URBAN CIRCULAR ECONOMY

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The circular economy

According to the Ellen Mac Arthur Foundation the circular economy is a model of production, circulation, consumption of goods and management of related waste, oriented by the principle of conservation of the social and economic value of objects and achieved through the design of tendentially closed economic systems in which the use of renewable energy is preferred

Preserving the value of goods generally means minimising the entropy of the material of which the goods are made, in order to maintain their usefulness and price, reduce their rates and times of transformation into waste, and promote ways of recycling waste. The temporal conservation of the socio-economic value therefore influences the environmental conservation, reducing the production of pollutants, solids, liquids and gases.

Circularity (or a system that tends to be closed) is the specific operating mode that best satisfies the principle of preserving economic value by putting waste back into the production cycle.

The existence of services of reuse, repair, regeneration of goods reinforces the preservation of the social and economic value of goods, preventing the formation of waste.

The possibility of carrying out the above operations is strongly influenced by the design of the goods themselves in terms of the materials used, their scheduled duration and the ease of reuse and/or recycling of their parts.

The inclusion of circular economic systems within defined political-spatial spheres and on a local scale allows greater collective control both over the management methods of the entire cycle, over the whole of the economic, social and environmental costs (favouring the minimisation of the monetary and environmental costs linked to transport), and over the destination and use of the values produced.

The circular economy in the metropolitan area

The circular economy distinguishes waste into two categories: biological and non-biological.

Cities and their peri-urban areas have been identified both by the Ellen Mac Arthur Foundation and by researchers in industrial technologies related to waste recovery as a space within which circular economy strategies can act effectively with regard to types of goods and waste[1] belonging to both categories. The choice of metropolitan space as a privileged area is due to a series of reasons that will be briefly listed here.

First of all, cities are highly parasitic areas in terms of economic and environmental relations compared to the non-urban areas in which they are located. The city depends on the outside:

- for enormous daily quantities of food flows, primarily from the countryside and the seas, intended for human consumption and for the now not insignificant proportion of domestic animals;
- for enormous quantities of non-renewable energy: oil (first and foremost) for the supply of means of transport and for economic production; natural gas for heating; electricity, coming from a mix of resources, usually including coal, for a variety of uses;
- for a wide range of materials and products used to meet the most varied needs, starting with those related to the construction industry and housing in particular.

1 The choice of the term "good" or of the term "waste" is not always unambiguous because, depending on the regulations and their changes, as well as on its stage of life, the same object can be classified as belonging to one or the other category.

But cities, as well as being highly dependent on input flows, are also highly dependent on the outside world for their output flows and, in particular, for the location of the gigantic quantities of urban waste produced. A city like Milan, in this not unlike other similar centers, produces almost 700,000 tons of household waste annually (ie from families only, not considering those from economic activities). Ninety per cent of these are: putrescible organic waste (just under half) as well as paper, cardboard, plastic, glass and metals. A clear majority of this waste is related to the consumption of food (e.g. about 2/3 of the plastic comes from all food and drink packaging). The amount of waste that cities are able to dispose of within their metropolitan area depends on a number of variables, and often on the inhabitants' opposition to the location of treatment and recycling plants within the metropolitan area. The results vary from city to city and from type of flow to type of flow, but today there is some worrying evidence both on a global scale (plastic waste produced by European cities is ultimately taken to some Asian countries and now mainly to Turkey and Malaysia), and on a local scale (in Milan, waste from food consumption is not recycled within the metropolitan area).
Given this reality, the logistical flows that accompany the supply of inputs and the placement of outputs inside and outside cities are proportionally massive, with a further intensification, in recent years, due to the spread of e-commerce. In almost all cases, logistics are entrusted to fleets fuelled by fossil energy, in particular diesel, the most polluting fuel in existence, yet used in a practically hegemonic manner for road freight transport.

Rethinking flows and priorities

Cities and their urban areas cannot be seen as self-sufficient economic units, nor would this make sense for natural, economic and cultural reasons. From an economic point of view, the production of many goods of industrial origin becomes more convenient if located outside urban areas, expensive in terms of rents and not very functional in terms of space and related services; from a cultural point of view, exchanges relating to goods or services of a cultural-artistic or artisanal nature are useful, even if they take place on a wide territorial scale, in order to promote knowledge and an enriching confrontation with diversity.
A series of entry and exit flows, on the other hand, should follow principles of circularity on a local scale, for environmental, social and economic reasons. For this reason, the distinction between flows with a circular-local orientation and flows involving different territorial scales is an operation that avoids autarkic or simplified approaches and offers a key of interpretation towards which to direct the relative political choices.
The local circular economy makes sense where production, reuse and recycling are more economically, socially and/or environmentally effective than different options. This happens in a part of the daily supply flows, i.e. in the field of food and energy. Some of the food, at least the food that is compatible with the nature of the land, can be provided by producers on a local scale: the possibility of direct contact with consumers, the use of cultivation and breeding techniques that respect nature and the incentive to produce goods of better quality than those coming from global flows and channelled into large organised distribution are elements that play in favour of a local choice, generating, moreover, a greater number of employees than industrial farming and breeding systems. This local choice can become a circular one where urban food waste is treated in aerobic digestion plants (composting) present in the same territorial area and transferred in the form of soil improvers and fertilisers to peri-urban and urban soils. By extending the perimeter from the mere waste of food consumption to the entire flow of biological waste in a city, the possibilities of recovering material that serves not only agricultural uses (soil improvers, phosphorus), but also construction uses (material for the production of cement) and in fields currently under research (recovery of cellulose and chemicals) are receiving increasing attention, including at the level of

