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A progressive framework for green industrial policy

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ABSTRACT

In the age of ecological breakdown, there is a growing need for 'green' industrial policy. However, existing frameworks for green industrial policy fail to address unsustainable growth in energy and resource use in high-income economies. In this sense, they are not adequate to achieve core ecological objectives. This paper fills a gap in the literature by offering a progressive framework for green industrial policy that combines traditional green industrial policy perspectives with insights from ecological economics and literature on post-growth and degrowth. The framework has three key pillars: (1) scale down ecologically harmful industries and sectors to directly reduce energy and resource use; (2) organise production more around public benefit, with greater democratic control and guidance over investment and production; and (3) work towards global ecological justice and enable greater 'ecological policy space' for the global South to pursue industrial development. The paper argues that this progressive approach to green industrial policy is necessary due to the scale and urgency of the ecological crisis. The framework shows how productive capacity can be liberated and redirected towards more socially and environmentally beneficial ends, while also democratising control over the economy.

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Introduction

Industrial policy is increasingly popular. Although governments have in one way or another always intervened in markets to develop specific industries and to push innovation – or even shaped and set the boundaries of markets to do so – industrial policy has experienced a renaissance since the 2010s as an explicit government objective (Stiglitz *et al*. 2013, Cherif and Hasanov 2019, Aiginger and Rodrik 2020, Juhász *et al*. 2023). Evenett *et al*. (2024) find that the mentions and use of industrial policy around the world have steadily increased due to more state intervention after the 2007/08 global financial crisis, intensifying geopolitical competition, and efforts to strengthen domestic manufacturing in the wake of supply chain disruptions. The United States' CHIPS and Science Act represents a clear example of this. In August 2022, the United States Congress authorised the largest industrial policy bill in history: $280 billion in new funding to boost domestic research and manufacturing of semiconductors and ancillary high-tech industries (White House 2022). The idea was both to strengthen US manufacturing and become less dependent on imports of manufactured goods from East Asia, particularly China.

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Governments are also now recognising that industrial policy may be useful or necessary to achieve certain ecological objectives, and that industrial production itself must be attentive to ecological impacts. Thus, the emergence of 'green industrial policy'. This approach started gaining traction in the 2010s, kickstarted by calls for green growth – very simply, the idea that economic growth can and should be more ecologically sustainable (Jacobs 2013, Pollin 2015, Hickel and Kallis 2020). Hauge (2023) highlights that three economic and political observations specific to the contemporary world economy underpin the rationale for green industrial policy: (i) change to the status quo of the global economic system is needed, involving a stronger focus on ecological sustainability; (ii) the manufacturing sector must play a role in the green transition, both through offering new, green technological solutions and through making existing energy systems and production methods greener; (iii) state action, involvement, incentives, and investment are crucial to achieve a green transition, especially because private markets – which organise production around what is most profitable rather than what is most necessary – do not have a good track record of dealing with problems related to ecological breakdown.

In the age of ecological breakdown, the world economy needs more and stronger green industrial policy. However, there are questions about whether industrial policy, as currently formulated, can be truly green. A growing body of literature in industrial ecology and ecological economics, developed under the umbrella of post-growth and degrowth, argues that continued aggregate growth in high-income countries is likely to be incompatible with ecological sustainability (Weiss and Cattaneo 2017, Haberl *et al*. 2020, Vogel and Hickel 2023). According to this literature, high-income countries should pursue planned reduction in energy and resource use in order to enable rapid decarbonisation and alleviate other ecosystem pressures (Hickel 2021). Some of this can be achieved through efficiency improvements, but it also requires scaling down less-necessary forms of production to reduce energy and resource use directly, and so that productive capacities can be redirected toward more socially necessary objectives.

To the extent that one of the objectives of industrial policy is to increase aggregate production, this is at odds with the critique of growth that has been developed within industrial ecology and ecological economics. Indeed, there are clear contradictions between this aim of industrial policy, as traditionally formulated, and ecological sustainability. This paper discusses these contradictions and offers a new, progressive framework for green industrial policy. This framework fills a gap in the existing literature by building on insights from literatures on both green industrial policy and degrowth. The paper first explores the journey of industrial policy toward ecological considerations, outlining the rationales and pillars of both industrial policy and green industrial policy. Then, the paper explores the contradictions of green industrial policy from a degrowth perspective. Building upon these critical analyses, the paper offers a progressive framework for green industrial policy, rooted in three policy areas: reduce damaging and unnecessary forms of production, organise production more around public benefit, and pursue global ecological justice.

