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Nell'attuale scenario economico e sociale si è affermata l'esigenza di orientare i sistemi di produzione e gli stili di consumo verso nuovi modelli virtuosi di gestione in cui l'innovazione, la qualità e la sostenibilità rappresentano elementi fondanti per la creazione di strategie sapienti e lungimiranti capaci di creare un valore "sostenibile" per tutti gli attori della "rete della vita".

Tale sfida rappresenta un tema ampiamente dibattuto nell'ambito delle Scienze Merceologiche e, in particolare, durante il XXIX Congresso Nazionale di Scienze Merceologiche dove sono stati coniugati contributi teorici con esperienze pratiche in un'ottica di valorizzazione delle conoscenze.

Il congresso ha rappresentato un'occasione di confronto, di condivisione e di approfondimento di percorsi di sviluppo su tematiche fortemente focalizzate sui seguenti aspetti:

- Industria 4.0, analizzata attraverso i binomi di innovazione e imprenditorialità, innovazione, start-up e spin-off, tecnologia e innovazione gestionale, ricerca e trasferimento tecnologico;
- Qualità 4.0, intesa come qualità di sistema e di prodotto e sistemi di gestione per la qualità;
- Sostenibilità e Corporate Social Responsibility, che prende in esame l'analisi del ciclo di vita, i sistemi di gestione per l'ambiente, i metodi e gli strumenti di ecologia industriale, fino al concetto di economia circolare.

Benedetta Esposito è borsista di ricerca presso il Dipartimento di Scienze Aziendali Management and Innovation Systems dell'Università degli Studi di Salerno e cultore della materia in Scienze Merceologiche. I suoi interessi di ricerca sono nell'ambito della Corporate Social Responsibility e della Circular Economy nel settore agroalimentare.

Ornella Malandrino, professore ordinario di Scienze Merceologiche, Direttrice dell'Osservatorio Interdipartimentale per gli Studi di Genere e le Pari Opportunità dell'Università degli Studi di Salerno e Delegata del Rettore all'Orientamento. La sua attività scientifica si focalizza prevalentemente sulla CSR e sulla relazione tra i vari sistemi e strumenti di gestione delle differenti dimensioni della qualità.

Maria Rosaria Sessa, PhD in Management & Information Technology e docente a contratto dell'insegnamento di Gestione Controllo della Qualità dei Servizi Turistici presso il Dipartimento di Scienze Aziendali – Management & Innovation Systems dell'Università degli Studi di Salerno.

I suoi principali interessi di ricerca sono: sviluppo di sistemi di gestione della qualità e dell'ambiente, responsabilità sociale delle imprese, strumenti di valutazione ambientale e certificazione delle competenze.

Daniela Sica, PhD in Scienze Merceologiche e docente a contratto di Gestione Controllo della Qualità dei Servizi Turistici presso il Dipartimento di Scienze Aziendali – Management & Innovation Systems dell'Università degli Studi di Salerno. I principali interessi di ricerca sono rivolti alla sostenibilità dei processi produttivi, al Quality Management Systems e alla CSR.



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NEW LEGISLATION ON RECLAIMED WATER FOR AGRICULTURE: REMARKS AND FUTURE SCENARIOS OF “CIRCULAR CITIES”

di

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Abstract (in inglese)

Sustainability in the water sector is a major concern, and compliance with the current legislation alone does not seem to be enough to face major challenges, like climate change or urban population growth. Recently, at European level, EU Partnership on Circular Economy has dealt to find workable ideas focused, among others, on the topics of EU legislation. In fact, cities play an essential role in the development of a circular economy. The Municipality of Prato is the Italian representative in the EU Partnership on Circular Economy. Within the partnership, the Municipality of Prato leads the debates regarding wastewater reuse.

This study aims to describe the role of Prato within the EU Partnership on Circular Economy, as well the recent evolution on EU legislation about reuse of treated wastewater for irrigation and agriculture purposes. In particular, we will focus on recent approved regulation on minimum requirements for water reuse. The Partnership contributed with proposals and a shared position in order to ameliorate the first proposal. Within this framework, at city level, an integrated approach in terms of water supply and wastewater treatment is recommended, in order to protect environment and biodiversity, together with the safeguard of citizens' health and wellbeing.

