


Stages of capitalist development and maximum marine plastic pollution

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Review

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Abstract

Marine plastic pollution (MPP) has become ubiquitous in the oceans and is damaging human health, ecosystems, and economies which has resulted in a mandate for a new binding plastics treaty. What would an effective treaty look like? What explains this relatively new global crisis? This review article argues that the work of Karl Polanyi and stage theory can put the MPP problem into context and illuminate requirements of an effective treaty. Polanyi argued that if market society did not restrain the capitalist use of land (nature), labor, and money it would destroy itself and MPP will only be solved if these social and environmental protections restrain capital. Stage theory looks at the evolving expressions of capitalism in distinct historical periods to provide context for the global economy and implies a structural remedy for the plastics in the ocean. In particular, the post-War Fordist stage introducing mass production and the following post-Fordist neoliberal period witnessed progressively thinned restraints on capital and the global plastic flow is a function of these changes over time resulting in continuously increasing MPP.

Impact statement

Marine plastic pollution has evolved into another global environmental crisis that affects the health of people and the oceans. This evolution matches global political economic regimes as they shift from increasingly permissive and less protective of ecological systems and societal needs. As the member states of the United Nations prepare for a new treaty to end plastic pollution, it is important to ask what an effective agreement would look like. To do this, the foundational work of Karl Polanyi and versions of stage theory are reviewed. Polanyi argued that if markets are seen separate from society and are not restrained to protect nature and people, self-regulated markets would destroy society and nature across stages of less and less protective historical periods. Thus an effective agreement to reduce plastic pollution, all plastic production and use must be restrained – directed by the needs of people and nature.

Introduction

The United Nations Environment Assembly decided in March 2022 to create a new binding treaty to deal with plastic pollution. What would an effective policy look like? To answer this question, this paper places marine plastic pollution (MPP) in structural context to explain the social forces behind what is increasingly called the “plasticene” (Reed, 2015; Tiller et al., 2019; Rangel-Buitrago et al., 2022).

Specifically, I rely on stage theory and the work of Karl Polanyi. Stage theory characterizes shifting expressions of economies such as the post-World War II (WWII) “Fordist” economy and the following “neoliberal” period explained below. In 1944, Polanyi (2001) published one of the more important contributions to political economy of the 20th century, *The Great Transformation*, which provides important insight relevant to MPP.

The paper demonstrates that the answer to MPP problem depends on how the global plastic flow is embedded in socioecological protections. This is because 3–4% of plastic that leaks from annual global plastic production (Jambeck et al., 2015) is *dialectically constitutive* with post-War stages of capitalism itself, that is, plastic and capitalism organize each other. Plastic flow is expected to “triple globally from 460 Mt in 2019 to 1,231 Mt in 2060” (OECD, 2022, p. 21). As capitalism and embeddedness change in stages so too does MPP and the appropriation of “cheap” ocean work (see Moore, 2015) and unequal ecological exchange in a galloping treadmill of production (ToP).

Plastics in the global economy

Plastic was first made in 1907 but was “insignificant from a historical perspective” until WWII (Geyer, 2020a, p. 33). Since then, plastic is increasingly an essential “workhorse material” (Hahladakis, 2020, p. 12830) for economic production.

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In the 1940s, plastic production grew as a WWII material for equipment but also a new form of oil refining, catalytic cracking, was used to make high-octane jet fuel. Olefins, like propylene, are a byproduct that “became the vital feedstock for the production of petrochemicals and plastics” (Huber, 2012, p. 304) and “Massive petrochemical plants sprung up next to oil refineries in the United States and Europe” (Mah, 2022, p. 5). Plastic commodities expanded at scale (Huber), linking plastic Fordist capitalism and war.

Plastic production intensifies again but much more dramatically in the neoliberal stage (1979–present) when plastics become the third most manufactured material behind cement and steel (Geyer, 2020b; Rangel-Buitrago et al., 2022) and is seen as “inextricable” from modern living (Huber, 2012, p. 307; see Figure 1). Neoliberalism puts the control of the economy primarily in private, not public, control (Centeno and Cohen, 2012). Davidson (2017) divides neoliberalism into three periods: the initial “vanguard” period (Reagan/Thatcher beginning), a period of consolidation where center-left parties adopt neoliberalism and solidifies neoliberal international hegemony, and crisis neoliberalism after the 2007 global recession. We see that the vanguard period increased the gross and pace of growth in plastic production, both of which grew again post-1992 until the 2007 crisis that temporarily slowed production (Figure 1).