The green journey of industrial policy

Industrial policy can generally be defined as state intervention to move the economy towards a desired structure in the medium/long term. At a more granular level, industrial policy refers to strategic government intervention at the firm or industry level to develop the economy, often with the aim growing innovative, productive, and high-value activities (Chang 1994, Pack and Saggi 2006, Rodrik 2008, Hauge 2023, Juhász *et al*. 2023). Industrial policy can be designed in a range of different ways, so, in practice, the toolbox of industrial policy is extensive. Trade policy is an obvious example, such as import tariffs and export subsidies to protect and assist domestic producers. But industrial policy can also involve less obvious instruments, such as price regulation, exchange rate policy, labour training policy, long-term financing by development banks, the establishment of state-owned enterprises, and infrastructure investment, to name a few.

The appropriate degree of state intervention has always been central to discussions on industrial policy. This makes the role of industrial policy a contentious issue, as it relates to state-versus-market

debates. Irrespective of one's opinions on this, industrial policy has been used by governments for hundreds of years and has been an invaluable tool for economic growth and development strategies. Alexander Hamilton, one of the founders of the United States, was a fierce a supporter of industrial policy, and laid the basis for a century of steep tariff barriers on imports of manufactured goods into the United States, which helped enable US industrialisation (Chang 2002). In the second half of the twentieth century, industrial policy was at the centre of the rapid economic development of the so-called 'Asian Tigers' (Hong Kong, Singapore, South Korea, and Taiwan) (Wade 1990, Amsden 1992, Chang 1994, Woo-Cumings 1999).

Even governments that have been ideologically opposed to state intervention have used industrial policy. Ronald Reagan protected the US steel and automotive industries from import competition, and Margaret Thatcher designed financial incentives to increase investment rates in the UK automotive industry (Juhász *et al*. 2023). That said, the period of neoliberalism spearheaded by Thatcher and Reagan in the 1980s saw a decline in the use of industrial policy globally, and particularly in the global South. This was largely because industrial policy was effectively outlawed by international organisations – such as the International Monetary Fund (IMF), the World Trade Organization (WTO) and the World Bank – through the enforcement of free trade agreements and structural adjustment programmes (Wade 2003, Chang 2007, Gallagher and Kozul Wright 2022).

Since the 2010s, however, industrial policy has come back with force (Stiglitz *et al*. 2013, Cherif and Hasanov 2019, Aiginger and Rodrik 2020, Juhász *et al*. 2023). This is due to a number of reasons (for a detailed discussion, see Evenett *et al*. (2024)). First, in the wake of the global financial crisis in 2007/08, governments have become more wary of leaving key national objectives to the market, and have generally increased levels of regulation and intervention. Second, we have witnessed increasing geopolitical competition, especially between the United States and China, the two largest economies in the world. Both countries are more actively ramping up investment in manufacturing and innovation as part of broader strategies to strengthen their international competitiveness and international economic power. Third, the COVID-19 pandemic and Russia's invasion of Ukraine rattled global supply chains, reminding countries of the dangers of being too dependent on imports of critical goods and intermediate inputs. The response by governments around the world was to use industrial policy to strengthen domestic production.

The return of industrial policy is also due to growing environmental concerns. Governments are recognising that the world economy needs to become cleaner and greener, involving change to the status quo. So far the private sector has not made the necessary investments in renewable energy, public transit, building insulation, etc, because these are not considered sufficiently profitable (Christophers 2024). In light of this, governments are recognising that state intervention is necessary to achieve a green transition. Of course, the motivation to develop green industries is not coming purely from the perspective of respecting planetary boundaries, but also from a desire and need to be internationally competitive in technological clusters that are shaping our future (Lebdioui 2024). Countries are racing to become global leaders in industries associated with renewable energy, such as batteries, electric vehicles, photovoltaics, and wind turbines, to name a few. China, for example, has become the world's leading manufacturer of electric vehicles and photovoltaics through years of strategic industrial policy (IEA 2024).

Unsurprisingly, the idea of 'green industrial policy' has become more central to discussions on ecological sustainability and national economic development/planning policy (Hallegatte *et al*. 2013, Rodrik 2014, Schmitz *et al*. 2015, Altenburg and Assman 2017). The idea of green industrial policy has grown alongside and builds upon the idea of 'green growth'. Green growth as an agenda was pushed by various international organisations in the 2010s, and has by now become mainstream. The idea is to achieve growing GDP alongside a reduction of ecological impacts to sustainable levels, e.g. by absolutely decoupling GDP from greenhouse gas emissions and resource use (Jacobs 2013, Pollin 2015, Dale *et al*. 2016, Hickel and Kallis 2020, Green 2023).

