



Figure 1. Cooking the food surplus. Food Shakers-Food Remakers installation © M. Paolillo for UNIGE, Creative Food Cycles, 2019.

# FOOD WASTE AS A TRANSITIONAL KEY FACTOR TOWARDS CIRCULAR ECONOMY

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Food waste becomes raw material for new cycles. Based on this assumption, the paper explores the food life cycles by starting from the process of wasting and then going backwards in the circular process that generally begins with production. The paper proposes a journey through projects, experimentations, and start-ups where communities are put at the centre and, in a way, drive social innovation ahead of food industry and large-scale distribution. From processing food waste to produce new food or zero-miles products (such as sustainable packaging), to distributing surplus through innovative services for communities, ultimately this overview helps to orientate in the consumption to disposal phase. It proposes, indeed, new ways of recycling and reusing food waste as a resource for new ecological materials. These innovative prototypes have been developed as concrete actions with the aim to persuade users to change their behaviours, while simultaneously exploring cultural, social, and economic perceptions of food waste. These practices face the challenge of building an alternative economy in which the innovative social enterprises, addressing design-based culture, can play the fundamental role of social actors able to create new values alongside the economic ones.

food / waste / creativity / circular economy / sustainability

## FOOD CYCLES AND SDGs

Food—in its life-cycles—can become a crosscutting factor towards co-designing sustainability in cities and with urban communities (Schröder 2019). This can be also achieved by making available new products and services that, according to the United Nations Sustainable Development Goals (SDG 12.8), can raise awareness of sustainable development and lifestyles in harmony with nature.

Design cultures today have begun to question and innovate in the production, distribution and recycle models of food cycles. Food waste has a special role in these design activities as potentially a new material capable of starting new cycles: by coming back again as food, nourishment for life, or creating objects for everyday life such as packaging or for other purposes. Since access to food is often problematic in urban areas and the need to find fresh and quality food has been rapidly emerging, cities have become laboratories to experiment creative approaches. Contemporary cities represent the political and cultural arenas where networks and practices openly break with the traditional dynamics of food industry, and thus propose new values (Tucci 2016). These movements of opposition to the standardised food system are lifeblood to support communities' needs and practices, subverting the current patterns of food cycles in the urban environment. Moreover, the academic research is crucial in pursuing and promoting to a large audience the necessary radical change towards many of the 2030 SDGs with a focus on urban communities.

These new holistic approaches are well represented by the biennial European project Creative Food Cycles (CFC) developed within the Creative Europe Programme, aimed at improving and integrating interactions between the food system and the urban context in a transnational perspective, placing food at the centre of cultural discoveries and social innovation (Markoupoulou et al. 2019; Gausa et al. 2020).

In particular, within this project, the issue of food waste is examined as a fertile field for reversing course and enhancing circular economy in everyday life. From a scientific point of view, the research contributes to developing new materials derived from food-chain waste as well as to explore possible applications ready to market, investigating at the same time how the public perceives such products. This need emerges because the existing wide availability of waste-derived and sustainable materials—on which experiments are taking place everywhere and at different levels—does not correspond to their effective application on a larger scale. Today it is possible to retrieve online recipe books based on waste-derived materials as well as open data libraries to learn how to make new materials sourced from local biomass (Corbin et al. 2019). It is therefore necessary to understand, be-

yond the economic issues, what can really be the near future of waste materials in design.

Food waste reduction needs to update knowledge and develop new skills required by multiple social and economic agents. Food waste implies significant economic losses, ethical and social concerns, adverse environmental effects, and considerable nutritional consequences, posing a threat to global sustainability. The goal set by the UN is ambitious: to halve the global food waste per capita by 2030 at the retail and consumer levels and reduce food losses along the production and supply chains, as well as to ensure that everywhere people have the relevant information and awareness of sustainable development and lifestyles.