Figure 1 shows that MPP part of the “Great Acceleration” – the exponential growth of problems like nitrogen pollution and biodiversity loss (McNeill and Engelke, 2014) realized by the tendency to increase the ratio of products per unit of labor over time, hastening biophysical throughput in a treadmill (Stoner and Melathopoulos, 2015).

Plastic is a synthetic material that substitutes increasingly scarce natural resources and is “intrinsic” to the ToP (Foster et al., 2011, p. 210) as much as post-War capitalism is intrinsic to plastic. ToP was first described by Alan Schnaiberg (1980) who recognized post-War capital investments greatly increased production necessitating equal increases in natural resources; also, the new production processes were energy and chemically intensive resulting in accelerating pollution, especially of synthetic materials like plastic. This means that the market partially evades a constraint described by van der Pijl (2001) who notes the regular phases of (1) original

accumulation, (2) production, and (3) exhaustion, and then the process starts over again. Plastic is only becoming more abundant.

Successive cycles renew the process and the treadmill grows, also growing firm power and independence from government since the state increasingly depends on growth (Gould et al., 2015). While producers believe, “production is legitimately the exclusive province only of the owner/management/shareholder class,” (Gould et al., 2004, p. 303), steering production is essential to reducing MPP under ToP. Unfortunately, neoliberalism globalized the plastic flow, facilitating the transfer of waste to global South labor, markets, and ecosystems (Gould et al., 2004; Lewis, 2019).

While plastic helps avoid some natural resource exhaustion, it still consumes the ocean as a sink. Since the exhaustion of ecological sinks can interfere with production, I will call this contradiction “maximum pollution.” Maximum pollution is a field of obstacles that increasingly interfere with commodity production and accumulation as the pollution becomes progressively costly and unacceptable, like O’Connor’s (1991) “second nature.” Second nature is nature changed by capitalism, and even though it initially seems free, second nature later undermines capital accumulation, for example, mining the soil in agriculture. Further, second nature provokes social resistance with a self-aware civil society. Already, the increased attention from publics around the world has put the petrochemical industry on “high alert” as reported by Alice Mah:

‘We need to make plastic fantastic again,’ said a senior industry adviser in his keynote speech on the ‘Future of Polyolefins’ in January 2019. ‘We need to get the image of plastic in oceans out of the public’s mind’ (Mah, 2021, p. 122).

Nevertheless, MPP is on the global agenda now, and the new treaty *might* embed the plastic flow. The treaty mandate calls for measures across the life cycle of plastic, which includes plastic production. It is not yet clear how this life cycle will be restrained or directed, however, MPP clearly requires authentic restraints, such as limits on the petrochemical industry, because it “endangers human health and causes disease, disability, and premature death at every stage of its long and complex life cycle” (Landrigan et al., 2023, p. 71). However, will the treaty lean more on economic structures, or will it focus more on individual responsibility, like recycling? In other

