ACADEMIA | Letters

The circularity gap and the growth of world movements for environmental justice

Joan Martinez-alier, Universitat Autònoma de Barcelona

The EJAtlas (www.ejatlas.org) is an archive of ecological distribution conflicts (Martinez-Alier and O'Connor, 1996) that took place in the last decades or are taking place now mostly at the commodity extraction frontiers or at the waste disposal frontiers (Temper et al 2015, 2018). The EJAtlas is a product of the grassroots counter-movement for environmental justice, and at the same time a tool for researching its contemporary history and supporting its presence across world regions and cultures. The EJAtlas provides descriptions and coded materials for research on comparative, statistical political ecology (Scheidel et al, 2020, Tran et al., 2020, Martinez-Alier 2021). One of its main purposes is to lift the curtain of invisibility over movements for environmental justice or "liberation ecologies" (Peets and Watts, 2004) (these are names that look at the aims of the movements) or over the environmentalism of the poor and the indigenous, ecofeminism, subaltern environmentalism, the environmentalism of the dispossessed, peasant or agrarian environmentalism, working-class environmentalism, the environmentalism of "peoples of color" (names that look at the social actors).

The industrial economy was still growing until 2020. Energy from the photosynthesis of the distant past, fossil fuels, is burnt and dissipated. Even without further economic growth the industrial economy would need new supplies of energy and materials extracted from the "commodity frontiers", producing also more waste (including excessive amounts of greenhouse gases). Therefore, new ecological distribution conflicts (EDC) arise all the time. We are registering them in the Atlas of Environmental Justice (ejatlas.org).

Calisto Friant et al., 2020 offer a rich typology of the discourses on the circular economy. In a nutshell, the concept of 'circular economy' implies that material resources could be increasingly sourced from within the economy, reducing environmental impact by increasing the reuse and recycling of materials. However, quantitative biophysical, metabolic analysis

Corresponding Author: Joan Martinez-alier, joanmartinezalier@gmail.com
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(Fischer-Kowalski and Haberl, 2015) reveals that for the EU-27 economy only around 12% of the material input was recycled in 2019 (Strand et al 2021). There is an enormous "circularity gap". The industrial economy is not circular, it is entropic (Haas et al 2015, 2020, Giampietro and Funtowicz, 2020), therefore it requires new supplies of energy and materials extracted from the old and new "commodity frontiers" (Moore 2000, Joseph, 2019, Gerber, 2020, Hanáček et al 2021), and it produces polluting waste. Therefore ecological distribution conflicts arise. The resistance movements born from such conflicts may help to move the economy in a less unsustainable direction (Scheidel et al, 2018, Temper et al 2020).

Driven mostly by economic growth, the decrease of biodiversity continues as the HANPP (the human appropriation of net primary production of biomass) increases due to meat consumption and "biofuels" (Temper, 2016), while the world input of materials to the economy (measured in tonnes) still goes up (until 2020) though it might soon reach a peak (Hickel and Kallis, 2019). Carbon dioxide in the atmosphere measured in the Keeling curve was 320 ppm in 1960, reaching 415 ppm by 2020 in its march to 450 ppm by 2050. True, peak CO2 emissions and also peak extraction of materials (including coal and oil but not yet natural gas) might be reached soon but descent from the high peaks will be slow. At a time in which despite all the evidence to the contrary there is much enthusiasm about the possibilities of an industrial circular economy, it is necessary to explain the two main senses in which authors write about the "circular economy". They could be teachers of introductory microeconomics or more recently they could be chemical engineers and industrial ecologists.

Introductory microeconomics is often taught in terms of what Georgescu-Rogen called "the merry-go-round" between consumers and producers (Georgescu-Roegen, 1975), a circular scheme in which producers put goods and services in the market at prices which consumers pay; meanwhile, consumers (as providers of labour, land or other inputs or "factors of production") get money from producers in the form of salaries, rents etc. and they buy, as consumers, the products or services that have been produced. The "merry-go-round" needs energy for running (energy which gets dissipated), and it produces material waste which is not recycled. For instance, coal and oil are not really produced (contrary to textbook economics), they are merely extracted, and its energy is dissipated by burning which causes excessive amounts of carbon dioxide. This is left aside in introductory mainstream economics, or maybe it is introduced much later, in the analysis of the "intergenerational allocation of exhaustible resources" and in the treatment of externalities which are "internalized into the price system".

