that have as their mission the implementation of a 100% circular value chain and material usage creating, accidentally, an incubator for the development of the CE. The government promotes the CE and the various

¹⁸⁷ BUSINESS COUNCIL FOR SUSTAINABLE DEVELOPMENT IN HUNGARY (BCSDH), Hungary establishes Circular Economy Platform, 2018.

¹⁸⁸ Reusethisbag.com, Plastic Bags Usage + Bans Around the World, 2017. https://www.reusethisbag.com/articles/plastic-bag-bans-worldwide/

ministers always nudge with public speeches the companies to be recognized as circular companies¹⁸⁹.

The SME, pushed by the new startups and by the government¹⁹⁰, are converting their innovative programs towards a CE¹⁹¹. The largest part of the Irish companies is interested in the development of new eco-innovative technologies, because thanks to it, they could open new opportunities; this is also allowed by the numerous grants of the government to overcome the technological lock-in¹⁹². There are numerous circular economy initiatives with a strong net of reuse and repair and programs of sustain by the government, thanks to the strong will of the community.

The Brexit is slowing down the economy and so the eco-innovation will be on the back burner during a period of economic recession¹⁹³. That being said, for the future, Ireland is introducing a new plan of development for the years 2018-2027 called Ireland 2040¹⁹⁴ with a strong accent of the CE.

¹⁸⁹ IRISH GOVERNMENT, The Minister for Communications, Climate Action and Environment. *Minister Bruton Calls on Irish Start Ups to Compete in European Green Alley Awards*, 2019.

¹⁹⁰ GOVERNMENT OF IRELAND, Department of Business, Enterprise and Innovation, *Irish Government's Supporting SME*, 2019. https://supportingsmes.gov.ie/sme-search/

¹⁹¹ IRELAND EUROPEAN COMMISSION, 2018.

https://ec.europa.eu/docsroom/documents/32581/attachments/15/translations/en/renditions/native texts and the second sec

¹⁹² A, TRIGUERO, Leaders and Laggards in Environmental Innovation: An Empirical Analysis of SMEs in Europe, 2016.

¹⁹³ INTERNATIONAL MONETARY FUND, 2018.

https://www.imf.org/~/media/Files/Publications/CR/2018/cr18224.ashx

¹⁹⁴ GOVERNMENT OF IRELAND. Éire 2040 - An Tionscadal An Creat Náisiúnta Pleanála, 2019. www.gov.ie/2040

Latvia

The creation of a regimentation on wastes started in 1996, later on, has been adapted to the European Directives. The initiatives about the circular economy are limited, with the only recycling of valuable materials. The recognition of the circular economy in the country is really low, but the academic¹⁹⁵ part of the country and the European subsides are opening their way towards the creation of the CE. Small parts of the country, thanks to the example of Kalundborg are starting to organize independently¹⁹⁶.

Lithuania

In Lithuania the initiatives on the circular economy are scares and only by the end of 2017 the NGO Žiedinė ekonomikastarted to write about the circular economy, making it popular amongst the young people. The academic world seems not to care about it. Unfortunately, the car industry and the textile, with the metallurgic industry, could convert their politic towards a circular one using the European founds to favor the development of the SME.

Luxembourg

The governmental and non-governamental organizations are high in number and very active in Luxembourg, like the rest of northern Europe. Luxembourg during 2014 made a study on the potentialities of the circular economy on the financial sector that

¹⁹⁵ UNIVERSITY OF LATVIA - RIGA TECHNICAL UNIVERSITY, *Green Technology Incubator*, 2019.

¹⁹⁶ N. CUDEČKA PURIŅA, Evaluation of Economic instruments for involvement of individuals in Regional waste management system, 2019.

ended up in the creation of the EcoInnovation Cluster¹⁹⁷. It is very active with the SME, proposing solutions to convert them into CE companies. For at least three years Luxembourg became a circular economy laboratory and, by the end of 2015, 15.000 jobs were already considered inside the CE of the country¹⁹⁸. For the country, it is a pillar that impacts all the sectors: energy, food, mobility, real estate, industry, and finance¹⁹⁹.

In 2017 Luxembourg has been awarded Circular Hotspot of the Year. All of the 102 municipalities of Luxembourg signed a deal with the government²⁰⁰ in order to generalize the good practices of the CE with the pride of being the first country in the world to develop and push ideas on the circular economy across the nation. Moreover, they have an experimental lab²⁰¹, a methodology for the circular companies²⁰² and an advanced method of construction²⁰³. For sure Luxembourg is one of the most exemplary countries for the complete transition towards the circular economy.

¹⁹⁷ THE LUXEMBOURG GOVERNMENT, Ministère de l'Économie Rechercher, 2014.

¹⁹⁸ THE LUXEMBOURG GOVERNMENT, STATEC National Institute of Statistics and Economic Studies of the Grand Duchy of Luxembourg, 2016.

¹⁹⁹ R. POULLES, Luxembourg Government, Ministère de l'Économie Rechercher.

Stratégique Interministériel Pour L'économie Circulaire, 2019.

²⁰⁰ THE LUXEMBOURG GOVERNMENT, Accord de coalition 2018-2023.

²⁰¹ DELANO WILTZ, Luxembourg's Circular Economy Laboratory, 2018.

https://delano.lu/d/detail/news/wiltz-luxembourgs-circular-economy-laboratory/172585

²⁰² THE LUXEMBOURG GOVERNMENT, Méthodes et outils pour la mise en oevre de l'Economie Circulaire dans de zones d'activités economiques au Luxembourg, 2018.

²⁰³ THE LUXEMBOURG GOVERNMENT, Ministère du Développement durable et des Infrastructures, *Plan national de gestion des déchets et des ressources*, 2018.

Malta

Malta is trying to create a circularity in the island in order to get economic benefits in the long term²⁰⁴. The idea of the CE is particularly relevant for Malta, especially due to his geographical location, the high dependence from the imports and the lack of raw material. In Malta almost all the enterprises (95%) fall in the definition of SME and the access to the financial options represents the obstacle to the transition towards the CE; the sector that is more dependent from the importation is the constructions one²⁰⁵, the esteem says that the 84% percent of the wastes comes from there²⁰⁶.

The initiatives about the circular economy are very limited, even though some of them are becoming reality: The Ministry for the Environment, Sustainable Development, and Climate Change recently published the "Malta's Sustainable Development Vision for 2050" that the European commissary Vella²⁰⁷ called "*a force able to train the circular economy in Malta*".

Netherlands

In the Netherlands, like in the rest of the world, wastes management has been the first chapter of environmental politics. A problem that in the Netherlands has been perfectly solved and now the government is focusing on the environmental safeguard and the raw materials management, pillars of the circular economy.

²⁰⁴ J. SPITERI, The Circular And Malta Economy, 2018.

²⁰⁵ M. L. ZAMMIT, The Development of the Maltese Insurance Industry, 2018.

²⁰⁶ GOVERNMENT OF MALTA, Ministry For The Environment, Sustainable Development And Climate Change, 2019.

²⁰⁷ Karmenu Vella, a Maltese politician and current member of the European Commission, where he is in charge of Environment, Maritime Affairs and Fisheries.

The first decade of this century has seen almost no public investment in the circular economy and, moreover the taxation applied for the research and development was inefficient in order to have long term perspectives. Since 1990 a change in the taxation and stops on the junkyards made the recycle incredibly profitable, With the energetic politics the Ministry for Economic Affair gained an incredible amount of profits thanks to the gas economic bubble and the royalties connected to it²⁰⁸.

Thanks to the modifications to the legislation on the wastes' management, the Netherlands started to pursue strong decisions in order to convert from a linear economy to a circular one; both in Europe and in the Netherlands legislators and politician has been asked to take a guidance role in the definition of the CE and recyclables raw material, in order to create a differentiation between disposal, recover, recycle and "actions to prevent and reuse ordinary materials and products that belong to a circular economic system"²⁰⁹ asking the politicians to bring their contribution in the EU in order to get more juridical safety for the entrepreneur. The pursue of economic circularity is parallelly in the European and Netherlands'²¹⁰ agenda.

In the Netherlands specifically, programs like the VANG²¹¹ and sustainable bioenergy projects²¹² are made in order to switch from a linear to a circular economy.

 $01aa75ed71a1.0010.02/DOC_1\&format=PDF$

²⁰⁸ S. OXENAAR, De Nederlandse overheid en de olie- en gasindustrie: zoek de verschillen, 2018.

²⁰⁹ J. TIEMAN, *Met recht naar een circulaire economie*, 2017.

²¹⁰ Maak de cirkel rond - Een EU-actieplan voor de circulaire economie https://eurlex.europa.eu/resource.html?uri=cellar:8a8ef5e8-99a0-11e5-b3b7-

²¹¹ Vang afval tot grondstoffen - RijksoverheidFrom Waste to Raw Material; 2016 file:///C:/Users/Alex/Downloads/voortgangsrapportage-van-afval-naar-grondstof.pdf

²¹² A sustainable bioenergy policy for the period after 2020 – Rijksoverheid https://www.rijksoverheid.nl/binaries/rijksoverheid/documenten/publicaties/2016/08/23/a-sustainablebioenergy-policy-for-the-period-after-2020/a-sustainable-bioenergy-policy-for-the-period-after-2020.pdf

Moreover, is possible to foresee an acceleration on the bureaucratic part thanks to the governmental proposal on the circular economy that aims to include biomasses, aliments, industry, plastic raw materials, and constructions. At the moment the uncertainty on the detention of the wastes in the Netherlands is a very strong obstacle for the CE; the holder of the materials may face several sanctions due to the inefficient law. Many managers ask for clarification in the bureaucracy about what is considered "*waste*"²¹³: everyone wants laws, stimulant regulations and activities that wouldn't get in the way of the transition towards the CE.

Anyways, the Netherlands is amongst the first countries in Europe for conversion towards the CE with tons of initiatives: The Netherlands Environmental Assessment Agency²¹⁴ estimate that 85.000 activities with 420.000 employers play a role in the CE. The most important plan has been developed in 2016 by the Minister of Infrastructures and Environment and the Minister of Economic Affairs²¹⁵. The objective is to reduce the use of raw materials by 50% by 2030 and convert into a circular economy by 2050. Moreover, the VNO-NCW and the MVO Netherlands signed the "*Grondstoffenakkoord*"²¹⁶ with the "*Versnellingshuis*"²¹⁷, a pact about the usage of the material with the so-called acceleration house.

²¹³ G. BUIJZE, Afnemer wil rechtszekerheid, 2016.

