IO1 Module

“Incorporating digital technology in the circular economy for sustainable development”

by LABC

Substance of circular Economy concept as Efficacious Determinant for the development of Successful entrepreneurship

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Table of Contents

Incorporate digital technology for sustainable development

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1. Introduction

Environmental protection and **climate action** are one of the main goals of the 2030 Agenda for Sustainable Development, which was adopted by the UN General Assembly in 2015 [1]. To deal with the climate crisis, integrated and innovative solutions need to be taken in many areas. In the report "Digital with Purpose: Delivering a SMARTer2030," experts from Deloitte and the Global Sustainable Development Initiative (GeSI) note that as many as 103 of the 169 Sustainable Development Goals (SDGs) are impacted **by digital technologies** [2]. According to this report, effective use of digital technologies can accelerate progress on these goals by up to **22%**. Therefore, it is important to know **how to use digital technology for sustainable development.**

By the end of this module, you will learn:

- **How** digital technologies can affect the circular economy and what are the benefits of introducing digital technology in a company
- **What** kind of digital technologies have already been implemented in companies
- **Good practices** that have been developed by different companies in Italy.

This module was created for people who want to learn more about introducing digital devices for sustainability. It will give you a **basic understanding of how digital technologies can impact the circular economy and the benefits you can gain as a company by implementing them.**

Source: https://www.freepik.com/free-vector/global-carbon-emission-vector-with-globe-background_16267873.htm#page=2&query=digital%20technology%20ecology&position=10

2. Circular economy in digital technology for sustainable development

To look deeper into the application of digital technologies for sustainable development, first, **we need to know what digital technologies are** in general. Digital technologies are technologies that use **digital technolog**y and **information systems**. Digitalization and technological advances are affecting all sectors of the economy and society, changing the direction of the industry, and creating new ways of producing products and services. They are also affecting how we live, work, and learn, so they are critical to our future.

The idea behind the circular economy is to extend the life cycle of products by taking **various actions** to make waste a valuable part of the production process again. This approach leads to the emergence of **new and innovative business models** that are driven by the solutions of new technologies, mainly digital ones. Innovative business models, the digital revolution, and the circular economy are creating great opportunities for companies to build competitive advantages that allow companies to make additional profits.

Effectively combining physical and digital channels and reaching more customers is possible by introducing digital solutions such as **social media, cloud computing, Machine to Machine (M2M) communication, data analytics,** etc. Below we will examine some solutions in detail in the context of the circular economy [3].

Source: https://www.freepik.com/free-vector/recycle-background-vector-dark-blue-tone_16267879.htm#page=2&query=digital%20ecology&position=9

2.1 Digital solutions in the circular economy

Below is the list and **advantages of effective digital solutions** that foster **innovative business models** in the circular closed economy:

- **Mobile technologies** - Access to data and applications is low cost and versatile and reduces the need for physical resources i.e., paper, ink, gadgets. With mobile devices, we increase the efficiency of employees and also take care of the environment because we do not produce unnecessary waste.

- **Social media** - online platforms allow you to share and receive feedback from customers. Businesses can take advantage of social media platforms so that they can reduce marketing costs and improve their offerings easily and quickly. Moreover, nowadays social media, if done in the right way, is the best marketing option as we can get a large audience through it.

- **Cloud computing** - Storing data and files in the cloud helps to reduce the cost of the business. With this technology, employees can access data anywhere, anytime.

- **Machine-to-Machine (M2M)** communication - Machine-to-machine communication can be used for control systems in factories.

- **Modular Design Technology** - it affects the performance of the products as well as their lifespan. When a product that has been modularly designed breaks down, only the part that was damaged is replaced or repaired, making the product still usable and extending its overall life cycle. [4]

Source:https://www.freepik.com/free-vector/light-bulb-vector-background-green-energy-technology_16267852.htm#page=2&query=digital%20ecology&position=5

2.2 Opportunities linked to the introduction of digital technologies in the circular economy

Introducing digital technologies in businesses has many benefits for the company as well as for the environment and society.

For example, innovative solutions based on the circular economy model can **inspire customers** to lead sustainable lifestyles. Digital technologies can create solutions that enable waste to be used to create entirely new products, extend their lifespan, and reveal entirely new possibilities for their use.

What business models can companies use to support sustainability?