A study by the Ellen McArthur Foundation (2008) reveals that, in Europe, the circular economy can generate an economic benefit of 1,800 billion euros by 2030, and can create new jobs and increase annual resource productivity by 3%. This represents a new economic model that puts design cultures as a major driving force for the envisioning and realisation of social innovation processes towards resilient and sustainable cities, in which communities act collaboratively. If we consider that in the Mediterranean area food and nutrition are fundamental and recognised elements of culture and economic development, the topic of food as an opportunity of action towards co-designing sustainability comes to the fore. In this direction the activities, herein illustrated, explore new ways not only targeting design innovations of food waste as an industrial product, but also trying to move the levers of social innovation.

In the last two centuries, through a food globalisation process, food has turned out to be an industrial product strongly subject to profit (Liberti 2016). Just as the food industry has progressively and systematically designed the products that support distribution and consumption of goods in our daily lives, design cultures today have begun to rethink and question new recycle models of food cycles. It has to be taken into account that designing in the topic of food has the “ability to work on the functions of the emotional process, which is closely linked to the cognitive process, or rather to the aesthetic emotion that objects trigger” (Di Lucchio 2010, p. 150). Food is a powerful medium to convey these issues to a wider audience, as a tool for reflection, and to expand the field of investigation to solutions in response to future challenges: functional ones, above all, linked to the availability of food, consumption habits, production and distribution chains, environmental impacts of supply chains, and food waste through a creative approach.

As an industrial product food is a fertile field for thoroughly understanding both the relationship between ethical elements and the way we produce, consume, and recycle it in our cities.

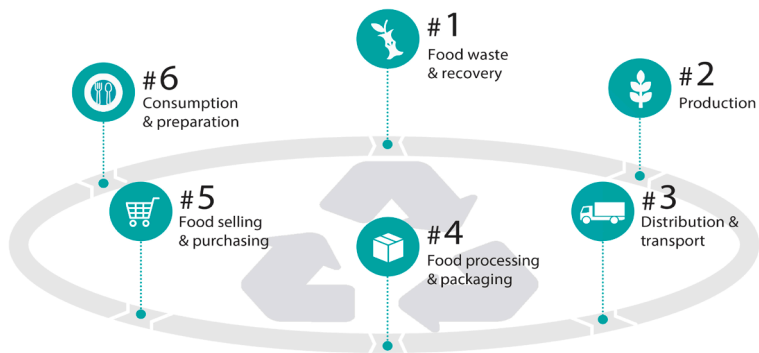


Figure 2. The Food Life Cycles: starting from Food Waste. © S. Pericu, 2020

Even more, this topic represents an interesting domain of studies for design having a “reparative role” (Antonelli 2019), with respect to environmental and social issues in which the system at a general level and the choices of individual consumers are intimately intertwined. “Designers and artists are able to formulate, through artefacts and concepts, urgent political questions that cannot rely solely on regular processes to enter public discourse. In regards to the environment and all associated concerns, in particular, state policy is driven to make reformations by the priorities that researchers, designers, activists, scientists, architects, and citizens set forth” (p.18).

The development of products, prototypes and services aimed at food—reducing waste generation through recycling and reuse in everyday life—needs, on the one hand, to be inquired within the academic design community as new artefacts and materials derived from food waste; on the other hand, it needs to be disseminated as new practices through creative events to raise awareness of the impacts of food cycles in our cities. Products derived from food waste can therefore vehicle positive messages to communities encouraging them to act in opposition to a food distribution system that leads to wasting and to the immoderate use of other materials with unsustainable costs. This bottom-up response should be able to subvert the economic interests of food industry, changing the course on the basis of



Figure 3. La Peruana Coffee packaging Peru', Lima, Peruana Coffee © Elizabeth Palomino Nolasco, 2018.

consumer interests. This can be achieved by involving urban communities (with a particular focus on creative communities), which are at the centre of these experiences and, in a way, can drive innovation ahead of food industry and large-scale distribution. The creative communities, accustomed to social innovation practices in cities, are able to design and make visible new ways of recycling and reusing food waste, as a resource for the creation of new environment friendly materials or prototypes. These projects are developed as material actions with the aim to persuade users to change their behaviours about food waste, exploring at the same time cultural, social, and economic perceptions of it.