²¹⁴ NETHERLANDS ENVIRONMENTAL ASSESSMENT AGENCY - PLANBUREAU VOOR DE LEEFOMGEVING (PBL), Circulaire Economie in kaart, Planbureau voor de Leefomgeving, 2019. https://www.pbl.nl/publicaties/circulaire-economie-in-kaart

²¹⁵ THE MINISTRY OF INFRASTRUCTURE AND THE ENVIRONMENT, A Circular Economy in the Netherlands by 2050.

https://www.government.nl/documents/policynotes/2016/09/14/a-circular-economy-in-the-netherlands-by-2050

²¹⁶ CENTRAL GOVERNMENT, 2017. https://www.rijksoverheid.nl/actueel/nieuws/2017/01/24/180-ondertekenaars-nationaal-grondstoffenakkoord

²¹⁷ CENTRAL GOVERNMENT, 2019.

Poland

The first juridical norm on wastes management appeared in 1997, but the concrete actions ins this sector are bond to the join of Poland to the EU in 2001. Only in 2013, the authorities became responsible for the urban wastes in their zone, the hierarchy has been introduced and consequentially some hypotheses on the CE. Strong with their initiatives are the NGOs in Poland, but also the government during the last period started to participate²¹⁸ and talk about the circular economy at a European level²¹⁹.

Poland joined the project R2 π Horizon 2020²²⁰, that involves 9 countries and will create a roadmap for the circular economy soon. In October 2019 a lot of conferences and initiatives will take place in the capital thanks to the help of the Netherlands. The government started these days to introduce a program about the CE in 5 cities of Poland²²¹, so is possible to say that, even if slowly, the regulation and the consciousness are taking place.

Slovakia

The political and normative picture of Slovakia is fragmented, a low consciousness by the population makes that the CE in Slovakia is still unknown. In

https://www.rijksoverheid.nl/actueel/nieuws/2019/02/13/circulaire-ondernemers-krijgen-hulp-om-door-te-breken

²¹⁸ POLISH GOVERNMENT SERVICE, Poland Road To The Economy With A Closed Circumstances Description Of The Situation And Recommendations, 2017.

²¹⁹ POLISH GOVERNMENT SERVICE, Ministry of Environment. *Poland's comments on the circular economy*, 2017.

²²⁰ POLISH GOVERNMENT SERVICE, Ministry of Enterprise and Technology. *Circular economy*, 2018.

²²¹ POLISH GOVERNMENT SERVICE, Ministry of Enterprise and Technology. *Circular economy in the municipalities*, 2018.

the management of wastes, the government made some progress. The pressures of the NGO carried the government to publish a strategy for the green economy that includes the CE²²². Cooperation between Slovakia and Hungary called the "*circle of the circular economy*"²²³ will allow this country to slowly enter into the mindset of the more developed countries.

Slovenia

"In Slovenia, we have a lot of knowledge and a series of solutions with high technological impact, innovation in the wastes field and in the intelligent services sector. We must sustain the green economy and the CE"²²⁴. Slovenia is demonstrating true dedication to the full actualization of the circular economy. Is modeling a net of economic partners to create instruments of the circular economy to benefits the SME. The example is the city of Maribor²²⁵ that already is a case study. Ljubljana introduced the program "circular economy 100"²²⁶ that also is the headquarter of the stakeholder's platform "Circular Change" that helps the transition of Slovenia toward

http://www.skhu.eu/fundedprojects/circle-of-circular-economy

 ²²² SLOVAK REPUBLIC, Ministry of Environment, *Slovak Republic towards Green Economy*, 2016.
²²³ INTERREG SLOVAKIA - HUNGARY (SKHU), *Circle of circular economy*, 2017.

²²⁴ GOVERNMENT OF THE REPUBLIC OF SLOVENIA, Vlada Republike Slovenije, 2019. http://www.vlada.si/teme_in_projekti/prehod_v_zeleno_gospodarstvo/

²²⁵ CITY OF MARIBOR, Mesto Maribor, 2019. http://www.maribor.si/dokument.aspx?id=33421

²²⁶ CITY OF LUBIANA, 2019. https://www.ellenmacarthurfoundation.org/ce100

a circular economy²²⁷. "A strategy of smart specialization and the consequent strategical partners for the transition towards the CE"²²⁸.

The circular economy is the light at the end of the tunnel for the Slovenia that could benefit a lot from the transition toward a green economy: more competitivity, more jobs, less dependence from external resources, more economical and social stability, more innovation and more opportunities.

Portugal

The Portuguese government started the transition towards the CE during 2014 with the "*commitment to green growth*"²²⁹ signed by over 100 organizations, focusing around three main assets, one of them is the circular economy. With the law n° 152-D /2017²³⁰ that cleared the regime around the waste's management, the discussions around the recycle and the circular economy became real.

Thanks to the iteration with the Dutch government, the "*action plan for the circular economy in Portugal 2017-2020*"²³¹ has been presented to the government,

²²⁷ GOVERNMENT OF THE REPUBLIC OF SLOVENIA, Roadmap towards the circular economy in Slovenia, 2018.

²²⁸ GOVERNMENT OF THE REPUBLIC OF SLOVENIA, *Strategic Development Innovation Partnership*, 2017. https://www.stajerskagz. si/administracija/wpcontent/uploads/2018/03/ Akcijskina%C4%8Drt-31-7-2017-SRIP-Kro%C5%BEnogospodarstvo-WEB.pdf

²²⁹ GOVERNO DE PORTUGAL, Compromisso para o Crescimento Verde (CCV), 2014. http://www.crescimentoverde.gov.pt/compromisso/

²³⁰ REPÚBLICA PORTUGUESA, 2019.

https://dre.pt/pesquisa/-/search/114337042/details/maximized?print_preview=print-preview

²³¹ GOVERNO DE PORTUGAL, Ministry of Environment. (2017). *Leading the transition: A circular economy action plan for Portugal*, 2017.

https://circulareconomy.europa.eu/platform/sites/default/files/strategy_-

_portuguese_action_plan_paec_en_version_3.pdf

foreseeing incentives for the innovation, fiscal and economic benefits for the SME²³² that would adopt the CE standards.

Romania

Like the rest of the East European countries, Romania inherited from the communist occupation serious environmental problems caused by the industrial politic. Romania is struggling with what concerns the environment and the circular economy. Initiatives are rare, but slowly growing following the government and his new politic around the investments in the SME.

An example is the companies like Ecoizm²³³ that produces many reusable products like the Trezy diapers; moreover, in 2016 the FEI²³⁴ signed three operations with big financial institutes in order to finance the CE initiatives amongst the SME like the Green Fiber project: the plastic bottle are used to produce a polyester flake used to extend the recycle. The government is moving his first steps and studying a strategic plan²³⁵ in order to carry the CE that is well seen by society and to create legislation on wastes management.

Spain

As the rest of the countries the Spanish contribute to the CE starts with the wastes management and, even though is getting better, is not close to the European standards.

²³² GOVERNO DE PORTUGAL, *SIFIDE*, 2019.

https://www.portugal.gov.pt/pt/gc21/comunicacao/comunicado?i=observatorio-de-emprego-cientifico-ematualizacao-permanente

²³³ ECOIZM, *Trezy washable pocket diaper*, 2019.

²³⁴ EUROPEAN INVESTMENT BANK, European Investment Fund Recycling and circular economy Romania, 2016.

²³⁵ GUVERNULUI ROMÂNIEI, Institutul European din România ©, 2019.

Spain is composed by 2 autonomous cities (Melilla and Ceuta) and 17 autonomous communities (Andalusia, Aragon, Astoria, Balearic Isles, Canaries Isles, Cantabria, Castilla y León, Castilla-La Mancha, Catalonia, Valencian Community, Extremadura, Galicia, Madrid, Murcia, Navarra, Basque Country, and La Rioja). Every single one of them has politic and economic autonomy, for this reason, the approval of the laws and the executive powers belongs to the single state.

The two institutions are the Legislative Assembly and the Government Council and so the legislative matters are in a rivalry between state and communities. The norms about the environment and wastes may be summarized by the law 22/2011 that sanction the principle of wastes' hierarchy, the state program for the waste's prevention 2014-2020 and the state program for the wastes' management 2016-2022. The Spanish model about the circular economy has born recently²³⁶, with a series of initiatives created to sensitize the population especially in the first years of school.

The legislative package entails different directives that must be absorbed by the Spanish legal order; unfortunately, the central government and the regional ones make it difficult to reach some objectives and they highlight the juridical problem of Spain. The problems are bond to the multiple competition between an administration that could interfere in many sectors that involve the CE. The first step should be to obtain a better alignment between the authorities, but anyways the initiatives started by the autonomous communities like the Basque country with the IHOBE, a public impact society created to promote the reuse of materials²³⁷, the Andalusia experience

²³⁶ GOBIERNO DE ESPAÑA Ministerio de Industria, Comercio y Turismo *España 2030 estrategia española de economía circular por un futuro sostenible borrador para información pública*, (2018). https://www.miteco.gob.es/images/es/180206economiacircular_tcm30-440922.pdf

²³⁷ THE BASQUE GOVERNMENT. *IHOBE*, 2014: http://www.stemcoalition.eu/members/basque-government

for the promotion of the renewable energies with the intent of reducing the energy demand by 25% or the Sevillian Manifesto²³⁸ signed by over than 200 municipalities.

The community of Extremadura, with the intent of converting the area to make an example of a functional circular economy published the "*Extremadura 2030*". They tried to connect the already working international CE net with the growing Spanish one²³⁹. Must be also mentioned the valuable initiatives of Tarragona²⁴⁰ and Monzón²⁴¹. At a national level, the commitment of Spain is confirmed by local initiatives like the pioneering lab TheCircularLab²⁴² and the treaties signed with Finland and Portugal²⁴³

Sweden

The politics and the society in Sweden mage huge progress in the circular economy field, at the point, that they are already analyzing new and various models in order to improve this efficiency. From a Swedish point of view, the implementation of the CE is something that is not only crucial for the environment but even more important for business activities²⁴⁴. During 2008 the Swedish government decided to set 16 objectives to reach by 2020 and 8 of them were about the circular economy.

²³⁸ FEDERACIÓN ESPAÑOLA DE MUNICIPIOS Y PROVINCIAS, Municipios y economia circular, 2017. https://www.municipiosyeconomiacircular.org/home/

²³⁹ EUROPEAN COMMISSION, EXTREMADURA 2030, 2018.

²⁴⁰ R. ÁLVAREZ-PORTAS, *Detección De Sinergias De Simbiosis Industrial Y Gestión Medioambiental Entre Pymes De Áreas Industriales Mediante Herramientas De Análisis Espacial De La Información*, 2014.

²⁴¹ J.R.P. BOCARDO, Economía Circular en el ámbito rural, 2014.

²⁴² THE CIRCULAR LAB, 2017. https://www.thecircularlab.com/en/

²⁴³ GOBIERNO DE ESPAÑA. La Moncloa, Spanish and Finnish governments reaffirm commitment to innovation and the green economy, 2018.

http://www.lamoncloa.gob.es/lang/en/presidente/news/Paginas/2018/20181004finnish.aspx?qfr=121

²⁴⁴ J. SCHOR, Debating the Sharing Economy, Great Transition Initiative, 2014.