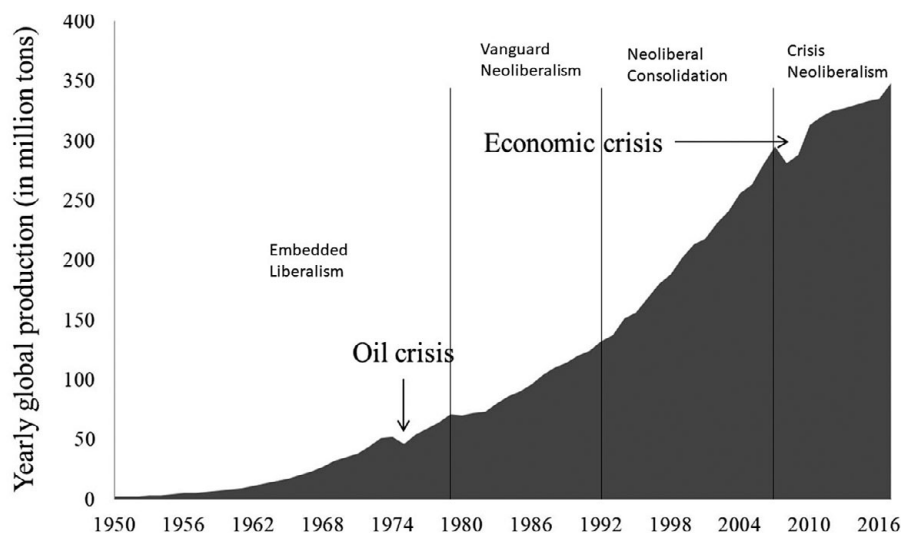


Figure 1. Periodized plastic production. Adapted from da Costa et al. (2020, p. 2) under CC BY.

words, *how* will plastic become embedded, how much *social* protection will be instituted?

Embeddedness and social protection

Polanyi elaborated three concepts that help explain environmental crises – fictitious commodities, embeddedness, and double movements. Polanyi defines commodities as “objects produced for sale on the market” (p. 75). This means that things not produced for sale but are required for markets to function, like land (nature), labor, or money (Burawoy, 2021 adds knowledge) are “fictitious commodities.” These require social institutions – social and ecological protections – to shield them from annihilation:

Undoubtedly, labor, land, and money markets *are* essential to a market economy. But no society could stand the effects of such a system of crude fictions even for the shortest stretch of time unless its human and natural substance as well as its business organization was protected against the ravages of this satanic mill (Polanyi, 2001, pp. 76–77, emphasis in original).

Thus, economies must “always and everywhere” (Block, 2007, p. 5) be “embedded” in legal, cultural, and political restraints because a market economy will destroy itself without them. Current neoliberal governance has progressively thinned restraints: “the idea of the free market drives policies that are *increasingly* destructive,” a progression Stuart et al. (2020, p. 38, emphasis added) use to explain climate politics.

For example, “In disposing of a man’s labor power the system would, incidentally, dispose of the physical, psychological, and moral entity ‘man’ attached to that tag” (Polanyi, 2001, p. 76). Similarly, if the market were the only authority, “Nature would be reduced to its elements, neighborhoods and landscapes defiled, rivers polluted, military safety jeopardized, the power to produce food and raw materials destroyed” (Polanyi, 2001). Granovetter (1985) likened “disembeddedness” to the Hobbesian state of nature.

Polanyi argued societies react to the first movement of *laissez faire* to protect themselves through a second movement. These “double movements” were made up of a “wide range of social actors, to insulate the fabric of social life from the destructive impact of market pressures” (Block, 2008, p. 1). Further, these movements are “not simply national phenomena, but global phenomena” and *laissez faire* has been ascendant the past 200 years due to financial and military coercion from globally dominant powers, exported first from England and then the US (Block, 2008, p. 4).

However, Fraser (2014) warns that Polanyi’s social protections are romantically communitarian and so as to avoid domination she adds a third movement of intersubjective consent. Nonetheless, she also argues that Polanyi could never have known how dramatic the (holistic) social and ecological crisis would be (Stuart et al., 2020 also make this point about climate change).

Another problem: Polanyi assumes a semi-autonomous public and state who comprehend a genuine public interest separate from economic elites, or “thick reciprocity” of meaningful relationships and a logic of solidarity beyond simple exchange (Block, 2008). If the public is too easily “purchased,” as Gramsci (2011) believed, then there is a danger of a false counter-movement where the “protections” serve economic elites while appearing to solve a problem. For example, scholars (see, e.g., Ferguson, 2018; Gunderman et al., 2018; Stuart et al., 2019, 2020) have used this logic to critique carbon markets as false counter-movements that expand market power and protect fossil fuels. Avoiding a false counter-movement or an “empty institution” with no regulation

(Dimitrov, 2019) will require a vigilant global civil. Just as in climate change, “a real solution” to MPP “would involve subordinating economic systems to social and environmental goals” (Stuart et al., 2020, p. 36).