As ecological economist critics of mainstream economics since the 1970s and 1980s, we thought that we were slowly convincing the public, if not the professional economists, that the "merry-go-round" representation of the economy was wrong. The economy is embedded in physical realities. However, to our surprise, the recent novelty is that, from industrial ecology

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and not only from economics, a circular vision of the economy is also preached. The geologically produced energy and the materials entering the economy are here taken into account, and the waste is very much present, but it is assumed that technical change may close the circle. The waste becomes inputs. The energy (dissipated, or course, because of the Second Law of Thermodynamics) is not a problem because it will come from current sun energy (not fossil fuels, which are exhaustible stocks of photosynthesis from the past). The circular supply chain is supposed to rule physically in the economy. We know however that the actual degree of the circularity of the industrial economy is very low, and it is probably decreasing as formerly biomass-based economies complete their transition to an industrial economy based on fossil fuels in India and Africa (Roy and Schaffartzik, 2021).

There is a very large "circularity gap" between the "fresh" material input and the recycled material input into the economy. At the world level, the first is about 92 Gt per year and the second about 8 Gt. Georgescu-Roegen in *The entropy law and the economic process* (1971) and other authors before and after him (cf. Martinez-Alier 1987 on the history of ecological economics) insisted on the fact that the industrial economy is not circular but entropic. This explains the growth of environmental conflicts at the extraction and waste disposal frontiers because energy is dissipated and only a small amount of materials are recycled. This is lesson number one in a course of ecological economics and political ecology. The low degree of circularity has two main reasons (Haas et al 2015): First, 44% of processed materials were used to provide energy and are thus not available for recycling. Second, socioeconomic stocks were growing at a high rate with net additions to stocks of 17 Gt/yr. The expansion of stocks (the "built environment") requires first a rising input of materials and energy; and once in place, a persistent input of materials and energy is needed for their maintenance and operation (Haas et al 2020). Even a non-growing industrial economy would need large new supplies of energy and materials from the commodity extraction frontiers because energy is not recycled and materials are recycled only to a small extent.

Ecological distribution conflicts at the commodity extraction frontiers

The so-called Circularity Gap Report (based on Haas et al 2015) asserts that 92 Gt of virgin resources were extracted in 2017 and only 8.6% of all materials used were recycled. https://circularity-gap.world/2020. If less than 10 per cent of materials (including the energy carriers) are recycled, where do the other 90 per cent come from? My answer is: from the new commodity extraction frontiers and also to some extent from customary sources. Thus aluminium may come to some extent from recycling, it may come from bauxite from old mines

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which are used more intensively, or it may very likely come from new bauxite mines.

There is a new collective initiative for the historical study of "commodity frontiers" and also a new journal with this title (https://commodityfrontiers.com/journal/). This concept (Moore 2010) is becoming ever more relevant. The industrial economy marches all the time to the extraction frontiers in search of materials and it also travels to the waste disposal frontiers. The waste is sometimes deposited anywhere (solid or liquid waste, or GHG), and sometimes a small part of it is economically valued again by recyclers, or in controversial REDD schemes for "capturing" carbon dioxide (Schindler and Demaria, 2020). Both the expanding commodity extraction frontiers and the waste disposal frontiers are often inhabited by humans and certainly by other species. Hence the growth in the number of conflicts over the use of the environment, and as a response the growing strength of the environmental justice movement.

Two processes of growth and changes in the socio-metabolism are associated with the commodity extraction frontiers: commodity-widening and commodity-deepening (Banoub et al 2020). The first implies the spatial extension of nature appropriation, via territorial claims to the control and use of natural resources and associated acts of dispossession. The second implies the intensification of exploitation at existing sites, through socio-technical innovation and new investments in the same location (commodity-deepening) as for instance the mining of metal ores or coal by open-cast techniques discarding previous subterranean mining, or gas or oil fracking, or energy-intensive fishing or plantation agriculture.

Combining knowledge from ecological economics, industrial ecology and political ecology, we conclude that the "circularity gap", i.e. the need for the industrial economy to get "fresh" materials and energy all the time, is the main cause for the large and growing number of ecological distribution conflicts (in extraction, transport and waste disposal - including those caused by the excessive amounts of CO2), and hence also so many movements of resistance at the commodity extraction and waste disposal frontiers (as shown in the EJAtlas which by March 2021 has 3,380 entries from around the world, a large sample from a much larger unknown number of conflicts). Sometimes corporations face payments for environmental liabilities in national or international courts. However, the rule seems to be "cost-shifting" success as K.W. Kapp explained in 1950. The Paris Agreement of 2015 on climate change applies the rule of "no liability" to countries, the "Agreement does not involve or provide a basis for any liability or compensation".

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