## WASTING AWAY

Before beginning an exploratory journey through the selected practices, following the lifecycle phases, we need to take a necessary step and overturn the notion we have of waste.

As to Lynch (1991) waste and waste places are natural in a quite different sense, also for us the aesthetics of waste must represent a land of freedom, of different possibilities with a high use-value. "Living among ruins has its delights... It can be a wilderness wilder than any natural one, an alluring mix of freedom and danger."



Figure 4. Permafungi mushroom farm. Permafungi, 2018.

(p. 23) We have to reconsider the aesthetics of waste, bringing them closer to us, but also to understand that in nature everything has its purpose, nothing is wasted away. The word 'waste' and the act of 'wasting' are just human inventions (McDonough et al. 2002). Yet, while awareness is growing, the problem of producing food waste remains a significant barrier to achieving a sustainable food system. An estimated 30% of the food supply is wasted in the developed countries. If food loss were a country, it would be the third-largest greenhouse gas emitter, behind China and the United States (Stenmarck et al. 2016).

According to the sense of urgency provoked by these facts, we need to adopt a radical approach, and to create a new meaning for food waste. To do this we must refer to the circular economy cycle, for food as a natural system of regeneration, in which waste becomes again food, transforming itself into a new resource. "Making the most of food" (Ellen Mac Arthur Foundation 2019) means to involve local communities, stakeholders and active urban society, developing a cultural and holistic approach, joining all the aspects of food cycles, but also to stimulate with an open and inclusive approach a deeper interconnection of disciplines dealing with the urban environment, to reduce food waste and co-design a new concept of waste. Above all, to do this we want to put waste at the centre of the food life cycle, as a primary resource and the starting point of the entire cycle. The aim is to enhance



Figure 5. Food Action. Final project in Design Sistemico R. Passaro © Politecnico di Torino, Food Design Lab, 2018.

the role of waste in the creation of new products and services that can have a value in activating creative communities and in allowing sustainable behaviours to everyone. This represents an alternative market to the predominant one, which creates and satisfies new needs in total respect of the environment and, therefore, destined for a bright future. It is also important to note that in all these actions the aspect of social innovation is always strongly linked to that of circular economy, thus creating a new social self-supporting system, which deals with food as a profitable field. These practices face the challenge of building an alternative economy that gives these social innovation enterprises a new and fundamental role as social actors in order to create new values alongside the economic one. The concept that lies behind is the non-linearity of the processes, which assume a regenerative dimension, as if they were biological life cycles able to recover living matter even at the end of life.

## THE FOOD LIFE CYCLE PHASES STARTING FROM FOOD WASTE

This life cycle allows us to illustrate new products, in which the design of the product system—objects, communication, and services (Vannicola 2018)—goes hand in hand with social innovation actions that implement strategies at different levels.



A selection of examples and best practices explored in the Creative Food Cycle project are compared with the creative actions carried out within the CFC lifespan.

### **From Food Waste to Production**

The organic component of soil, the humus, is formed through the decomposition of plant materials by soil microorganisms. Humus is the nourishment of life and the energy we need, in association with water, to grow food. Food waste through this process can be used to produce food. This process has always been performed in agriculture at a large scale and we can do it today even on a small scale in our own homes thanks to products that facilitate domestic farming activities. Designers can optimise products and services, creating closed-loops of material flows that are sustaining, and in which waste becomes a raw material. The project Perma-Fungi applies this principle and represents a perfect example of this attitude. It, was created and implemented by a social cooperative in Brussels based on participatory urban agriculture actions combined with circular economy principles. The main goal of this project is to recycle urban organic waste mixed with coffee grounds to grow oyster mushrooms and produce compost. In the same direction goes the installation “Myco-scape”, developed in 2019 in Barcelona by the Institute for Advanced Architecture of Catalunya (IAAC), within the CFC Food Cycle in action. Myco-scape is a wood modular system with an external surface which supports the growth of edible mushrooms in the urban environment, producing both food and construction materials. This prototype project acts as a real manifestation of food life-cycles: creating a culture of caring for locally sourced and produced food and raising awareness of sustainable development and lifestyles in harmony with nature, according to the SDGs.