Stages of capitalist development

Here I review some of the more important liberal and Marxist brands of stage theory to put MPP in context as well as highlight broader global importance of authentic embedding of the plastic flow. The core tension between these two general orientations is over-embeddedness – how shall nature, labor, and money be distributed?

Modern liberal approaches

Enlightenment theorists like Mandeville, Locke, and Mill described social progress as a Eurocentric natural history (see Brewer, 1998). Smith (1976) thought evolving production methods, increased divisions of labor, and development of markets brought socio-economic progress. Progress equaled economic growth and better material lifestyles, including luxury goods (Brewer, 1998). In Book IV of *The Wealth of Nations*, Smith elaborates on the “four-stage theory” defined by the mode of subsistence: hunting, pastoralism, farming, and commerce. This is explained in his discussion of a standing army (Chapter 1, Part 1) where each mode of subsistence requires different institutions that serve the specific needs of that stage. For example, “Among nations of hunters, the lowest and rudest state of society, such as we find it among the native tribes of North America, every man is a warrior as well as a hunter” (p. 213). A standing army is not needed. Pastoralists and farmers can form an army and subsist on their own. It is not until the commerce stage that this changes. If a carpenter joins an army, the carpenter has no subsistence on his/her own because “Nature does nothing for him, he does all for himself. When he takes the field, therefore, in defense of the public, as he has no revenue to maintain himself, he must necessarily be maintained by the public” (p. 217). Meanwhile, war becomes a “very intricate and complicated science” requiring a professional army. Smith’s four-stage theory explains that institutions need to solve problems that are *incidental* to progress (Harpham, 1984, p. 769). While Smith knew social protections could not be left to merchants, the main restraint was competition and institutions should be structured to increase the economic growth and natural freedom (see, e.g., Naggar, 1977), not restrain production.

Related, Meramveliotakis and Manioudis (2021) argue that Mill was deeply impacted by the Scottish Enlightenment and Smith in particular. “Mill’s ‘stages theory of economic development’ is founded on the principle of succession and progress and its central premise ‘is the desire of increased material comfort’” which is brought to society through improvements in knowledge and then technology (Mill, 1898; Meramveliotakis and Manioudis, 2021, p. 6).

Finally, both Rostow (1960) and Organski (1965) proposed stages of economic development for poor countries to follow. For Rostow, “It is possible to identify all societies, in their economic dimensions, as lying within one of five categories” (p. 4):

1. Traditional society
2. Preconditions for take-off
3. Take-off
4. Drive to maturity
5. High mass-consumption.

Distancing from Marxism, Rostow states, "...although stages-of-growth are an economic way of looking at whole societies, they in no sense imply that the worlds of politics, social organization, and of culture are a mere superstructure built upon and derived uniquely from the economy" (p. 2). Economic changes are "the consequence" of political and social changes. The goal of institutions is to realize the "end of history" in mass consumption. Inequality between societies at different stages of production is natural, and pollution is an opportunity where "economic logic behind dumping a load of toxic waste in the lowest-wage country is impeccable" (former World Bank economist Lawrence Summers quoted in Foster, 1993, online).

Still, both liberal and Marxist camps see history as linear and traditional societies are deemed backward (Chilcote, 1994).

Liberal stage theory sees progress embodied in mass consumption and development. Problems growth are merely necessary nuisances – there is no maximum pollution. Notions of social protections are, as in Smith, guided by "the self-interest that lies at the heart of modern commercial society" (Harpham, 1983, p. 773). Thus, if the MPP treaty is made in the liberal view, and it almost certainly will be, it be less embedded with the distribution of land, labor, and money heavily favoring monopoly capital.

Marxist stage theories

Marxist theories see environmental problems, like MPP, as "metabolic rifts," or disruptions in natural systems caused by capital accumulation processes. In ecological unequal exchange, nutrients from agricultural fields of the countryside become food for the urban core. When the nutrients are not replenished, the periphery is depleted to build the core and the human relation to the natural world is ruptured (Foster, 1999). Metabolic rifts are always an imperial relationship. Global environmental problems are explained by the totalizing pursuit of profit, "subsuming all natural and social relationships" which "generates rifts in natural cycles and process..." (Foster et al., 2011, p. 76).