- **Closed-loop recycling** - Taking recycled materials and using them to make entirely new products
- **Industrial symbiosis** - This business model will enable efficient use of resources, the main principle is to share services, tools, and related products among industries.
- **Packaging recycling** - Bringing already used packaging into reuse
- **Downcycling** - Using materials from several used products to produce a new product of lower quality.
- **Upcycling** - Using materials from one or more used products to create a new product, thereby improving quality [5].

Source: https://www.freepik.com/free-photo/cheerful-women-holding-plant-icon_3679613.htm#page=3&query=digital%20ecology&position=6

2.3 Incorporating digital technology in circular economy for sustainable development – Good practice

CARLSBERG POLSKA SP. z o.o.

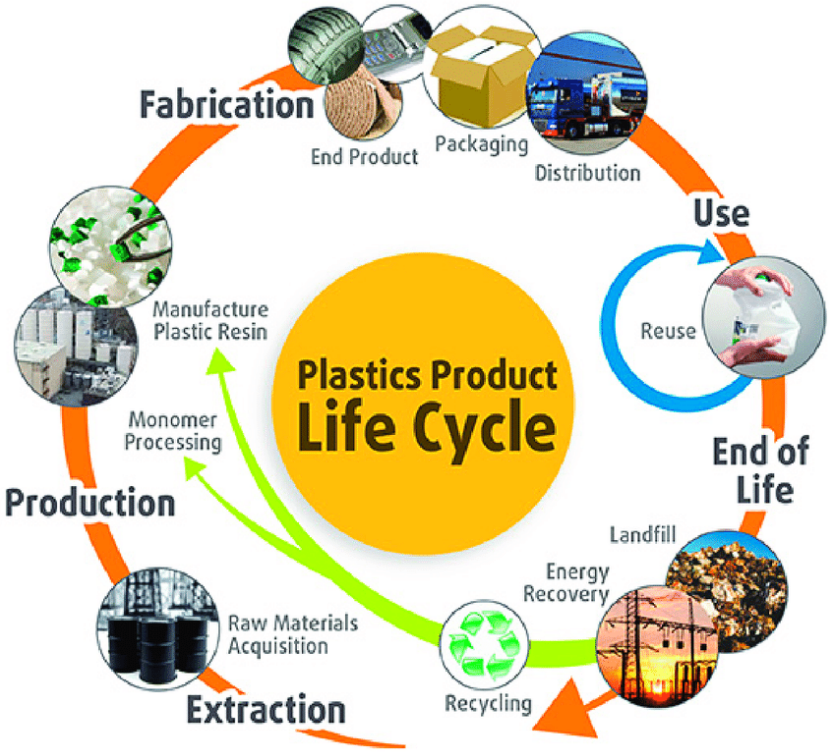
The Returnable Bottle as part of the Carlsberg Circular Community

Carlsberg Circular Community (CCC) is a global program focused on **reducing waste** and **optimizing used bottles** by creating a **closed loop**. As part of the "Take Me Round" campaign, compelling materials were created that encouraged the community to recycle. The bottle was given characteristics and narratives were created in which the product has a life and goes through different adventures. This included **spots with influential celebrities**, as well as **animated videos**, **infographics** and **eco-comics**. Environmental education about returnable bottles also took place in stores, where consumers received eco-gifts for returning their bottles [6].

The program used a business model, **Recycling Packaging**, in which it introduced packaging for reuse. It also used **digital solutions** in the form of **social media** where the community was encouraged to live a **sustainable lifestyle.**

The campaign had many social benefits, i.e., raising awareness about the rotation of the returnable glass bottle, building responsibility towards the environment, increasing environmental awareness and building habits that are good for the future of nature.

In addition to the social benefits, the campaign also gained many **environmental benefits**, i.e., reducing the consumption of natural resources that are used to produce glass, reducing electricity, and reducing waste.



Source: https://www.researchgate.net/figure/Life-cycle-of-plastics-2_fig1_331249931
by Sheila Devasahayam

3. Innovation, circular economy in digital technology

According to Deloitte's "Closed Loop - New Opportunities" report, the economy has grown significantly over the past five decades, and the quality of life of the world's population has increased [7]. Population growth as well as increased income has led to **increased consumption**. Because we are currently consuming more resources than the earth's regenerative capacity allows, we are faced with the need to find a solution that reconciles human needs with available environmental resources.