The Swedish agency for environment protection decided to publish the report called "*Waste in Sweden*"²⁴⁵ with the objective of transferring the information and the safeguard of the environment also to the next generations. The objective of Sweden is to break apart the normal "*scheme of usury*²⁴⁶" and to reduce the raw material usage, even though there are similarities between the two²⁴⁷. Sweden worked for years in order to get better wastes management, following the Naturvårdsverket²⁴⁸ reports and the Swedish SOU²⁴⁹ to finally have a parliamentary solution²⁵⁰. Sweden is a nest of ideas: in 2018 the IVA²⁵¹ created a dedicated space for the circular economy proposals and to create new jobs in Eco-innovation, improve in order to represent the evolution of the CE, to apply with success new business models.

To give the possibility to startups and new companies to access financial resources from banks has born a joint venture between the Swedish Agency for the

²⁴⁵ SWEDISH ENVIRONMENTAL PROTECTION AGENCY, 2016.

https://www.scb.se/contentassets/842cdb4c880247b28fad6fef853a0526/mi0305_2016a01_br_misambr1801.p df

²⁴⁶ C. J. MARTIN, The sharing economy: A pathway to sustainability or a nightmarish form of neoliberal capitalism?, 2016.

²⁴⁷ P. PLANING, Business Model Innovation in a Circular Economy Reasons for Non-Acceptance of Circular Business Models, 2015.

²⁴⁸ SWEDISH ENVIRONMENTAL PROTECTION AGENCY, 2016.

https://www.naturvardsverket.se/Documents/publikationer6400/978-91-620-6619-2.pdf?pid=13196

²⁴⁹ STATENS OFFENTLIGA UTREDNINGAR, 2017.

https://www.regeringen.se/495f62/contentassets/82aabf7f731c4e18aaee3b8dc3621063/delningsekonomi--pa-anvandarnas-villkor-sou-201726

²⁵⁰ SVERINGES RIKSDAG, 2017.

https://www.riksdagen.se/sv/dokument-lagar/dokument/motion/avfall-och-kretslopp_H5023888

²⁵¹ ROYAL SWEDISH ACADEMY OF ENGINEERING SCIENCES, 2018.

https://www.iva.se/sok/?q=Resurseffektivitet+och+cirkul%C3%A4r+ekonomi

energy²⁵² and the Swedish agency Vinnova²⁵³ that administrates financial lending for research and development.

United Kingdom

The UK as a whole doesn't have a solid strategy for incorporating the CE but agreed to the plan called "*United Kingdom Building a Britain fit for the future*"²⁵⁴. The objective is to create an efficient circularity for the resource and with a clean growth, both social and economic, thanks to the low carbon emissions and the new strategy for the waste management imposed by the EU. A lot of initiatives are undertaken by private organizations and NGOs.

First of all, the Ellen MacArthur Foundation (EMF) leads the research on the circular economy all over the world, even though their influence is low in their motherland. In 2018 the EMF reunited 250 organizations, including big multinationals to rethink and recreate the packaging of many products, the project is called "*New Plastics Economy*"²⁵⁵. The vision about the CE in the UK is unfortunately not aligned with Europe²⁵⁶ and until the Brexit, there has been a lot of discussion about the plans that Europe had for them. The approach to the circular economy is undertaken by the leading companies and also by Scotland and Wales, pro-European countries.

- https://www.gov.uk/government/publications/industrial-strategy-building-a-britain-fit-for-the-future the strategy-building-a-britain-fit-for-the-future the-f
 - ²⁵⁵ ELLEN MACARTHUR FOUNDATION, New Plastics Economy, 2018.

²⁵² THE SWEDISH ENERGY AGENCY, 2016. www.energimyndigheten.se/forskning-ochinnovation/forskning/bioenergi/bransleforsorjning/program/resource/

²⁵³ VINNOVA, 2016, Coordinated initiative for efficient management of resources and waste

https://www.vinnova.se/en/m/strategic-innovation-programmes/resource

²⁵⁴ United Kingdom Building a Britain fit for the future.

https://www.ellenmacarthurfoundation.org/our-work/activities/new-plastics-economy

²⁵⁶ J. HILL, The circular economy: From waste to resource stewardship, Proceedings of the ICE – Waste and Resource Management, 2014.

The peculiar development, after the independence choice of 2014, is that the companies now choose their challenge, instead of waiting for more political development, in particular, England and Northern Ireland have as objective the reduction of wastes of raw materials. In 2015 the Scottish government decided, in collaboration with Green Alliance, to describe and choose the best circular economic activities and plans on order to create opportunities for the gas, petrol, beverage and finance sectors²⁵⁷ while in Wales through the "*One Planet Living*" initiative the government wants to give a CE political approach to the future generations²⁵⁸. The companies are already anticipating the political debate on the circular economy in the UK and thanks to the consumer proactivity towards this new paradigm, their vision is positive towards the future.

The testimony is partnerships with the Ellen MacArthur Foundation²⁵⁹, the Great Recovery Project of the RSA²⁶⁰ and the Green Alliance's Circular Economy Task Force²⁶¹. The companies and the government gladly accepted the report from the RSAP²⁶², a shared initiative of the Authority for the environment, food and rural affairs (Defra) and the BRI that accented the recover of materials trough circular approaches and make the companies more committed in the reuse²⁶³.

²⁵⁷ D. BENTON, Circular economy Scotland, 2015.

²⁵⁸ F. NAWRS, National assembly for Wales Research Service, key issues for the fourth assembly, 2011.

²⁵⁹ ELLEN MACARTHUR FOUNDATION, Towards the circular economy, Report No.1, 2013.

²⁶⁰ RSA, *The great recovery – Investigating the role of design in the circular economy*, 2013.

²⁶¹ GREEN ALLIANCE, Circular economy task force, 2015.

http://www.green-alliance.org.uk/CETF.php

²⁶² United Kingdom. Defra. (2012). Resource Security Action plan.

https://www.gov.uk/government/publications/resource-security-action-plan-making-the-most-of-valuable-materials

²⁶³ D. BENTON, Resource resilient UK (Circular economy task force), 2013.

CHAPTER 3: Futur-e project

3.1 Enel, values and the project

Enel S.p.A. (originally the National Authority for the electric energy) is a multinational company of energy and one of the biggest operators in the fields of electric energy and gas. Established as a public authority at the end of 1962 and end up as a joint-stock company; listed in 1999 in the Italian stock exchange after the liberalization of the Italian electric energy market. The Italian State through the Ministry of Economy and Finance²⁶⁴ is still the main shareholder with a portion of 23,6% of the share capital²⁶⁵.

Enel, with 76,64 billion of turnover, is ranked 84th amongst the top 100 companies at a world scale; moreover, it has the top integrated utility of Europe with 48,9 billion revenues. It is listed in the FTSE MIB index of the Milan Stock Exchange.

In Italy the electric production in 1898 was 100 million kilowatts per hour²⁶⁶, by 1960 it increased to 56 billion; the entire productive and distributive system was on the should of more than 1.200²⁶⁷ private companies. During 1962 the newborn government instituted the unification of the entire national electric system by decree of law n.3906 of the June 26th, 1962²⁶⁸ and by the law n.1643 of December 6th,1962 ENEL (Ente Nazionale per l'Energia Elettrica) was born. ENEL bought all the activities from the private companies operating in the fields of production,

 $^{^{264}}$ MEF

²⁶⁵ Date: April 1st 2016

²⁶⁶ C, SILVI, Frammenti di storia dell'energia solare in Italia prima del 1955, su Gruppo per la storia dell'energia solare, 2003.

²⁶⁷ G. BONARDI, C. PATRIGNANI, Energie alternative e rinnovabili, 2010.

²⁶⁸ https://www.camera.it/_dati/leg03/lavori/stampati/pdf/39060001.pdf

transformation, transmission, and distribution of electric energy. To compensate for the various acquisitions, after an estimation of the actual value of the companies, an indemnity to be paid in 10 years with the interest of 5,5% was set.

Later on, in the next 10 years, ENEL focus on the creation of the high tension net, the international connection, the connection with the Italian islands and the electrification of the rural areas. All of these projects were financed by the Italian State's obligations for a value of 200 billion Lire²⁶⁹.

In order to see the first positive balance sheet and returns on investment, we have to wait for 1986²⁷⁰, also thanks to the reduction of oil dependence. Another event that had a strong impact on the energetic field in Italy was the Černobyl' disaster; after it in 1987 took place a referendum in Italy that sanctioned the end of the nuclear energy and the immediate closing of all the nuclear facilities.

From 1990 to 2000 Italy has seen a progressive opening of the electric energy market. First with the law n.9 of the 9th January 1991²⁷¹, then in 1992 with the transformation of ENEL in a joint-stock company with the Italian Department of Treasury as sole shareholder and culminating in 1999 with the decree n.79 of the April 16th, 1999 for the execution of the European directive 96/92/CE²⁷². The electric market was opened, and Enel was separated into three different companies, recognized by production activities: production, distribution, and sales. Moreover, it has been established a threshold of electric production for ENEL equal to 50% of the national production.

²⁶⁹ http://legislature.camera.it/_dati/leg04/lavori/stampati/pdf/013_001184_F001.pdf

²⁷⁰ E. BORRIELLO, L'Enel dopo 25 anni ha chiuso in attivo, 1987.

²⁷¹ https://www.normattiva.it/uri-res/N2Ls?urn:nir:stato:legge:1991-01-09;9

²⁷² https://www.arera.it/it/docs/riferimenti/bersani.htm

In 1999 ENEL has been listed on the Italian stock exchange market for a price of $4,30 \in$ for every share (then $8,6 \in$ after the society's grouping); the total was 4,183 billion shares, for a total of 18 billion Euros²⁷³.

Since the year 2000, the politics of ENEL has been focused on the progressive internationalization of the company²⁷⁴ through numerous mergers and acquisitions like:

- The acquisition of CHI Energy, producer of renewable energy in 2000 for 170 million dollars²⁷⁵;
- The acquisition of Viesgo;
- The total control of the Iberic utility Endesa in 2009^{276} .

But mostly ENEL focused on the development of a green and circular politic; the most notable example and the core of the research is the Futur-e project.

Enel has chosen to guide the transition towards a circular model for the power industry with Futur-e, the program that aims to completely change the face of 23 thermal power sites that are no longer useful for the domestic energy market, with a total of 13 GW of power installed. The mission is to find a new use for the various power station that goes beyond the limits of the energy sector in order to sustainability at a social, environmental and economic level.