Keywords: Circular economy; Wastewater reuse; Reclaimed water.

Introduction

In a developed economy with several industrial activities, many different by-products are generated. According to principles of circularity, the range of potential uses of by-products as second raw materials can be various. Circular economy enables, in fact, the development of a brand new paradigm, where the model overcomes the concept of an economy that close the loop with waste (Ellen Macartur Foundation, 2015). Today, both the reasons for the sustainability and the environmental impact suggest a radical switch to the circular paradigm, with positive conditions leading to a full exploitation of the big potential of this new approach (Ghisellini et al., 2016). In order to stimulate the transition to circular economy, in 2015, the European Commission has adopted a “Circular Economy Package”, which consists of an action plan with concrete actions and measures covering from production and consumption to waste management and the potential market and reuse of secondary raw materials. These actions aim at both promoting to close the loop in products’ life cycle and bringing benefits for both the environment and the economy. At European level, an EU Partnership on Circular Economy has been established. In facts, cities play an essential role in the development of a circular economy; they act as enablers of potential measures by which they can influence both consumers and businesses (Kirchherr et al., 2017). Moreover, overall governance, enabling businesses, public procurement, consumption and resource management are the themes that would all have a bearing upon the development of circular economy concepts within cities. The partnership consists of six urban authorities, namely the City of Oslo, The Hague, Prato, Porto, Kaunas and Flanders region. The Member States are Finland, Poland, Slovenia and Greece. The European Commission, the Council of European Municipalities and Regions, Eurocities, Urbact, the European Investment Bank and the Association of Cities and Regions for sustainable Resource management are also partners. At present, the Municipality of Prato is the Italian representative in the Partnership on Circular Economy, leading the debates regarding wastewater reuse and urban regeneration.

Prato is one of the largest Italian industrial districts and one of the most important textile and clothing production area in the world. Since the post-war period, textile waste management has represented one among the main drivers for textile district development: recovery and recycling of natural fibers from rags and used clothes were the basis for the Prato’s yarn and textile industry. The local centralized water treatment plant also plays one role within the textile district. Created in 1981, GIDA was founded in order to manage wastewater and sewage treatment plants, as well as the industrial aqueduct network. ARCO provides the Municipality of Prato with technical

and scientific support on the topic of circular economy within the partnership.

This study aims to describe the role of Prato within the Urban Agenda on Circular Economy, as well describing the recent evolution on EU legislation about reuse of treated wastewater.

1. Materials and methods

Water for irrigation and food production is a great issue worldwide, considering that the agriculture accounts for over 70% of global freshwater withdrawals and up to 90% in some fast-growing economies (UN, 2017). Moreover, as the climate changes, both flooding and droughts are likely to become more frequent in the European Mediterranean countries. At European level, disparities in the existing water reuse standards generate differences in the production costs of food products. While water reuse encounters numerous barriers in EU, conversely, this practice is commonly used in extra European countries. In Europe, identified barriers in water reuse are, among others: more burdensome regulatory requirements for industrial production activities compared to urban wastewater; lack of minimum quality requirements for water in its different uses and processes; reused water being less attractive than freshwater (EU Commission, 2018).

Feasibility of food-crops irrigation with the treated effluent from a vegetable transformation and canning factory (agri-food) is undergoing at a demonstration site in Southern Italy (Capitanata), within the framework of the EU funded project Demoware. Furthermore, GIDA in Prato is involved in an EU funded project on the reuse of treated water called "IRRIGATIO". The project aims to assess the chemical/microbiological contamination and productivity of selected fruit species grown under irrigation with different kinds of reclaimed wastewater in the agricultural production chain. Within the cities involved in the project (i.e. Marrakech, Amman, Cairo and Prato), abandoned areas or unused fields have been identified and used for pilot activities of urban gardening and for peri-urban farming systems (Borsacchi et al, 2019). The need to address the issue of reclaiming water at European level has been acknowledged in the 2012 Commission Communication "A Blueprint to Safeguard Europe's Water Resources" (EU Commission, 2012).