The Closed-Circuit Economy is an **opportunity** that enables **economic growth** while reducing and optimizing resource consumption, as well as **designing new, innovative business models** based on digital technologies. Businesses that choose to transition to a closed-loop economy need to know that doing so will foster a sustainable, low-carbon and competitive economy. For this transition to be possible, companies must fundamentally change the business models they have been using, as implementing a circular economy involves new ways of production and a different approach to supply chains, but not only. Customer relationships and waste management will also change, and most importantly, the company will become more innovative.

Introducing digital technologies into the enterprise also involves the development of employees who need to significantly expand their digital competencies. In the digital revolution, companies need to remember that **digital skills are key to managing a business**, and all employees should be able to thrive in the digital world.

Source: https://www.freepik.com/free-vector/technological-ecology-concept_6849678.htm#page=1&query=innovation%20ecology&position=4

3.1 Innovation and digital technologies in the water sector

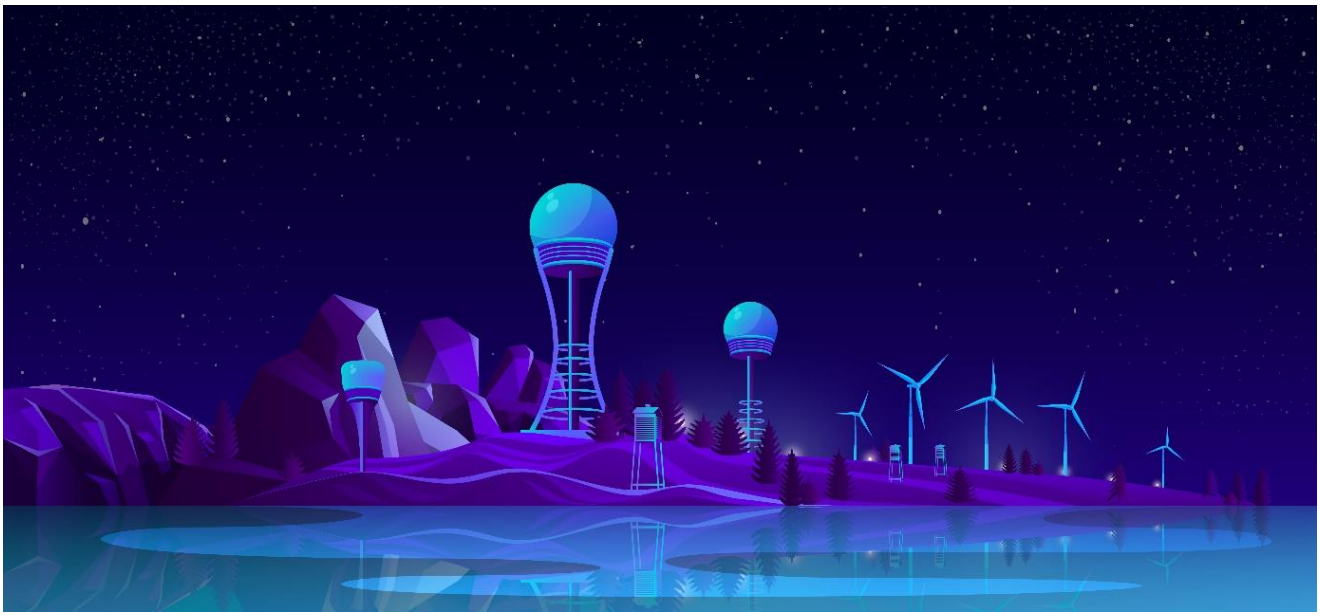
Due to climate change, maintaining a stable supply of water, which is essential for both humans and the entire ecosystem, is a serious problem. Therefore, **it is necessary to develop and quickly implement new and innovative technological solutions.**

Modern technology is important for water management because it is an opportunity to collect large amounts of data from remote devices that can be compared with other data to find meaningful connections. The data that will be collected will allow predicting aspects of future operations, including changes in efficiency, anticipating potential failures and also looking for sources of improvement.

IBM experts believe **that digital technologies will enable virtual representations of systems** so that water resources can be managed more effectively.

More efficient asset management is also influenced by **EAM (Enterprise Asset Management)** systems, which, when combined with VR and machine learning, offer great opportunities. The introduction of innovation and digital transformation of the water sector will enable leak detection and water quality management [8].