²⁷³ http://www.mef.gov.it/ufficio-stampa/comunicati/1999/comunicato_0173.html

²⁷⁴ Enel is present in Europe (Italy, Spain, Belgium, Portugal, Russia, Slovakia, Romania, France, Bulgary, Greece, Croatia, Germany, Poland, the Netherlands, the United Kingdom and Ireland) in North America (Canada and USA), South America (Argentina, Brasil, Cile, Colombia, Costa Rica, Guatemala, Mexico, Panama, Perù and Uruguay), in Africa (Algeria, Morocco, Sudafrica and Zambia), Asia (India and Indonesia), in Oceania (Australia) and South Korea, Taiwan and Japan

²⁷⁵ https://www.ilsole24ore.com/fc?cmd=anteprima&codid=22.0.54259217&chId=14

²⁷⁶ https://www.corriere.it/economia/09_febbraio_21/enel_conquista_endesa_dossena_fcbcd4d8-fff0-11dd-a585-00144f02aabc.shtml

The way the project works has been developed in order to be spread around different approaches, like international calls for ideas and projects, workshops, real estate procedures, round-table discussions: all of this to find and identify the perfectly fitting solution to every single case, solutions that local communities could believe in.

In order to make it all possible Enel decided to create the processes from the beginning, finding investors, involving local institutions and partners. The investors may propose their ideas about the purchase and the future development of the sites. Then, the proposals and the various projects are seen and evaluated by a jury composed by representatives of Enel, local institutions leader and people from the academic world. The ideas that meet the parameters of environmental, economic and social sustainability and the principles of the Circular Economy can move next to the negotiations for the acquisition of the site.

Contrary to the linear approach mechanics used for the decommissioning of the sites, the project Futur-e is created in order to be completely circular on its own, moving the entire industrial site that reached its EoL²⁷⁷ to a new, circular and sustainable life.

The approach selected for this project is completely in line with Enel's new vision for Open Power²⁷⁸, which sees the company focusing on working together with

²⁷⁷ End-of-Life

²⁷⁸ Open power is the new Enel way of action: instead of creating corporate-centric content the company focuses on creating customer-centric content. The goal is to allow users to experience Open Power through a relationship with Enel and not trough the usual advertising campaigns. Thanks to this, in just 12 months, 13global websites, 10 company websites, 2 commercial websites and 1 corporate portal have been entirely revamped with an Open Power UX and a novel Content Strategy that shifts the focus of Enel's corporate communication from information to brand journalism. This process has involved a total of 9 countries, 6 different languages and over 400 people



local communities to design a bright future for these sites.

Figure 9 Location of the 23 power plants of the Futur-e Project

Futur-e represents a concrete example of an approach that follows the circular economy. It provides the recovery of the dismission of the traditional assets in favor of new and more efficient forms of industrial reuse and material recovery, able to generate satellite activities in the territory and create social and cultural development thanks to the involvement of the communities thanks to the shared platform.

The business of the electricity is living a deep transformation phase. Enel started the project in 2015 and has been created looking at shared value creation, in favor not only of all the local shareholders but also the national and international investors.

In order to carve the highest value from the project, Enel created 7 principles to apply to every Futur-e's asset, all equally essential:

- Personnel working on the site are relocated within the Enel Group, avoiding redundancies and loss of know-how
- 2. Requalification projects are identified through **public tenders** without direct assignments
- During the whole project, from preliminary interviews to the decision on the requalification project, Enel works in cooperation with local stakeholders, in line with Enel's vision for Open power
- 4. Ensure **environmental protection**: land remediation is performed by Enel with the best standards
- 5. Requalification projects must be **sustainable and innovative**. Sustainability as environmental (minimizing environment impacts), social (create jobs and economic activity), and economic (self-sufficiency)
- 6. Reusing assets for new functions that meet the concrete needs of the local communities according to the principles of **Circular Economy**
- Contribute to Enel Group's goals by cooperating with other business lines for the realization of projects such as BESS²⁷⁹, e-mobility, digitalization, renewables, etc.

²⁷⁹ Battery Energy Storage System

As previously mentioned there also are 4 founding principles on which the Future project bases its existence:

ENVIRONMENTAL SUSTAINABILITY:

- Protecting the environment and local lands and communities
- Reusing materials and revitalizing site features
- Reduce CO₂ emissions

ECONOMICAL SUSTAINABILITY

- Creation of economic development trough reconversion, promoting the potentiality of local lands and communities
- Business development opportunities
- Promotion of local natural, cultural and artistic excellence and assets

SOCIAL SUSTAINABILITY

- Creating shared value for our business and for the local communities
- Redeployment of Enel employees within other company divisions
- Local capacity building through ad hoc training programs
- Promoting local employment as well as new development opportunities for local communities

INNOVATION

- Development of start-ups and new businesses
- Enhancing creative thinking and solutions
- Leveraging on new partners in ICT²⁸⁰, new technologies

Every single project follows a procedure named call for projects; it's divided into 5 different phases, each one of them is necessary in order to create a relationship

²⁸⁰ Information and Communications Technology

between Enel and the partners and at the same time, to choose the best partner and project to which entrust the whole operation.

The first phase in the **ENGAGEMENT** and is necessary in order to meet the local stakeholders and to set the CFP²⁸¹ requirements, moreover its necessary in order to create awareness and public acceptance and prepare the true call for projects:

- Identification of key stakeholders and preliminary interviews ("local alliances")
- Selection of "Technical Advisor"
- Detailed interviews (and workshop) with stakeholders to define CFP requirements
- Preparation of documentation (teasers, CFP, ...) according to technical requirements (economic, social and technical) and Communication Plan.

Then starts the **PHASE 1**; after the clarification and setting of the previous points, the CFP starts with Non-Binding proposals, the true generation of possible and achievable ideas:

- Launch Call for Projects
- Reception of Non-Binding Expressions of Interest
- Evaluation of EOIs²⁸² and proponents to select a shortlist for binding phase (preliminary security check)

<u>PHASE 2</u> is the crucial part in which the selection of the various proposal has ended, and they technically and financially meet the requirements:

- Reception of Technical & Qualitative Proposals and Financial Offers
- Evaluation of Technical & Qualitative Proposals by a Steering Committee

²⁸¹ Call for Projects

²⁸² Expression of interests

• Evaluation of the Financial Offers of technically viable proposals by Enel

The <u>NEGOTIATION</u> phase starts with the selected bidder, it's the part in which the preliminary sales agreement take place

- Detailed security check and financial/operational soundness
- Negotiation with the winning bidder (exclusivity)
- Execution of Preliminary Sales Agreement

The last part is the **DEMOLITION & REMEDIATION** part in which the final sales agreements are made, and the project may start

- Demolition and eventual remedial works
- Execution of Final Sales Agreement

3.2 Alessandria

The first project that is going to be analyzed is the one that is growing around the city thermoelectric power plant of Alessandria. To follow the principles of the circular economy the entire plant has been kept as it was: the whole industrial building and the memory of the previous operations haven't been touched, hybridizing the new idea with the old structure. The only element that has been added is a path-road that connects the various sites, distributing the visitors and hosting some services.

The project that won the competition, resulting first in ranking after having passed all steps explained in the earlier section is the XXL (Xtreme Xperience Land). It's the first Italian park dedicated to extreme sports and entertainment. The site is located in a strategic position between the cities of Milan, Turin, and Genova. The site forecasts huge urban marketing for the management of the city of Alessandria. To requalify the industrial site means to create a rejuvenating action at various levels, from the territory, to the landscape, and to the urban one.

The circularity here happens by maintaining the memory and the strong ability to communicate the power of the old industrial structure that, mixing with the new entertainment park becomes the perfect scenario and container for the expected activities.

Following the principles of the CE the site and the growing vegetation around it, that reminds us how nature takes back what has been stolen, like an old Mayan temple, creates a fluid image that contrasts with the hard industrial structure of the thermoelectric site.



Figure10 The expected scenario of the XXL park

All of the sports activities will take place in the central structure that has been preserved: the two main tanks, the fire-fighting tanks, the turbo gas groups with chimney, the compressor and overhead places, the tank for the waste water's treatment. The creation of new spaces is not even conceived. All of the masonry walls, the canopies, and minor structures will be destroyed, the material saved and reused, and will be realized a single service-building that will connect the various activities and will distribute the visitors.

Here are the main measures of the camp:

parcel = 66.000 sq. m parking space = 11.000 sq. m (that may be extended if needed) green area = 25.000 sq. m **new building** covered surface = 3.300 sq. m total floor surface = 2.000 sq. m

that includes:

office entering area = 100 sq. m

restaurant = 300 sq. m

shops = 200 sq. m

auditorium area and classes= 320 sq. m

locker rooms = 550 sq. m

storage equipment and services = 300 sq. m

The main camp is divided into zones, each one of them offers a differing perspective to the extreme sports, and at the same time it connects to nature and it's circularity, in order to transmit the idea of the circular economy to the people that enjoy the services offered by the park.

The zones are: Water, Earth, Air, Energy, and Nature



WAKE BOARD DIVING SURF CLIFF DIVING WATERBALL

The 15.000 m⁵ of one of the dismissed tanks and the equally large outer basin will become the scenario for an exciting water world. Inside the tank under a light transparent covering made of ETFE that protects and filter the light of the sun, will take place an indoor naturally air-conditioned

A

space, with an underwater environment in which amateur and professionals will enjoy a 12m deep swimming pool in order to dive in a real underwater world with properly studied scenographies. In the outer part there will be a huge outdoor swimming pool where there will be a chance to try the water surface sports: doing tricks with the wakeboard carried by steel ropes, surf on artificial waves or simply play into water balls studied for young and adults.

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CLIMBING BOULDER BMX FREERIDE PARKOUR SKATE PARK

The second tank will be the scenario for the construction of a mesmerizing world bond to the earth, a huge canyon, where the lovers of the competitive climbing and the boulder or the first trier, may climb both indoor and outdoor, following different paths based on their difficulty.

The climbing is an extreme sport adequate for the people of every age and will not only give you a burst of adrenaline but will also make you face a technical and physical challenge. Externally, in the collecting basin, ramps, parables, halfpipes, handrails, and specific paths will be dedicated to the skate, BMX and roller blades tricks and the acrobatics of parkour. Special viewpoints and tribunes will allow the spectators to assist to the performance of the athletes.



XTREME XPERIENCE LAND

INDOOR SKYDIVING HOUSE RUNNING BUNGEE JUMPING BASE FL.YING

The two fire-fighting tanks will become the place where you can make air experiences and try to fly! A wind tunnel where can be simulated the free fall and experiment the emotions of a flight in a safe ambient, it will be installed in the first tank: a windy cilinder that will raise over

the gutter level of the tank e that will allow to see the whole park while literally flying thanks to the push of a controlled air flux. The second tank will become externally the springboard where it will be possible to try the vertical run the house running, the base fly and the bungee jumping. All of the activities are organized with double paths separated so the spectators may watch different performances.