### **From Food Waste to Food Processing and Packaging**

Climate change demands original and radical thinking and if, as Papanek (2019) and Fry (2010) argue design is a vital form of political action, designers play a major role as powerful agents of change who can imagine long-term freedom. Aiming at freedom from plastic packaging, for instance, is a necessity for designs that not only can serve the market, but can also realise alternative visions. In Peru, the Pulpaking project contributes to tackling this sensitive environmental problem by developing 100% biodegradable and compostable containers made from kitchen and agricultural waste. The cultural impact of the project is to generate awareness and environmental education with the use of sustainable packaging. Among the

various solutions developed, the most successful in terms of audience acceptance is the design of bio-packaging for the coffee brand La Peruana Coffee, which responded to an international call for best practices in the context of the Creative Food Cycles project. In the same project, the research unit of Genoa has developed with product design creatives various products from food waste. These projects work with the main idea of making citizens aware of recycling, looking for easy procedures that can be reproduced at home by everyone. These ways of processing waste can be easily achieved through the addition of bio-resins or homemade processes that we could define as "cooking chemistry", or by drying and weaving food waste.

### **From Food Waste to Food Selling**

Services have also a major role in supporting communities of citizens as users and companies, by creating a virtuous circle in which everyone actively interacts for sustainability with a positive impact on the territory and the quality of life of all those involved. With a proper service and effective interaction design strategies, companies can promote their sustainable actions and behaviours, while consumers can lead sustainable lives. The example of Too Good to Go pushes in this direction. Designed as a free app by a movement against food waste, it allows the purchase of unsold food to prevent it from becoming waste and ending up in a landfill. Networks of actions for the recovery and redistribution of food surpluses with social solidarity purposes, such as the showed example, are growing in number, widening their impact on the territory. Following this strategy, as part of the CFC project, the "Food Shakers | Food Remakers installation" has explored the topic of food surplus by experimenting with food to become new material as packaging, or real products for consumers. The installation was part of an annual science event in Genoa, as an opportunity in which waste becomes a means for education and in which the true essence of contemporary design is expressed not merely as an intellectual exercise. Food thus becomes an artistic experience, because art makes the invisible visible and generates a sense of responsibility, which in turn is a social act in the form of creativity.

### **From Food Waste to Food Consumption**

Starting from food waste, food design can develop strategies for reusing food surpluses to feed people by transforming the raw material. The project Food Action, developed by Polito Food Design Lab, creates new edible products transforming

vegetable and fruits that, otherwise, would end up in trash. Food Action promotes a new approach as a project of design-driven education empowerment and food products innovation targeted to the homeless people hosted in Turin's night shelters. These products take into account the importance of nutritional values and the consumption experience according to specific dietary needs. Innovative techniques in preparing the products guarantee a long shelf life that prevents the risk of food expiration.

## CONCLUSIONS

The concept of food waste and food losses is not only a topic at the centre of the debate, but also a powerful tool for raising awareness of sustainable development at the community level. The actions shown in the paper aim at persuading consumers to change their behaviours, and at the same time exploring cultural and social perceptions in this new attitude. With the aim of making cities more sustainable, it is necessary to find out and develop tools to engage people also and above all from a cultural point of view. In this direction the CFC research has turned into an educational campaign and an open platform where prototypes, new materials, and products are developed as inspiration for change.

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