Digitization will also make it possible to predict weather conditions more accurately and discover the effects of climate disasters, which will be very important for the agriculture sector and help businesses **prepare appropriate strategies for crisis management.**



Source: https://www.freepik.com/free-vector/renewable-energy-generation-cartoon-concept_4758723.htm#page=2&query=water%20innovation&position=43

Good practice in introducing innovation into the water sector

The EU is making a concerted effort to ensure the effective protection of the EU's water sources. A key element of EU policy is the **Water Directive** [9], which applies to all Member States. Under this directive, countries are obliged to **protect and improve resources**. For this purpose, they have prepared river basin management plans and various programmes, which are prepared in six-year cycles.

In addition to policy measures, Europe is also turning to innovation to develop methods that will ensure water security and adequate water for all citizens. The EU funds projects that contribute to innovative ideas, an example of which is **ECOLORO: Reuse of Waste Water from the Textile Industry.** The main objective of this project is to **design a complete system for recycling** the waste water that is produced in textile factories. The ECOLORO concept is to use electrocoagulation in combination with flotation to effectively remove contaminants, dyes and chemicals from the wastewater that textile mills produce. It is an innovative method that leads to a healthy, sustainable and competitive industry [10].

Year after year, more and more **initiatives and projects are created to protect the environment**, move towards a closed loop economy and sustainable development.

More information about the ECOLORO project: https://cordis.europa.eu/article/id/241015-designing-a-full-recycling-solution-for-the-textile-industrys-waste-water

Source: https://www.freepik.com/premium-photo/fabric-roll-background_3108835.htm#page=2&query=fibre%20ecology&position=24

3.2 Innovation and digital technologies in waste management

As we have already learned, **new technologies are changing the world.** A new type of economy is taking shape before our eyes: The digital economy, which is based mainly on the Internet economy. In recent years, we have witnessed the introduction of the latest technologies into our daily lives, from education to medicine. New, innovative technologies such as artificial intelligence, cloud computing, the Internet of Things or robots are significantly accelerating the process of datafication (creating digital representations of areas of the real world), also increasing networking and fostering personalization. The following is an example of a company that has incorporated the idea of a circular economy into its operations.

Archiblox is a manufacturer of **modern, eco-friendly homes** that are created from **prefabricated modules or materials sourced from certified sustainable crops.** Each of the company's home designs uses a range of techniques and technologies that make the homes and buildings created as environmentally friendly as possible [11].

Archiblox's offerings include the complete creation of homes, from construction to delivery. They use **state-of-the-art technology** that combines user comfort with minimal home maintenance costs. The techniques they use at the design stage are: passive thermal design principles, learning weather patterns, tracking the movement of the sun as well as the direction of the wind. In this way, the houses created by Archiblox maintain the right temperature, which results in lower electricity bills. Moreover, photovoltaic panels are installed so that natural energy resources are maximized.

Archiblox also works to minimize their **water footprint,** so water management and creating a closed loop is an important element in the design of their buildings.

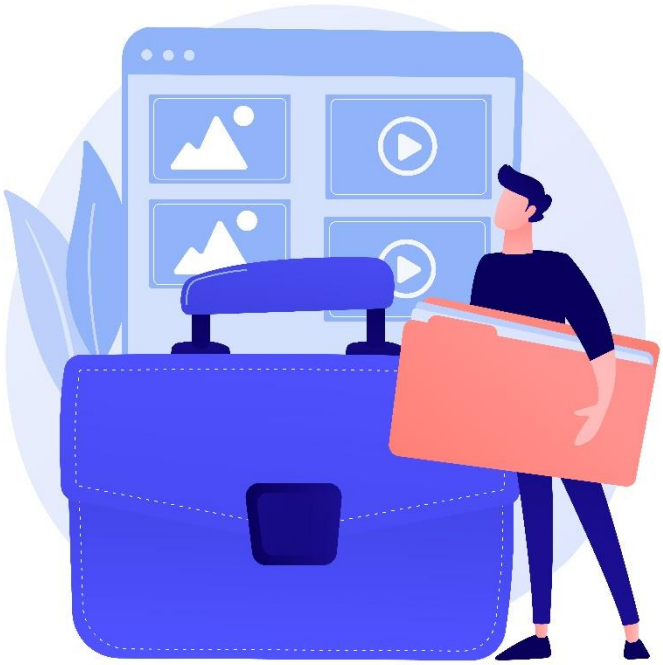
They use AAA rated products in the construction of their buildings, as well as products that allow water to be heated naturally. Each building is also equipped with rainwater harvesting systems, which can then be used in toilets, laundry, bathrooms or kitchens.