The paper is the result of the involvement of the authors within the Partnership on Circular Economy. Main activities carried out:

a) Desk-based analysis of reports and publications on CE as well as main European legislation on water;

b) Open consultation within the Partnership on the topic of water reuse;

c) Participation at all debates and meeting within the Partnership.

These methods have allowed diversifying the sources of information, in order to contribute at the debate, at European level, about changes in water reuse legislation.

2. Results and discussion

The Partnership considered the issue of water reuse as key factor at urban level. Discussion among the members of the Partnership as well as a recognition of legislation and barriers at European and at national level was carried out in order to propose an effective action. Meanwhile, in 2018, a proposal for “Regulation of the European Parliament and of the Council on minimum requirements for water reuse”, with the submission of a draft report in September 2018. The Partnership welcomed the proposal and, after consultation with relevant stakeholders (e.g. Eurocities, EurEau) it decided to deliver a position paper in January 2019. In providing comments and possible amendments for the proposal, the authors, in accordance with the Partnership, considered four main areas of evaluation: i) Realistic applicability of the proposed minimum quality requirements; ii) Risk Assessment procedure; iii) Health and safety of agro-food production using purified water; iv) Possible extensions in the application.

In the proposal, it appeared relevant the role of reclamation plant operators playing the main role. In fact, they shall ensure that reclaimed water destined to a specific use (e.g. crop irrigation) comply with defined conformity limits. Thus, regarding the uses of reclaimed water, the proposal outlined different requirements for agricultural irrigation according to different types of crops:

- Class A, to irrigate food crops consumed raw;
- Class B, to food crops where the edible part is not in direct contact with water or processed food;
- Class C, to food crops where the edible part is not in direct contact with water or processed food (drip irrigation only);
- Class C, to use of reclaimed water in crops for industrial or energy purposes. It did not include the watering of flowerbeds, public gardens and parks.

Any member State could still adopt or retain more stringent legislation for water reuse in its territory. To avoid unequal barriers, the proposal went in the direction that no Member State could ban imports of food products irri-

gated with reclaimed water in another Member State. Member States competent authorities would be responsible for enforcing the permit and carrying out inspections, as necessary.

It should be noted one main general issue in the proposal. Even though it refers to minimum requirements for water reuse, there is a total lack of responsibility on the part of users in terms of ensuring safe water reuse. In fact, ensuring that the reclamation process (and distribution by operators) complies with all the requirements is useless if afterwards there are no defined responsibilities and obligations for the users.

The following SWOT table outlines the main strengths and weaknesses, together with some suggestions and proposal of change and integration:

Table 1. Source: authors

STRENGTHS - The proposed conformity requirements do not constitute main technological barriers. - Requirements are realistic and vary in a reasonable manner in correspondence with the different types of crops and destination. - Combination of minimum requirements and other parameters required by European and national regulations, widening the requirements to be monitored and consequently the number of analyses to be carried out at defined frequency.	WEAKNESSES - Not explicit indication that the risk management plan is constantly updated. In order to guarantee a standardization in risk management, the regulation could expressly indicate to refer to ISO or international standards. - Weak synergy and collaboration between the purification plant operator and end-users. - It is not expressively ask to end-users add more frequent analyses of the reclaimed water they use in their productions.
OPPORTUNITIES - Include among the classes in Annex I the street washing and the watering of flowerbeds, public gardens and parks. - Member states should implement information campaigns to raise awareness among end users and citizens about the saving of water resources resulting from the reuse of urban wastewater and the controls able to guarantee its salubrity.	THREATS - Member state could oppose the free exchange of agro-food products irrigated with reclaimed water.

Although risk management procedure appeared well defined, there was no explicit indication about responsibility of food business operator that use reclaimed water within his productions (i.e. crops irrigation or water as food ingredient). It should be noted that, if the reclamation plant operator knows the destination of treated water could be easier for him to set the treatments according the requirements. In fact, a collaboration among reclaimed plant operator and food operators could create positive industrial symbiosis. At

city level, this kind of collaboration can advance social relationships among the involved local actors, including surrounding neighbourhoods. These activities involve a form of brokering to bring companies together in new positive collaborations (e.g. industrial symbiosis), finding innovative solutions to use resources, and thus to increase revenues while reducing waste. More, we suggested the explicit indication that the risk management plan needs to be constantly updated. In order to guarantee a standardization in risk management, the regulation could expressly indicate to refer to the ISO 31000:2018 or other international standards. This will facilitate the work of the bodies responsible for issuing the authorization of the plant and the subsequent verification.