The Uno School

Albritton (2022), writing in the Uno tradition, the stages of capitalist development, "...consists of a more concrete set of interacting ideological, legal, and political practices dominated by a set of economic practices" (p. 5, 1). Albritton suggests four stages: mercantilism (1600–1775), liberalism (1740–1875), imperialism (1880–1914), and consumerism (1945–1975) where the dates indicate the "golden age" of each stage (p. 1). After consumerism, Albritton expects "disintegration of capitalism towards forms of barbarism that portend the end of human society as we have come to know it" through militarism and climate change – or a more humane socialism (p. 6). Uno (2016) made considerable progress for stage theory through a thought experiment of a purely capitalist society where all relations are commodity relations and all noneconomic (e.g., use) value is either turned into commodity values or eliminated. Society operates through the dialectical logic of expanding capital and market imperatives (Sekine, 2020), that is, totally disembedded and set to devour itself and drown in waste.

The Regulation Approach School

In the "Regulation Approach" (RA) which "explores the interconnections between the institutional forms and dynamic regularities of capitalist economies," Fordism plays an important role (Moulaert et al., 1988; Jessop and Sum, 2006, p. 3). The RA approach is attuned to the crisis tendencies of capitalism and

attends to the historical ruptures of structure "as accumulation and its regulation develop in and through class struggle" (Jessop and Sum, 2006, p. 4). The accumulation type referred to as Fordism has four components:

1. Mass production of standardized goods under a technical division of labor and a Taylorist scientific management expectations.
2. A positive feedback between mass production and mass consumption, where economies of scale increase incomes and demand which lead to more investments and improved techniques that grow production. Not all firms need to be Fordist, but this second criteria means other related industries need to also increase their production, for example, the steel industry for car production.
3. It is a mode of regulation that includes, "an ensemble of norms, institutions, organizational forms, social networks, and patterns of conduct" that guide the Fordist firms, including Keynesian welfare standards such that "most citizens can share in the prosperity of economies of scale" (Jessop and Sum, 2006, pp. 60–62).
4. The broader social impacts are a normalized mass consumption of standardized commodities and a standardized set of collective services from a bureaucratic state/local government like education, unemployment, retirement, and health insurance. All of this normalizes ideals (nuclear family, private car ownership, suburban home).

In the post-War Fordist period, mass production began in earnest internationally, firms were regulated and were expected to be good "citizens," currency exchange was regulated by the gold standard, and workers benefited from corporate profit with strong wages bolstered by unions (Moulaert et al., 1988). Ruggie (1982) called this period "embedded liberalism." Plastic is mass-produced, but with restraint.

During this period, plastic production reached 2 Mt (Geyer, 2020a). As post-Fordist neoliberal institutions developed, plastic production grew by hundreds of times, for example, by 2015 the global 450 Mt of plastic was produced (Geyer, 2020a).

Nixon abandoned the gold standard in 1971 but neoliberalism was fully embraced by Ronald Reagan and Margaret Thatcher who deregulated corporate obligations allowing the consolidated profit-making without shared benefit to communities or workers, increasingly less represented by unions. Meanwhile, social safety nets were reduced – all of which spurred yawning inequality (Jacobs and Myers, 2014). As the post-Fordist global economy grew, "site-intensive factory machinery and fixed capital of 'heavy modernity' dissolve into outsourcing, batch production, and hypermobile capital" (Yaeger, 2010, p. 523) – and plastic production grew at its fastest, most devastating, pace (Geyer, 2020a).

The Capital-Logic School

Related, in the Capital-Logic School (Hirsch, 1978), the capitalist economy grows further from social control because of the internal logic of capital. This logic is to convert relations from noneconomic forms to commodity forms: "commodity form of relations between people and likewise between humans and nature is accepted as an unquestionable self-evident truth" (Altwater et al., 1997, p. 454). Money as the super-commodity, "...enables all qualities to be reduced to one: it makes apples and pears, pneumatic drills and nappies the same and so renders them comparable on the market" (Altwater, 1997, p. 48). Thus, the Capital-Logic School sees capitalist development unfolding the internal logic of capital itself, and MPP

can again be seen as a result of disembedded economic logic. This means that MPP and other environmental changes face the difficult realities of the, “actual governability of limited environmental space under the auspices (or in the context) of globalized, politically borderless, socially disembedded, and deregulated economic processes” (Altvater, 1999, pp. 47–48).