Source: https://www.archiblox.com.au/project/avalon-beach-house/

4. Case studies

The circular economy is one of the main elements of the **European Green Deal** [12], which is why it is so important for companies to introduce new business models that are based on the sharing and collaborative economy. **Digital technologies** such as the internet, artificial intelligence, blockchain technologies will be **very important** in achieving **environmental goals.**

The growing awareness of the importance of circular economy for sustainable development is creating **new business models based on the circular economy concept.** In this chapter we will **present good practices related to the use of digital technologies** in the circular economy. After deep research we have selected the most interesting examples of companies in Italy that have already implemented innovative business models and are working to protect the environment.



Source: https://www.freepik.com/free-vector/portfolio-management-previous-projects-samples-works-catalog-skills-presentation-successful-graphic-designer-web-developer-cartoon-character_11667016.htm#page=1&query=examples&position=1

Case study no.1: Aboca – Italian healthcare company

Aboca is an **Italian medical company** dedicated to the production of safe and **100% natural products** that are developed according to the Systems Medicine approach. The company was founded in 1978 near Arezzo by Valentino Mercati, who understood **that innovation could come from combining heritage with current scientific and technological potential.** For more than 40 years, the company has been seeking solutions for human health in the complexity of nature [13].

The challenge

- **Improve** the health of people and the planet
- To **create** natural and biodegradable products that respect nature, but also meet human needs while respecting the human body and the environment.
- **Obtaining** natural molecular complexes from plants without the use of artificial substances
- **Combining** economic growth, social justice and respect for the environment
- **Building** new supply chain models

The solution

The company has created an unbroken **production chain** that begins with the **basic ingredients**, which are derived from organically grown herbs, and ends with the pharmaceutical and clinical testing of the final products. Everything the company does is based on one key word: **INNOVATION**. As a result, the company continues to grow and now has:

- 1400 hectares of organically cultivated land
- 80 plant species
- 33 international patent families
- 14 countries import their pharmaceutical products

Moreover, Aboca reuses all the waste and wastewater produced: as fertilizer or animal feed [14].

Contribution to environmental protection

The company makes a very big contribution to environmental protection. Through its actions it contributes to **economic growth while respecting the human body and the environment.** Thanks to the creation of an integrated system, in Aboca everything is designed to obtain natural molecular complexes from plants (which do not contain harmful substances).

Source: https://www.pexels.com/pl-pl/zdjecie/osoba-rece-rolnictwo-zniwa-3912947/

Case study no.2: Italian platform - Cobat

Cobat is a company that, since its creation, has been actively working for the **respect of the environment,** as well as legality and circular economy both in Italy and around the world. The company is known for its spectacular actions that recover hazardous waste at the bottom of the sea and in high mountains.

The challenge

In these times of transition to sustainable energy, there is a particular emphasis on **the use of energy storage systems to accumulate surplus production.** This will ensure that these surpluses can be used when needed in the future. One of Cobat's objectives has been to **properly manage the end-of-life of products** released for consumption, and to ensure the best standards of environmental sustainability. What's more, Cobat works to optimize the cost of managing operations and reduce emissions into the atmosphere.

The solution

Cobat is a company with a national presence (Italy). It has a **logistics and plant network** that guarantees a collection, storage and recycling service for all types of waste.

Contribution to environmental protection

The company organizes **projects** and **initiatives** that combine **environmental protection with social commitment.** In 2002, it carried out an action to recover used lead batteries that had lain in a CNR laboratory pyramid at 500 meters above sea level [15]. In 2007 and 2008, it was part of a project to install solar panels for the Tibetan Children's Village in India. There are many more examples of the company's activities that contribute to the environment, we invite you to learn more about Cobat's activities at: www.cobat.it.

Source: https://www.pexels.com/pl-pl/zdjecie/rece-kreatywny-ziemia-swiadomosc-7048040/

Case study no.3: BIONAP

BIONAP is an Italian company that was founded in 1977 and since then has dedicated all its **activities to "Earth Science"**. BIONAP is a company that is supported by experts from all over the world, thanks to whom it can constantly develop and introduce new technologies and digital solutions [16].

The challenge

- **Discovering** innovative active ingredients
- **Enhancing** the health and well-being of people around the world
- **Producing** standardized botanical extracts from plants and fruits growing on the Etna site, which is a UNESCO World Heritage Site
- A traceable and ethical chain.
- Making a positive impact on the environment.