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ADVENTURE ROUTE FLIGHT ON THE ROPE MEGA SWING BUNGEE TRAMPOLINE SIMULATORS

Turbo gas groups, cranes, chimney and the structures of the local compressors are the support for the creation of a hanging world connected to the energy! Different adventure paths, tibetan bridges, pulleys, nets, and catwalks fixed and mobiles cross

and loosen around the hearth of the park: differentiated paths for children, adolescents, and adults hanged at 18 meters from the ground where you can play in safety. Inside the local compressors, you can live unique experiences in the simulators or play with the bungee trampoline.

XTREME XPERIENCE LAND



BODY ZORBING SOFT AIR SLACK LINE PAINT BALL

Even though it is inside an old electric power plant, nature is everywhere in XXL: a vast planted area is created in order to host many green activities. Slackline between rocks and trees, to test your dynamic balance and equilibrium, longline and trickline

paintball and softair challenges between the trees and the elements made in order to create fun football matches and out of the ordinary matches inside the zorbing ball





Figure 11, Figure 11, 12, 13, 14, 15 The five zones of the XXL park

3.3 Porto Tolle

The second project is the one that involves Porto Tolle. The town is located in the north of Italy, in the delta of the river Po, the biggest river in Italy. The industrial site of Enel is located in a unique and suggestive environment, located in the middle area between the biggest attraction poles of the Veneto and Emilia Romagna and 1 hour from the principal airports and docks.

Thanks to the deliberation of the regional committee n.120 of February 7, 2018, and the regional law n.14/2019 already cited in note 227 and 228 it will benefit from the facilitation of the circular economy norms.



Figure 16 The location of the Enel site

The overall surface of the industrial site is 380 hectares, the north area is occupied by the installations that are going to be demolished, a woody area is present in the 113 central part of the area and the southern one is filled by local fishponds and floral vivariums.

The project is called DELTA FARM and obviously is not a scrapping initiative, but a CE initiative: it involves the economical development of the local communities and reconversion towards business and social forms that valorize the human, environmental, and territorial resources of the Delta of Po.

The project's development follows this plan:

- The creation of an open space touristic village, in a unique environmental and landscaping context (Delta del Po is a UNESCO heritage site and biosphere reserve)²⁸³
- 2. An area for the aquatic sports able to be a reference point for those disciplines at a national and international level
- 3. A tourism center able to valorize the local environmental and landscaping excellences and a center for the local production and the fishing tourism

The way that is going to be adopted for the valorization, expects the integration of the economic supply chains, the cultural ones, and partnership with the biggest local companies.

The proposal made by the company expects:

- The valorization of the are trough open space tourism and the creation of touristic structure: the touristic village, localized in the inner part of the extanks and in a small part in the green area;
- The creation of an aquatic sports area and a connected building that will function as a campus;

²⁸³ http://www.unesco.it/it/RiserveBiosfera/Detail/95

- The development of an open public area dedicated to the sport, in order to give to the territory new types of equipment, with synergy with the other touristic services;
- The installation of fishing and agricultural structures for the development of the local activities, merchandising of the products and promotion of the local companies;
- The valorization of the environmental excellences with the empowerment of the visitor center, by retraining the existing green areas, the creation of green paths through the Parco del Delta del Po, and observatories for the biodiversity;
- The empowerment of the floriculture, already existing in the area, in order to enhance it to a national level.



Figure 17 The idea of Porto Tolle's project

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3.4 Carpi

The third project in development is one of Carpi. Carpi is a city in the district of Modena. It is located in the strategic region of Emilia Romagna, one of the main industrial areas of Italy and, at the same time, one of the most advanced both in technologies and production techniques.

Moreover, as said in the previous chapter, the Emilia Romagna is one of the most advanced regions in the adoption of the circular economy: Enel and the Futur-e project could benefit from the laws that favor the CE, specifically the law n.16/2015 that aims to convert the region to a fully circular one and the various initiatives from the local entrepreneurs.

The project revolves around the requalification of the ex-thermoelectric center of Carpi into an energetic pole for the locals. Differently, from the previous projects of Alessandria and Porte Tolle, this project aims to reconvert the area in a more efficient version of the previous one, completely following the rules of the circular economy and without wasting any material. Moreover, the project itself expects the new center to be a "circular center": thanks to the new installments the center may reuse, recycle and absorb all the surrounding energies.

First of all, will be installed an external tank to collect the rainwater from the forecourts for the first treatment. It will:

- limit the discharge flow rate
- accumulate water to irrigate the plants
- accumulate water to clean the external squares

Thanks to the installation of solar panels, for a total of 10kW 30 tons of CO₂ each year will be saved, and the energy collected from the sun will be able to:

• illuminate all the areas thanks to LED lights

• use electric forklift connected to recharge stations



Figure 18 The old central of Carpi



Figure 19 The new expected central of Carpi

CHAPTER 4: Value Creation

This chapter is going to analyze in detail the various components that form the value creation of the project Futur-e. The basic descriptions of the previous chapters were not enough to give an idea of the real value of the transformations and the potentiality of the circular economy.

The data are going to be divided into some sub-paragraphs, in order to describe in detail, the main interest areas of the project: Real estate, Materials Recovered, and Social and job development.

4.1 Real Estate

The real estate component is the biggest and more important part for a simple reason: the project itself has been created to valorize and rebuild a nowadays worthless area. The central of Alessandria is the one that has been through the biggest transformation as for now and also the one with the more interesting characteristics from a RE^{284} point of view.

Not only the site is going through a complete renewal, but also is very interesting how they are going to take advantage of the already existing structures, create a very unique ambient capable of mixing the old construction, with new and addictive activities.

From a geographical point of view, the XXL park is very well positioned: the area is barycentrically located among the main three big cities of the Italian north-west. In

²⁸⁴ Real estate

an hour of traveling is possible to reach Milan, Turin and Genova, and their respective airports. The park is less than 3km from the western exit of Alessandria, which is also



Thanks to the location it is possible to expected to attract people from 1 and a half hour distance and three different scopes:

- Zone 1, 30 minutes far: it involves the local population, located in Alessandria and the surrounding. There are 420.000 people, of which 300.000 having between 5 and 65 years (the real target)
- Zone 2, 60 minutes far: it touches the province of Asti, Vercelli, Pavia, Genova, Piacenza, Turin, Milan. It involves 1,75 million peoples of which 1,25 potential visitors.
- Zone 3, 90 minutes far: it touches Milan, Turin, Genova, Novara, Biella,
 Lodi, Pavia, Piacenza, Cuneo, Savona, Cremona, Monza e Brianza,
 Varese. It involves 8,2 million people and 5,9 potential visitors.

XXL extends on an area of 63.550 sqm of which 18.950 sqm is dedicated to the access and parking area. The dimension of the parking area is the consequence of the related normative:

- The request of the PRGC²⁸⁵ for the sport's attraction has been satisfied, following the "law Tognoli²⁸⁶"
- CONI norms for the sports attractions (n. ²⁸⁷1379 June 25, 2008)

Both normative are shown in the figures n.21 and n.22

²⁸⁵ Piano Regolatore General Comunale

²⁸⁶ <u>http://www.bosettiegatti.eu/info/norme/statali/1989_0122.htm</u>

²⁸⁷ <u>https://www.assopiscine.it/images/stories/Allegati-PDF/norme_coni-delibera_cn_n.1379-2008.pdf</u>

PARKING SPACE SIZING (urbanistic norms)		G teoric request u. computation		u.m.	space request		project space
PRGC	SLP residential b	ouildings		sqm	4.770		
	SF from PRG wit	h Uf 1sqm SLP / 1sqm SF	:	sqm	4.770		
	public parking s	urface	50% SF	sqm	2.385		
TOGNO	LI building volume			sqm	27.000		
	private parking	surface	1sam/10cbn	n sam	2 700		
(ING SPAC norms)	Figure 21 Parl	king area following the PGF	parameters	LI norms	sp	ace request	
	attandanca paak		nº noonlo	2 500			
	workers and instructors		n° people	2.500			
	total parking users		n° people	2.577			
	, <u>-</u>	transportation method	sqm	transported people	n° parking space	capacity	sq
		MOTORCYCLE	3	1	20	20	
		CAR	20	3	380	1140	
		BUS	50	60	10	600	
	TOTAL PARKING AREA				410	1.760	15.3

Figure 22 Parking area following the CONI norms

The sport's structure will take place in the central structure that has been kept following the circular economy principles and also for their scenography. For this, they don't need any more dedicated space.

In some cases has been expected an integration with the already existing structure, in order to make it more adequate for the necessities of the specific activities that it will host; in other cases the structure will be cleaned of the accessories, that will be recovered, sold or reused, in order to highlight the characteristics of the old structure.

The five thematic areas, inspired by the natural elements have, all of them, an indoor and an outdoor part, with independent activities in order to amplify as much as

possible the offer, creating a functional mix capable of creating a heterogeneous customer base.

The distribution expects different access areas for the type of visitor: for every activity has been created an entrance for the clients, while the partners may assist from the outside with a preferential view.

The activities and their equipment have been designed with the technician of the main Italian and international leading companies of various sectors, discussing also similar structures. The activities are located in order to fit the spaces assigned to them and the expected affluence ratio.

Obviously, the project proposal may be modified in the future, making it more or less rich, based on the objectives and the users.



Figure 23 All the five theme areas and their activities

The plan showed in the image above is the final plan of the XXL project, comprehensive of the areas saved using the circular economy principles; the data relative to the savings made by creating a CE project, instead of a complete rebuild are astonishing: summing all the indoor and outdoor space over 50.000 sqm has been saved and hundreds of tons of materials. In the graph below the details of the operation are explained.

PARKING area 18.950			DIMENSIONAL DATA	NOTES	EQUIPMENTS	
		SQM	н	CBM		
R						PARKING
OUTODOO	Public parkings and roads	15.300				380 cars
						10 busses
						20 motorcycles
	Green area planting	3.650				
	TOTAL	18.950				

		Figure 24 The parking area ²⁸⁸				ł	
BUILDING		area 8.350 som		DIMENSIONAL DAT	4	NOTES	EQUIPMENTS
			SQM	н	СВМ		
		Hall entrance	195				
		Central Foyer	310			<u>}</u>	ļ
		Bar	35			{	BAR
		Consumption (44 seats)	105				44 seats
	¥	Kitchen	190				RESTALIRANT
	2	Distribution Restaurant	45				150 seats
	L Q	Consumptio restaurant (150 seats)	440				
	Ino	WC	45				[
	5	Shops	75				[
		Foyer Auditorium	215				AUDITORIUM
		Auditorium and services (300 seats)	485				300 seats
		Main lockers	220				LOCEKRS
×		Medic center	35				
ğ		Equipment room	35				
Z		TOTAL PT	2.430				
		Offices	120				
	œ	Team Building Rooms	255				
		Hall Team Building	325				
	STF	WC	40				
	H	Main Lockers	290				LOCKERS
		Path	800				
		TOTAL 1P	1.830		25.500		
		Climbing Gym Access	65				
	BGE	Panoramic Bridge	260				
	BRIC	Scuba Diving Pool Access	160				
		Scuba Equipment Room	25				
		TOTAL BRIDGE	510		1.500		
		TOTAL PATH BUILDING (SLP)	4.770	variabile	27.000	covered surf.3.600 sqm	
DOOR	Green	Area	2320				PIC NIC AREA
Бо	Externa	al Floor Pavimentation	2690				GAME AREA
		TOTAL OUTDOOR AREA			5	5	

Figure 25 The path building

²⁸⁸ In the brown area, the parking one, over 400 spaces for cars has been expected and a total of 18.950 sqm has been saved.