European policies. In particular, since 2015, the Bioeconomy Directorate of the European Commission's Directorate-General for Research and Innovation has been conducting research and policy activities to identify the main potential of the value chain related to municipal bio-waste products. In 2018, the European Commission published its Communication "Updated bioeconomy strategy". Following this, DG Research and Innovation proposed for discussion the concept of "circular urban economy based on bioeconomy". The concept refers to the processes of valorisation of the resources of urban organic waste through the production of goods that use this waste as a raw material, together with wastewater sludge.
A similar discourse crossed by the principles of the circular economy on a local and urban scale is valid today, and was not valid until a few years ago, for energy. The production of electricity and heat directly from the sun (through photovoltaic systems or solar thermal systems) meets a general objective of absolute priority: only with the transition from the use of energy from fossil fuels to energy from renewable sources will it be possible to avoid global warming of more than 1.5 ° between 1880 and 2100, disastrous for human life on the planet. It is not only the quality of the source that makes the difference, the location of the power plant is also important. The fact that each location has plants for on-site production optimises the synchronisation between the needs of the energy consumer and the system that produce it; today, the major and rapid technological improvements in the field of storage (lithium batteries, hydrogen accumulators) allow the design of local systems for production, storage and consumption designed to operate without dependence on either sources, or external networks. From the point of view of circularity, the most interesting experiments on an urban scale are concerning electric energy storage batteries, the value of which encourages their direct recovery at a local level. One example is the stadium in Amsterdam, which is partly lit up by lithium batteries, which were taken out of the city's electric buses and recovered for this purpose.
Another example of a circular urban economy, less developed than the previous ones, but subject to increasing research, is the construction sector. There are significant cases of buildings built with a mix of circularity techniques that involve both the reuse of existing materials and - a key element of the circular economy - the design of materials and structures that can be reused even after the life of the macrostructure that contains them. Again, the circularity and the location on a local scale of the process complement each other[2]. Knowing the needs for materials and structures within an urban area makes the process of reusing specimens much simpler and more effective.
This last consideration allows to connect to the theme of reuse services (the same device with the same function, is used again thanks to a repair or a transfer of possession), and reconditioning (a high value-added good is regenerated in its functionalities), two support services to the circular economy that tend to operate on a local scale and environmentally and economically more useful than recycling services. As one of the noble fathers of the circular economy, Walter Stahel, recalls: "the value in use of an object is greater than the sum of the value of the materials that compose it; reusing goods by extending their life cycle is more profitable than recovering molecules (recycling materials); reusing glass bottles is more convenient and ecological than recycling glass to produce new bottles". (Stahel, 2019, p. 49)

The evaluation of the circular economy.

To date, there is no universally recognised system for evaluating the results of the circular economy in general, let alone the circular urban economy.

2 For example, the Amsterdam CIRCL pavilion

Anders Wijkman and Kristian Skanberg studied in 2016 the economic impact of a national industrial circular economy in the Czech Republic, Finland, France, the Netherlands, Poland, Spain and Sweden, concluding that there would be a 66% reduction in greenhouse gas emissions compared to the current linear economy model, a great help to achieve the decarbonisation targets agreed in Paris in 2015.
It is also possible, from a social point of view, to estimate quantitatively or qualitatively a series of advantages of the circular economy compared to the linear economy, advantages which are realised both on a large scale and on a local scale. The study by Wijkman and Skanberg mentioned above, estimates a 4% increase in the national level of employment as a result of the introduction of an advanced industrial circular economy. As an empirical example it could be added that the Italian consortium of plastic packaging recyclers estimates that a recycling plant, compared to an incineration plant, creates at least three times the employment, for the same volumes treated.
On the socio-economic level, an indirect effect that is little considered in macroeconomic studies is the range of benefits for the consumer. Preserving over time the functions of use of an object, designing it for this purpose and then repairing and regenerating it, decreases the frequency of purchases, lowering the related cash disbursements. A significant limitation of disbursements also occurs when, according to another mechanism of the local circular economy, disused but still reusable goods are made available to purchasers: from furnishing items, to technological devices, to clothes, to food surpluses.
To date, however, it is difficult to estimate the overall economic impact, in terms of increasing the added value produced, of the introduction of a system of widespread circular economy. At the same time, the influence of a series of variables should be considered, often of different signs, such as: the reduction in the purchase of new goods; the production of goods with greater added value; the development of recovery services (*latu sensu*), some of which could lead to the extraction of chemicals or the development of waste treatment processes with high added value, which are still difficult to evaluate today; the presence or absence of barriers of different types so that some developments can take place or not (e.g. regulatory barriers on the use of end of waste goods).
All these considerations show that the transition to a widespread circular economy would bring a series of advantages related to the public interest (environmental and social advantages) and would offer a series of potentials, directly related to the private interest and indirectly to the public interest (possible increase in GDP, at least in some sectors), which undoubtedly makes the new paradigm of great interest also for institutional decision-makers, both at national and at local level.

Reference list

Ellen Mac Arthur Foundation (eds.) (2012) *Toward a circular economy.* Cowes: Ellen Mac Arthur Foundation.

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