The solution

BIONAP has opted for **innovation** and now specializes in the production of extracts that come from Mediterranean plants and fruits, especially from Sicily. Thanks to the latest technology it is able to use the plants and fruits in such a way that each part is fully utilized. For example, from the bergamot plant they extract the juice, from which, thanks to the innovation of their company, they are able to extract flavonoids, which are designed to control the levels of so-called bad cholesterol in the blood of humans.

Contribution to environmental protection

BIONAP is a company that is **constantly evolving** and has a **significant impact** on the environment. Thanks to its activities it significantly contributes to waste reduction and reduces the impact of man on the environment.

Source: https://www.pexels.com/pl-pl/zdjecie/osoba-trzymajaca-filizanke-z-zielona-roslina-421999/

5. Quiz

1. **Which business model relies on using materials from several used products to produce a new lower quality product?**
    a. **Downcyckling**
    b. Upcyclling
    c. Closed loop recycling
    d. Industrial symbiosis

2. **Which of the following are digital technologies that can be used in a circular economy model?**
    a. Artificial Intelligence
    b. Robotics
    c. Internet of Things
    d. All of the above

3. **Effective use of digital technologies can accelerate progress toward the goals of the Sustainable Development Agenda by:**
    a. 30%
    b. 15%
    c. 25%
    d. 22%

4. **What will be the benefits of bringing innovation to the water sector?**
    a. Water quality management
    b. More accurate prediction of weather conditions
    c. Assist in the preparation of appropriate strategies for crisis management
    d. All of the above

5. **What does EAM stand for?**
    a. Enterprise Asset Management
    b. Environmental Artificial Machines
    c. Ecology and Manufacturing
    d. Economy and Management

6. **What is the reason for inadequate processing of electrical waste?**
    a. Improper collection of materials
    b. Recycling costs
    c. Technical complexity
    d. All of the above

7. **What is datafication?**
    a. Database
    b. Creating digital representations of real-world areas
    c. Streamlining production processes
    d. Creation of 3D objects
8. **Current research shows that in seas and oceans float:**
    a. Approximately 1 billion tons of garbage

b. Approximately 3 billion tons of garbage
c. Approximately 5 billion tons of garbage
d. Approximately 7 billion tons of garbage

9. Which company is known for its spectacular hazardous waste recovery operations at the bottom of the sea and in high mountains?

a. BIONAP
b. Cobat
c. Aboca
d. Archiblox

10. Which of the following companies use innovation in their operations?

a. BIONAP
b. Cobat
c. Aboca
d. All of the above

References

[1] United Nations, Department of Economic and Social Affairs, Sustainable Development. https://sdgs.un.org/2030agenda

[2] 'Digital with Purpose: Delivering a SMARTer2030,2020' GeSI, Deloitte, 2019

[3] 'Che cosa è e dove va la sostenibilità?', in M. Carvelli e G. Vittadini (a cura di), Ritorno al futuro, Libreriauniversitaria.it, Padova, Giovannini E., 2020

[4] 'Urban Digital Twin: alfabetizzazione spaziale e competenze geo-digitali per vivere le città del futuro', AgendaDigitale.eu, 20 aprile, testo accessibile al sito: www.agendadigitale.eu/smart-city/urban-digital-twin-alfabetizzazione-spaziale-e-competenze-geo-digitali-per-vivere-le-citta-del-futuro/ , Farruggia S., 2021

[5] 'The Quest for Sustainable Business Model Innovation', David Young, 2020

[6] 'Carlsberg Circular Community' https://we-economy.net/case-stories/carlsberg-circular-communit.html

[7] 'Closed loop – open opportunities', Deloitte, December 2018

[8] 'Sostenibilità digitale', Digital Transformation Institute, Epifani S., 2020

[9] The EU Water Framework Directive - integrated river basin management for Europe, 2020; https://ec.europa.eu/environment/water/water-framework/index_en.html

[10] ECOLORO: Reuse of Waste Water from the Textile Industry; https://cordis.europa.eu/project/id/642494

[11] https://www.archiblox.com.au/project/avalon-beach-house/

[12] 'A European Green Deal', Priorities 2019-2024; https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en

[13] '100 Italian Circural Economy stories'; www.circulareconomy.europa.eu

[14] 'Impact Report 2020'; www.aboca.com/company/for-the-common-good/

[15] 'Cobat: About Us'; www.cobat.it

[16] 'Bionap: who we are' www.bionap.com

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