Starting from all these considerations, the position paper delivered by the Partnership provided the following comments and proposal of integration:

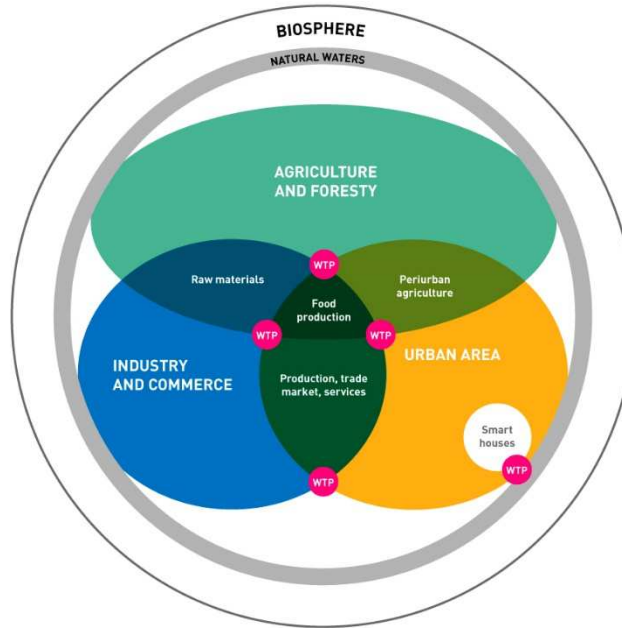
1. Regulation should include, among the classes of destination, water reuse for civil purposes (e.g. street and car washing; watering of flowerbeds, public gardens and parks). For each purpose, it should be crucial to define distinct levels of quality, according impact to human health and environment.
2. The competent authority should be in charge of overseeing the risk management in collaboration with the entities responsible for water reuse projects, operators of reclamation facilities and users. In order to guarantee a standardization in risk management, the regulation should expressly indicate to refer to international recognized standards.
3. In order to ensure that the reclaimed water is safe, thus protecting citizens and the environment, a collaboration among the reclaimed plant operator and food operators could create positive industrial symbiosis.

The law has been finally adopted in February 2019. The amended texts, adopted by the European Parliament, met with our position paper.

In fact, for a city, the goal of a more sustainable urban water cycle needs new infrastructures and the definition of innovative policies. All waters (freshwater supply, rain, rivers, and wastewater) need to be interconnected with each other and other urban areas (parks, roads, energy and waste) so that efficiencies and circular synergies arise from a coordinated approach. Water treatment plants (WTP), carrying out processes where organic and inorganic pollutants are removed from the sewage, figure in the connection points among different areas. The proposed model in figure 1 is a water-wise cities inspired by circularity. Main pillars are the definition of a shared vision

among stakeholders and policy makers, the strong commitments of city governors, the increase of knowledge, capacities and awareness among citizens.

Figure 1. Systemic circular approach and interactions among areas. (Source: Borsacchi et al., 2019)



3. Conclusions and future perspectives

Ensuring a more broadly reuse of treated wastewater could limit extraction from water bodies and groundwater. An integrated approach in terms of water supply, wastewater treatment and drainage services needs to be followed in order to protect the environment and biodiversity, together with the safeguard citizens' health and wellbeing.

This paper outlines remarks and future circular scenarios about the recent evolution on EU legislation about reuse of treated wastewater. The recent adoption of the new legislation on water reuse is an opportunity to solve the problem of water scarcity and at the meantime to address productions at circularity. Following circular approach, cities of the future will be more resilient, inclusive and livable. Also Sustainable Development Goals (SDG), and in particular SDG6 ("Ensure availability and sustainable management of water and sanitation for all") and SDG11 ("Make cities and human settlements

inclusive, safe, resilient and sustainable”), call for the promotion of sustainable urban water management for safer, more inclusive and resilient cities.

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Disclaimer The views expressed herein are those of the authors and therefore not necessarily reflect the official opinion of the European Commission and of the EU Partnership on Circular Economy.