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WATER	area 5, 350 com		DIMENSIONAL DATA	NOTES	EQUIPMENTS	
WATER	area 5.350 sqm	SQM	н	CBM		
R	Indoor Scuba Diving	1.100	14	15.400	4 - tanks of 15.000 mc	INDOOR SCUBA DIVING
DOGNI	Water Room Technical Room	550	3	1.650	External Tank	
	Services Room Nature zone	150	3	450	ex tank	
	XXL workers Lockers	150	3	450		
	TOTAL INTERNAL AREA	1.950				
OUTDOOR	Caraibic Lagoon	900			iExternal Tank	CARAIBIC LAGOON
	Sun Deck	2.900			extank	
	Beach volley	450				BEACH VOLLEY
	TOTALEXTERNAL AREA	4.250				

Figure 26 The water park

EARTH	area 5 880 com		DIMENSIONAL DATA	NOTES	EQUIPMENTS	
	area 5.000 squi	SQM	н	CBM		
OR	Climbing Gym	1.050		15.400	4-tanks of	
INDO	Equipment Storage	50	14		15.000 mc	
	TOTAL INDOOR ACTIVITIES SURFACE (SLP	1.100				
OUTDOOR	External floor	1.300				
	RMY a Skate Dark	3 400				BMX Pumptruck
		5.400				SKATE Park
	Outdoor Equipment Storage	80	3	240		
	TOTAL EXTERNAL AREA	4.780				