The Lenin School of imperialism and monopoly capital

Finally, the Leninist view that imperialism is the highest stage of capitalism (Lenin, 1939), has been extremely influential in later theorizing, such as Ernest Mandel’s theory of the “late capitalist” stage and the Uno School (McDonough, 1995). Preceded by Hilferding who proposed that finance capital – the combination of industrial and bank capital through the joint-stock company – was the highest stage because the pools of capital vastly expanded the scale of capitalism (Hilferding et al., 2019). Hilferding argued that this expansion allowed for the creation of cartels and monopolies, protected by tariffs organized through capitalist political force; and undeveloped areas become increasingly valuable abroad, making war likely as strong states advance to claim new space through primitive accumulation. Lenin synthesizes these accounts to define the stage of imperialism as when:

1. the concentration of production through monopolies make a “decisive role in economic life”
2. banking and industrial capital pool together into a “financial oligarchy”
3. export of capital becomes central
4. “international monopolist capitalist associations...share the world among themselves”
5. “the territorial division of the whole world among the biggest capitalist powers is completed” (Lenin quoted in McDonough, 1995, p. 353)

Imperialism is a manifestation of monopoly capital pursuing ecological space and people to feed the commodification processes in a dynamic that would later inform the notions of dependency and underdevelopment in comparative politics, describing a flow of value-enriching wealthy core imperial states (Chilcote, 1994). The reverse is also true: wealthy states export pollution, as they do plastic waste, to poorer countries who hope to capture some value in it (Bai and Givens, 2021).

Lenin provides the foundation for Magdoff (1969), Sweezy (1970), and Braverman (1998) – the “Monopoly School” which argues the concentration of capital into industrial oligopolies was the stage of capitalism from beginning of the 20th century. Yeros and Jha (2020) write that the “concentration of capital persists today hand in hand with the escalation of primitive accumulation and war, while national sovereignty continues to fray in the peripheries...” (p. 78). Foster (2021) also applies the stage of monopoly capitalism as contemporary mode of accumulation that can help explain “contradictions specific to monopoly capitalism such as the growing role of waste in production” (abstract). Foster refers to monopoly capitalism as the advent of the modern giant corporation that no longer allows for competition from smaller, especially, family, firms; Schnaiberg (1980) adds that monopoly firms tend to have better control over their sources and processes, like petrochemicals. Indeed, some of the largest companies in the world are also among the largest plastic producers – for example, Dow Chemical, ExxonMobil, BASF (Plastics Technology, 2022), making MPP also a result of monopoly power. Monopoly capitalism grows the power and autonomy of large corporations and empowers them to push government for less regulation, and

corporate power is all the more important in managing the plastic flow when governance is fragmented and the issue is complex and costly (Dauvergne, 2018; Mah, 2022).

All the Marxist schools see something like MPP as a result of capital aggregating across stages where it increasingly abuses people and ecologies in larger and larger rifts.

Conclusion

Karl Polanyi imagined the development of capitalism through both the movement of *laissez faire* and its restraint in a double movement. Liberal stage theory sees mass consumption as human progress and problems that arise are necessary nuisances, embodying the first movement. Marxist stage theory embodies the second movement, warning that capital is ever striving to commodify everything. Polanyi, certainly over-confident that society would protect itself, did warn against the failure of the second movement which would result in a Polanyian nightmare and the *coup de grace* of a complete metabolic rift:

To allow the market mechanism to be sole director of the fate of human beings and their natural environment indeed, even of the amount and use of purchasing power, would result in the demolition of society (Polanyi, 2001, p. 76).

For the plastic treaty to be effective, it must successfully embed plastic production, and restrain the market mechanism. Specifically, there will need to be serious restraints on monopoly capital in the petrochemical industry. Whether it does this or not will depend on whether global society lives up to Polanyi’s hope or if we pursue the Uno imaginary of universal commodity relations. From this stage of history, however, states and economic forces do not seem keen on anything but empty institutions (Dimitrov, 2019).

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