Figure 27 The earth park

ΔIR	araa 2 500 cam		DIMENSIONAL DATA	NOTES	EQUIPMENTS	
	area 5.500 squi	SQM	н	CBM		
DOOR	Green Area	1.600				
Бо	External Floor	1.680				
	TOTAL EXTERNAL AREA	3.280				
SOR	Tank - Skydiving	110	13,5	1.485	8 - tanks of 1.500 mc	SKYDIVING - Wind Tunnel
MD	Tank - Bungee e Simulatori	110	13,5	1.485	8 - tanks of 1.500 mc	FLIGHT SIMULATORS
~~~~~	TOTAL INDOOR ACTIVITY SURFACE (SLP)	220				

Figure 27 The air park

		1	DIMENSIONAL DATA	NOTES	EQUIPMENTS	
ENERGY area 6.700 sqm		SQM	Н	СВМ		
R	Green Area	2 900				ROPE COURSES
<b>D</b>		2.500				ROLLGLIDER
ō	External Floor	3.620				ZIPLINE
	TOTAL EXTERNAL AREA	6.520				
ő	Simulators	90	9 <b>,</b> 5	855	18 - Camera filters	GUIDE SIMULATORS
ŪNI	Bungee Trampoline	90	9,5	855	18 - Camera filters	BUNGEE TRAMPOLINE
	TOTAL INDOOR ACTIVITY SURFACE (SLP)	180				

Figure 28 The energy park

NATURE	2ros 14 920 com		DIMENSIONAL DATA	NOTES	EQUIPMENTS	
aiea 14.020 sqiii		SQM	Н	CBM		
~						SOFTAIR
Ő	Green Area	13.000				PAINTBALL
ILIO						BODY ZORBING
						SLACK LINE
	External Floor	1.820				
	TOTAL EXTERNAL AREA	14.820				

Figure 29 The nature park

On the other hand, the project of Porto Tolle, even though considered fully circular, it expects some demolition and construction processes and phases, the project, under the RE point of view foresees 4 phases:

- 0. Demolition phase (24 months duration) starting from the area number 1 of the tanks, where the touristic village will take place;
- Creation of the touristic village (36 months duration) with a partial opening during the 24th month;
- 2. Creation of the Pole for the Technologic and Sportive Innovations (24 months later the opening of the touristic village);
- Creation of the Hotel Touristic Pole (12 months later the creation of the point n.2).



LEGENDA:



Demolizioni Permanenze

Figure 30 Porto Tolle realization program

Even though the demolition and rebuild phases seem to have a huge impact on the project, 89% of the site will remain untouched, perfectly fitting the circular economy principles:

- The offices
- The storage rooms
- The concrete chimneys
- The visitors' locals and cafeteria
- The reception
- The local for the wood's maintenance
- Parking lots
- The tub for ashes and mud bath
- The dock
- The bridges and crossing roads
- The depurator
- The concrete superstructure
- Roads and squares
- Tanks in aluminum
- Island Tanks

The touristic village itself will receive much investment; the project synthesizes the elements, the signs and the technologies typical of the Delta of Po. It will:

- Cover a surface of 117 hectares of which 20 are a naturally wooded area that will remain untouched;
- The investment of 45 million will help to build 2000 pitches for a total of 8000 daily visits.



Figure 31 Porto Tolle's saved assets and valorization

Another interesting part from the CE point of view is the valorization of the old road and docks, by renewing them and creating a new crossroads scheme.

The project expects a lot of public paths that guarantee access to the area in different points, which allows walking along all the perimeter of the area and that also allows us to enter all the public areas directly.

The development of the seaside services is expected to the realization of a new bridge that exceeds the passes over the canal and allows access to the touristic village and the other zones of the touristic park. It also connects the already existing crossroads with the new structure allowing the visit of the Sacca del Canarin, a sandy beach that divides the lagoon from the sea.

The canal will be equipped with a system that allows the mooring and anchorage of the boats, for tourism and fishing. In the area, will also be present touristic services for agricultural and fishing tourism.

Obviously, inside all the parts of the project, are expected cycle paths, safe walking paths, created or differentiated with innovative materials and useful for the development of the touristic, commercial and cultural functions.



Figure 32 Porto Tolle's new crossroads and docks

In conclusion, the logistic pole of Carpi, is also a very good example of circular economy applied to real estate projects; the specifics of the infrastructure are the following:

## Already existing structure

- Covered surface (290x70m) = 20.300sqm 10m High
- Storage shelf area 16.200sqm
- Beams shelf area 3.900sqm
- Offices area/Locker rooms area/Restrooms area 400sqm
- Sprinkler plant firefighting protection/ hydrants
- 6 unloading bays for articulated trucks

# External area

- External shelf areas 20.000sqm
- Roads/Viabilities/parking lots 10.000sqm
- Green Area 18.000sqm
- Video surveillance and burglar alarm system



Figure 33 The renewed logistic pole of Carpi

#### **4.2 Materials Recovered**

The recovering of materials is the most crucial part of every CE related project; in fact, the circularity is expressed through the reuse and recycle of materials. The project of Carpi is the one with the easier to analyze in terms of raw materials recovered because the project itself focuses on the reuse of the building materials that are no longer useful.

That being said, trough the demolition and rebuild a huge quantity of materials have been saved from being wasted from metals to dirt, to concrete:

#### Selective demolitions and recovers:

- Recover of the metallic scraps: 3.738 tons
- Other valuable metals (copper and aluminum): 120 tons
- Excavated lands reused/ recovered: 32.320 tons
- Reused destroyed or demolished concrete: 7000 tons

The plant itself then has been converted and qualified as a "zero disposals" plant, able to save 160 tons of  $CO_2$ 

- Recover and improvement of the already existing infrastructures for about 15.000 tons of concrete saved
- Recover and improvement of the water collecting tubs for 3.000 tons of materials
- Recover of the valve, sensors, and engines for 320 tons of materials

Porto Tolle, on the other hand, as mentioned before foresees a small demolition plan, from which are expected the recover of 2000 tons of concrete and 500 tons of metal that are eventually going to be reused for the maintenance of the existing structures and the construction of the new areas. Even though the demolition and rebuild phases seem to have a huge impact on the project, 89% of the site will remain untouched, perfectly fitting the circular economy principles:

- The offices: already existing for the old project will host the new office room for the touristic village
- The storage rooms: will be emptied of the old materials and equipment, sold to third parties, and equipped with new apparatus
- The concrete chimneys: the gigantic chimney 250m tall was expected to be destroyed, now it will serve as a touristic attraction in the village
- The visitors' locals and cafeteria: as the storage room will be emptied and the equipment sold, in order to be filled with new ones and serve the same purpose as before
- The reception: the reception will serve the purpose of supplementary equipment storage
- The local for the wood's maintenance: the equipment will be renewed and the local will serve the same purpose since the green area will remain untouched
- Parking lots: the parking lots will be extended in order to be able to fit the whole touristic demand
- The tub for ashes and mud bath: the tubs will now serve as a beauty farm area for the clients
- The dock: as described before it will be widened in order to fit small and large boats and encourage the fishing tourism
- The bridges and crossing roads: will remain untouched and broadened as described in the real estate part, to be able to cover the whole perimeter of the touristic village and large part of the area
- The depurator: the depurator will be emptied and used as an emergency room

- The concrete superstructure: since there is no need to demolish the superstructure, and considering its resistance it will be used as a base for future constructions
- Roads and squares: the road and squares already existing in the plant are going to serve their old purpose, once renewed and adorned with green
- Tanks in aluminum: the tanks in aluminum may serve as supplementary storage rooms or completely recycled in order to sell the valuable metal
- Tank Islands: the little island will be connected by bridges in order to create a safe walk road for the tourists and as small supplementary docks for the boats.

The theme park of Alessandria, even though is the most advanced in terms of engineering and construction, is more complex than the others. This doesn't mean that the circularity is being bypassed, but that the circularity must cope with the new technologies that are a must in such a complex opera. In fact, the whole structure will be held but updated and modernized.

Dividing the project by segments, starting with the parking area foresees a complete pave of the old road and the construction of the new parking lots; that being said over 10000 tons of concrete, tiles, and tarmac has been expected to be recovered. This material will be able to rebuild the new parking area for over 80% of the area, with the possibility to save a huge amount of money and new raw materials.

The path building has already inside all the possible structures for the expected activities. The restaurants, the auditorium, and the locker room are already built, the only work here is a maintenance one. For both the restaurant and locker room, the whole building already has inside the water and electric connection, avoiding huge expenses and bureaucratic papers.

The energy and the nature parks are already green; the constructions needed for some activities like the bungee trampoline, adventure park, softair, and paintball will be created from scratch using recovered materials and woods.

The most crucial part in terms of circularity concerns the air, water, and earth park; the small and big tanks, used for the scuba diving, the climbing gym, and the skydiving and flight simulator proved to be strong over time, but unfortunately nobody wants to take for sure the stability of those structures. Moreover, the norms about seismic risk and security have been changed after the recent problems of middle Italy. Probably the walls of the structure will remain untouched, but the roof and the external part need some particular intervention that unfortunately can't be solved by using recycled materials or reusing some removed ones.

Thanks to the technology called "jacking" the full structured will be supported from the outside and the new roof, created in order to realize the various projects.



Figure 34 The jacking coverage for the tanks

### **4.3** Social and Job Development

One of the main goals of the Futur-e project is to support the local communities. Unfortunately, the whole Italian peninsula is afflicted by the plague of youth unemployment; to support the local communities is also a means to give an opportunity the all the people, not only the young one, to develop a career, to earn a salary so to be independent.

The last data from ISTAT highlight how, just around Alessandria where the XXL theme park will take place the 13.4% of the population is unemployed, rising to 42.7% for the people below 34 years.

Those statistics are worrying because they go with a permanent weakness of the social indicators: recent studies demonstrate how the unemployment rate tends to increase the gambling activities, not only at a small level but at national scales.

Initiatives like the project XXL are most definitely useful in order to create new job places, even if in small quantities, but necessary to remove the negative aura that floats in this country.

The profiles that can be integrated inside the XXL theme park are obviously oriented towards young people, thanks to the affinity between the playful-recreational activities and the generational culture.

Of course, are expected indirect positive spill-over effects on the touristic activities of Alessandria and the commercial activities dedicated to the selling of accessories related to activities done in the park.

At the same time, the presence of activities like the re-launch of the historic "Citadel of Alessandria", connected with the high relevance of the UNESCO sites "Paesaggi Vitivinicoli" close to the city and the XXL project may play an important role for the tourism of the region.

The Porto Tolle's touristic village, on the same wavelength of the XXL park, focuses on the tourism and the valorization of the local population and the local tourism. It aims to valorize the environmental excellences and landscape of the Po; it also expects many centers for the fishing and agricultural tourism.

This will affect indirectly the local communities that will receive the gains of widely increased tourism.

From the environmental point of view, open-air tourism is the synonym of a sustainable vacation with a low environmental impact. It expects a total of 2,9 million tourists every year in the villages, 800.000 in the hotels and 400.000 in the little houses.

The format of the Central Market, it's also an idea that will bring on the table of the tourist, all the preparations of the local chefs and more technologic food laboratories: restaurants, pizzerias, specific gastronomy, fish restaurants, and food trucks. It will also help the local farmers to bring fresh products and sell them as soon as they are gathered.

It will also benefit the local sporty communities by creating many racing and biking activities and recruiting local sports managers.

Differently, from the Alessandria and Porto Tolle, the logistic pole of Carpi will recruit a broader but much more specific woks management. The necessities belong to the fact that being a more technological and energetic pole, it will be impossible to recruit non-trained personnel. On the other hand, it will be possible to create much specific training for local young people.

The works management will include:

- A safety manager dedicated to the check of procedures
- Personnel for the monitoring of the construction site, their progress, and safety behaviors
- Environmental director for the correct recycling of the wastes and environmental work procedures
- Local work hand for a total of 500 people
- Specific workers that are able to use electric and non-polluting mechanic machines.

### **CHAPTER 5**: Conclusions and Considerations

At the light of what has been exposed, it results clear to the eye of the reader the incontestable fallacy of the '*take-make-dispose*' model. In the introduction, it was clear the assumption that the true purpose is to achieve the classic economic profit in parallel with social and environmental results. It must be underlined that for Enel this project is not a way to make a profit, but an ethic solution in line with its vision and mission to give new life to old infrastructures that could be left to collect dust in the future. So, what Enel gains is the image of a respectable company acting for a cleaner future, fighting for the change of this world built on disposals. Indirectly the company is achieving huge economic profits but no for itself, transforming useless assets and dead structures into something incredibly valuable, but for the local communities and for the environment.

It is really hard to give an exact value to the project since it is growing at a fast pace rate and the variables to consider are many: from the merely expected entries of the new attractions to the value of the recycled and reused materials to the creation of hundreds of jobs positions and the environmental results.

But, from the analysis of just 3 of the 23 sites that are going to be converted in the future, the outcomes are just astonishing: over 150.000sqm of unproductive land are going to be converted in new value-generating activities of which 1/3 will be covered by green areas; 200.000 tons of materials (concrete, raw metal, copper, aluminum) that, following the principles of the linear economy should be wasted, are going to be reused or sold for profit; approximately 1200 jobs position will be opened between the three areas; all of this sum with the tourism that the locations will attract, that will positively affect the local communities, the trades, the valorization of the products and the traditions.

The circular economic model demonstrates to be one, if not the only solution to the problems of mass production affecting our society. Instead of just creating and accumulating goods, wasting raw materials and resources, the recycle and reuse is the path to walk. Moreover, the fast-paced growth and development of technologies if correctly orientated towards this model, can further increase his efficiency creating a true circle in which the death of a product is just the beginning of the life of a new one.

Our country, in particular some companies like Enel, demonstrated that we could be the harbinger of this change, believing in the change by starting to introduce in business operations the circularity, managing the wastes, reusing materials, focusing on creating by using the ashes of what has been destroyed.

As widely showed in chapter 2, unfortunately, the norms don't cope with the technological changes. At a national level, every region is proceeding by its own and only the industrial ones are trying to evolve and adapt. The absence of laws reflects on the various companies by preventing them from fully apply the circularity: the unclear definition of waste, following the D.lgs. 152/2006, articolo 183, comma 1, lettera a and the four residual notions of sub-product described in the D.lgs. 152/2006 are just a hindrance for the companies that want to operate in this field or trying to gain benefits from the facilitations granted by the state; because the concessionalities are present, but the law is lacking and where is not lacking is tangled and contradictory.

Luckily, the whole of Europe, starting from the most advanced states in slowly moving and upgrading the production system and most importantly the laws and the norms in order to proceed towards a circular production system. France with his Law 2015-992 August 17, 2015, the Luxembourg with his EcoInnovation Cluster, and the Netherlands that already started profiting thanks to their green economy are just a few of the many virtuous examples described that show us how there is a light at the end of the tunnel. Moreover, the words of Ursula von der Leyen show how the entire European Commission is already moving in order to favor the circularity.

Lastly, must be said that these changes are not just for an economic profit or a way to prevent the waste of valuable resources. Avoiding this waste, coordinating the whole of Europe under common legislation and converting the companies into circular firms is for a higher purpose: we must start building a better world for the next generations. The globalization, the competition between firms, the maximization of the production, and the fast-paced growth of technologies devoted to the mass production are slowly wearing down our world.

The consequences of our irresponsible consumption are there for all to see and the heavy burden of our action will fall on the shoulder of the next generation. We are already paying the dept of our ancestors, but we are aware now that we can lighten this heavy responsibility from the posterity. The circular economy is just a small step towards this critical goal.

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## SUMMARY

The thesis develops around the concept of a circular economy, a new approach for the production and consumption of goods. The model of the circular economy is an evolution of the classic linear economic model. The linear model is described as "take, make, dispose of", son of the nineteenth century and the mass production. The circular economy, on the other hand has as its purpose to achieve the classic economic profit, in parallel with social and environmental results.

The first time that the term Circular Economy has been used is in a study of Pearce and Turner called "*Economics of Natural Resources and environmental*" of 1990, but since the '70 has been noticed how, the constant stream of extraction and disposal caused pollution problems, both terrestrial and marine.

Since then many authors, first of them Walter R. Stahel, thought that the best way to avoid this problem is to create a virtuous circularity. The product life cycle must not end with the death of a product, instead, this death may be the beginning of a new life. The exploiting of raw materials and energy may be partially stopped, by enhancing the system of repair and reuse of a product.

Many models have been developed, all of them highlighting the fallacy of the linear economy: economic inefficiency, loss of value through the whole supply chain, systematic risks and volatility of the prices, erosion of the natural capital, and more importantly unsustainability in the long period. On the other hand, a circular economy could eliminate the idea of waste, create a completely new idea of good or product, avoid risks by building a resilient economy, trust and rely on renewable energies, and make of every waste a new resource.

The idea of circularity relies on the basic accounting skill called the Life Cycle Assessment: trough the steps that lead us to the valuation of the value of the life cycle companies could greatly increase the responsibility towards pollution and environmental impacts while maintaining internal awareness of the products that lean towards an integrated analysis.

These instruments result more and more important the further we look into future scenarios. The data from the MacArthur Foundation and the OECD are worrying: the population by 2100 will double, going above 10 billion, especially in low developed countries. This will require additional use of energy sources, and the demand is forecasted to increase by over 100%, where 30% of global population will live far from urban areas. This means, in the worst scenario, that the increase of pollution and particles sent into the atmosphere will increase the temperature by 3° in the next 50 years.

The united nations already made its move and created an agenda of 17 Sustainable Development Goals by 2030, divided into 169 targets. Some of them clearly speak about the circular economy and the possibility of promoting an alternative model to the linear one.

The circular economy approach doesn't only focus on the safeguard of the environment, but also on the value creation trough the circularity. The expected results and the already applied model all over the world show how the circular economy always leads at the saving from the volume of raw materials, less volatility of resources and the empowerment of the value chain, increased innovation tendency, the creation of new workplaces, the extension of the life cycle of products, and an increase in the productivity and healthcare of the territories.

Even though the model is still developing the companies trying to apply the model are many and, trough the use of it, many business models started to develop. The circular supplies, for example, is a system of companies and suppliers that reaches the circularity thanks to the use of renewable energies and the use of recyclable or biodegradable inputs able to sustain a production system that avoids the waste of 157

resources and that could automatically regenerate itself. Or the resource recovery model, in which the valuable materials are extracted at the end of the life of a product to create a new input for the next generation, maintaining the quality and functionality.

The product life extension is a direct consequence of the previous one and is focused on the remanufacturing activity, the reconstruction of the good using the obtained materials of his "ancestor". Another very common model that found the fertile ground is the sharing platform, able to share product and cooperation between services, operators, consumer, and organizations; thanks to the new technologies is possible to put in contact two users in order to perfectly satisfy demand and supply.

Even though the positive aspects of the circular economy are evident to the eye of the reader, the actual model clashes with the impossibility or difficulty of being applied. That is because the actual legislative and bureaucratic models are not updated or differ completely from region to region.

The USA is lacking a relevant federal and political framework on the CE, but at the same time every single state is oriented towards the CE in his own way; California is the only state with political and social perspectives matching for recycling.

Japan on the other hand since 1991 and past the last 20 years modified his legislation continuously in order to stay up to date and created a very efficient system, verifiable thanks to the success of many projects like the Eco-Town program.

Canada even though it has a lot of small initiatives carried by private societies, the state itself overshadowed an implementation of the circular economy for a long time, emphasizing a national plan on climate change.

China, despite its heavy reputation of a polluted and grey country, is one of the most active countries working towards the creation of a green society. Moreover, the

use of the circular economy is creating all over the country synergic powers in order to avoid dumps, waste of resources and the reduction of greenhouse gas.

Last but no least Europe, thanks to some companies and green-oriented countries like Netherlands, Finland, Denmark, and Italy is making huge steps forward the full implementation of the circular economy. The EIP parks and specifically the Kaludndborg in Denmark are virtuous examples that are being appreciated all over the world.

The bureaucracy is also adapting to the growing common sense around the environmental cause. Starting for the law 75/442/Cee of the July 15, 1975 council to the European directive on wastes 2008/98 many signs of progress have been made, not only to protect the environment and the human well-being by preventing or reducing the negative impact of the production and management of wastes but also increasing its efficacy and efficiency.

A comunitary action is anyways present: The newly elected president of European Commission Ursula von der Leyen declared that Europe by 2050 will be the first climate-neutral continent in the world because it is clear that the traditional paradigm, based on the exploit of natural resources is not anymore a path that can be walked.

In Europe, anyways, every single country seems to proceed on his own path without a common vision. The actions are unitary and aimed at a certain field, depending also on the sensibility of the country to the theme of the environmental safeguard.

Italy, for example, from the normative point of view must relate the laws about the circular economy to a wider normative framework deriving from the European Union, coherently with the article 11 of the constitution, forcing the country to conform to the communitarian rules. The main sources to consider are the following: the legislative decree 152 of 2016 (Testo Unico Ambientale) and the recent law 221 of 2015.

The most relevant content of the norms, as well as the bigger obstacle for the companies that intend to operate in the CE regime, is the wastes management and the bad coordination of the norm and the hard interpretation of the articles 183 of the D.lgs. 152/2006 about the difference of what, for the law, is mandatorily considered waste and what cannot be considered that.

Meanwhile, the overview of the regions of Italy is, paradoxically, full of interventions by the presidents of the various regions and declarations of actions, but from the legislative point of view, the regions that issued specific laws are few.

Anyways, the country doesn't lack virtuous examples: the region Lombardia, with the approval of the council for a plan towards the circular economy, the region Toscana that trough the law n.48/2018 it created a good channel for the SME in order to convert to the circular economy or the region Marche that trough the law n.25/2018 the region develops its program for the circular economy thanks to tax relief on the new technologies for the regeneration and reuse of the goods.

The rest of Europe, as previously said, is marching towards the creation of a circular economy, but, every single state has its own way. The words of the European Commission are concrete and strong, the whole of Europe must run and lead the transition towards a circular future and obviously is not acceptable to the patchy development of the CE in our continent.

The regions already missing a high level of technology regarding the circular economy must be helped, guiding them through an energy transition based on the recover and recycle. Helping them accelerate this transition must be considered a help for the environmental, economic, and social sustainability towards the less developed states and the next generations. Of the many countries analyzed, the northern European countries like Denmark and Finland have reached a very high level of efficiency and efficacy and circular economic proposals high in both quality and quantity. As mentioned before the city of Kalundborg is a worldwide example and the many initiatives by the Finnish government are pushing the country to be the world leader in the circular economy field.

From the juridical point of view France is making a huge step forwards; must be said that bigger countries, on the contrary of small ones, need a solid normative base in order to pursue a higher goal. Thanks to the Law 2015-992 August 17, 2015, the France state is clearly declaring the willingness to move beyond the linear model, in order to transform itself in a circular economy state.

Another good example is Luxembourg. Its economic stability mixed with the juridical flexibility allow the country to move fast between the changes; the strong activity of governmental and non-governamental organizations and the creation of EcoInnovation Cluster created a very active contest for the SME, proposing solutions to convert them into CE companies. For at least three years Luxembourg became a circular economy laboratory and, by the end of 2015, 15.000 jobs were already considered inside the CE of the country.

The Italian excellence in the field of the circular economy is Enel S.p.A. Originally born as the National Authority for the electric energy in 1962, bought all the activities from the private companies operating in the fields of production, transformation, transmission, and distribution of electric energy.

By then to 2000 the Italian market of electric energy has seen a progressive opening of the electric energy market, first with the law n.9 of the 9th January 1991, then in 1992 with the transformation of ENEL in a joint-stock company with the Italian Department of Treasury as sole shareholder and culminating in 1999 with the

decree n.79 of the April 16th, 1999 for the execution of the European directive 96/92/CE.

Since then the company is operating independently, mostly focused on the development of a green and circular politic and culture. The biggest example is the Futur-e project, the biggest and largest program of this kind, that took the circular economy to a national scale. The program that aims to completely change the face of 23 thermal power sites that are no longer useful for the domestic energy market, with a total of 13 GW of power installed.

In order to make it all possible Enel decided to create the processes from the beginning, finding investors, involving local institutions and partners. The investors may propose their ideas about the purchase and the future development of the sites. Then, the proposals and the various projects are seen and evaluated by a jury composed by representatives of Enel, local institutions leader and people from the academic world. The ideas that meet the parameters of environmental, economic and social sustainability and the principles of the Circular Economy can move next to the negotiations for the acquisition of the site.

The project relies on 4 founding principles: environmental sustainability, economic sustainability, social sustainability, and innovation.

Three of these sites are analyzed in detail: the project of Alessandria, Carpi and Porto Tolle.

The first, Alessandria, is the biggest of them all; to follow the principles of the circular economy the entire plant has been kept as it was: the whole industrial building and the memory of the previous operations haven't been touched, hybridizing the new idea with the old structure. The project that won the competition resulting first in ranking is the XXL (Xtreme Xperience Land). It's the first Italian park dedicated to extreme sports and entertainment.

All of the sports activities will take place in the central structure that has been preserved: the two main tanks, the fire-fighting tanks, the turbo gas groups with chimney, the compressor and overhead places, the tank for the waste water's treatment.

The main camp is divided into zones, each one of them offers a differing perspective to the extreme sports: Water, Earth, Air, Energy, and Nature.

The second project is the one that involves Porto Tolle. The town is located in the north of Italy, in the delta of the river Po, the biggest river in Italy. The industrial site of Enel is placed in a unique and suggestive environment, located in the middle area between the biggest attraction poles of the Veneto and Emilia Romagna and 1 hour from the principal airports and docks.

The project is called DELTA FARM it involves the economical development of the local communities and reconversion towards business and social forms.

The project's development follows this plan: The creation of an open space touristic village, in a unique environmental and landscaping context; an area for the aquatic sports able to be a reference point for those disciplines at a national and international level; a tourism center able to valorize the local environmental and landscaping excellences and a center for the local production and the fishing tourism.

The third project in development is one of Carpi. Carpi is a city in the district of Modena. It is located in the strategic region of Emilia Romagna, one of the main industrial areas of Italy and, at the same time, one of the most advanced both in technologies and production techniques.

The project revolves around the requalification of the ex-thermoelectric center of Carpi into an energetic pole for the locals. Differently, from the previous projects of Alessandria and Porte Tolle, this project aims to reconvert the area in a more efficient version of the previous one, completely following the rules of the circular economy and without wasting any material. Moreover, the project itself expects the new center to be a "circular center": thanks to the new installments the center may reuse, recycle and absorb all the surrounding energies

The projects aim to create value under three main points of view:

The first is the real estate value. The XXL park, covering more than 50.000 square meters, following the principles of the circular economy will not need any work. Instead, the materials recovered will be used in order to create new spaces both indoor and outdoor. On the other hand, the project of Porto Tolle, even though considered fully circular, it expects some demolition and construction processes and phases. In conclusion, the logistic pole of Carpi is also a very good example of a circular economy applied to real estate projects; the recovery of material will cover all the expenses of construction and the unused area will be totally planted with threes.

The second is the number of materials recovered that is the most crucial part of every CE related project; in fact, the circularity is expressed through the reuse and recycle of materials. The Carpi project is based on the recovery and reuse is easier to analyze: almost 4.000 tons of scrap, 120 tons of valuable materials and 40.000 tons between land and concrete reused. From Porto Tolle's demolition instead, the recovery will amount to 2500 tons of concrete and metal, but most importantly the 89% of the structure will remain completely untouched like offices, storage rooms, the locals, and the concrete chimneys. The theme park of Alessandria, even though is the most advanced in terms of engineering and construction, is more complex than the others. This doesn't mean that the circularity is being bypassed, but that the circularity must cope with the new technologies that are a must in such a complex opera. In fact, the whole structure will be held but updated and modernized. That being said, over 10000 tons of materials like concrete, tiles, and tarmac are expected to be recovered. They will be able to cover at least 80% of the new parking area.

The third is social and job development. One of the main goals of the Futur-e project is to support the local communities. Unfortunately, the whole Italian peninsula is afflicted by the plague of youth unemployment; to support the local communities is also a means to give an opportunity the all the people, not only the young one, to develop a career, to earn a salary so to be independent.

Initiatives like the project XXL are most definitely useful in order to create new job places, even if in small quantities, but necessary to remove the negative aura that floats in this country.

The Porto Tolle's touristic village, on the same wavelength of the XXL park, focuses on the tourism and the valorization of the local population and the local tourism. It aims to valorize the environmental excellences and landscape of the Po; it also expects many centers for the fishing and agricultural tourism.

Differently, from the Alessandria and Porto Tolle, the logistic pole of Carpi will recruit a broader but much more specific woks management. The necessities belong to the fact that being a more technological and energetic pole, it will be impossible to recruit non-trained personnel. On the other hand, it will be possible to create much specific training for local young people.

At the light of what has been exposed, it results clear to the eye of the reader the incontestable fallacy of the '*take-make-dispose*' model. As assumed in the introduction the goal was to achieve the classic economic profit in parallel with social and environmental results.

Anyways It is really hard to give an exact value to the project since it is growing at a fast pace rate and the variables to consider are many: from the merely expected entries of the new attractions to the value of the recycled and reused materials to the creation of hundreds of jobs positions and the environmental results. Still, from the analysis of the 3 sites, the outcomes are brilliant: 150.000sqm of land converted in productive land, 200.000 tons of materials going to be reused instead of wasted and approximately 1.200 jobs position will be opened.

The circular economic model demonstrates to be one, if not the only solution to the problems of mass production affecting our society. Instead of just creating and accumulating goods, wasting raw materials and resources, the recycle and reuse is the path to walk.