In terms of how green industrial policy has been defined and discussed in existing literature, it can be understood as state intervention that supports the green growth agenda. One lens through

which one can understand green industrial policy is through the idea of Green New Deals (although a few of these – such as the Green New Deal for Europe – are critical of the idea of green growth). These are sweeping public policy packages with the intention of tackling climate change and global warming, while at the same time creating jobs and reducing economic inequality (e.g. Pettifor 2019, Rifkin 2019, Chomsky and Pollin 2020, Ajl 2021). Green New Deals have a strong association with progressive politics, especially in the United States, building upon Franklin D. Roosevelt's famous New Deal in the 1930s. In both Europe and the United States, the concept of Green New Deals started gaining momentum in the 2010s. It reached mainstream political discussion in 2019, when the Democrats Alexandria Ocazio-Cortez and Ed Markey attempted to get legislation passed for a Green New Deal in the United States Senate.

In line with both green growth and Green New Deals, green industrial policy focuses heavily on reducing greenhouse gas emissions through investment in new energy systems, energy infrastructure, and energy efficiency. The literature on green industrial policy is rich with extensive country case studies on public investment strategies in renewable energy, but also provides insight into the details of green government intervention, including carbon taxes, feed-in tariffs, research and development (R&D) support, subsidised credit, and public procurement (e.g. Hallegatte *et al*. 2013, Altenburg and Assman 2017, Pollin 2020).

There is clearly a need for more green industrial policy. However, one may question the ability of industrial policy to be truly green, at least in terms of how it has been considered so far. At their core, existing frameworks of green industrial policy support the idea of increased aggregate economic growth. But mounting evidence suggests that, in high-income countries, degrowth approaches may be necessary for ecological sustainability.

The contradictions of green industrial policy: A degrowth perspective

The idea of ecological limits to economic growth began receiving serious attention by economists as early as the 1970s (e.g. Georgescu-Roegen 1971, Meadows *et al*. 1972, Daly 1973). Over the past decade, research in industrial ecology and ecological economics has demonstrated that the global ecological crisis is being driven overwhelmingly by excess production and consumption in high-income countries. In high-income countries, material resource use exceeds sustainable guardrails by on average a factor of four (Hickel *et al*. 2022), and they are responsible for around 90 per cent of global carbon emissions in excess of the safe planetary boundary (Hickel, 2020b; Fanning and Hickel 2023). By contrast, low-income countries have low levels of resource and energy use, well within sustainable levels, and in fact need to increase resource and energy use in order to achieve human development objectives.

Advocates of green growth claim that by harnessing technological change and efficiency improvements, high-income countries can continue increasing total output while reducing resource use to sustainable levels and get emissions to zero by 2050. But researchers in industrial ecology and ecological economics have raised major empirical questions about the feasibility of achieving these objectives.

Let us first look at resource use. Several major reviews have found that despite strong efficiency improvements, high-income countries are not achieving sustained absolute decoupling of GDP from resource use – let alone the rates of decoupling necessary to achieve sustainable levels – and extant models indicate it is unlikely to occur in a growth-oriented scenario even under optimistic assumptions (Haberl *et al*. 2020, Hickel and Kallis 2020, Vadén *et al*. 2020, Vadén *et al*. 2021). This is because, in a growth-oriented economy, gains (savings) from efficiency are leveraged to expand total production, making absolute reductions in resource use very difficult to achieve.

Emissions are a somewhat different story but have parallels to the developments in resource use. Many high-income countries have achieved absolute decoupling of GDP from emissions, even in consumption-based terms (although the total number of countries achieving absolute decoupling remains relatively low; Hubacek *et al*. 2021). However, no high-income countries are on track to

meet their Paris climate obligations. At existing rates of mitigation, they will take on average more than 200 years to decarbonise and will burn their fair-share of the remaining carbon budget 27 times over (Vogel and Hickel 2023). Much faster mitigation is needed. For high-income countries, this is challenging because they have high levels of energy use, meaning a massive effort is required to build out enough renewable energy infrastructure. Climate scientists and industrial ecologists indicate that the only way for high-income countries to achieve sufficiently rapid decarbonisation is to reduce total energy use. Some of this can be achieved with efficiency improvements, but again – given economy-wide rebound effects (Berner *et al*. 2022) – this is not enough by itself.

To resolve these problems, recent research indicates that high-income countries need to abandon aggregate growth as an objective (Kallis *et al*. 2025), and take a more industry-specific approach to economic development. This implies focusing on increasing and improving socially and ecologically necessary activities, while scaling down or 'degrowing' harmful and less-necessary forms of production to reduce energy use and resource use directly (Hickel *et al*. 2021). This may include reducing production of, for example, SUVs, cruise ships, fast fashion, industrial meat, mansions, private jets, commercial aviation, advertising, weapons, etc. In the climate policy literature and IPCC reports, this is referred to as 'demand-side' or 'sufficiency'-oriented mitigation (Creuzig *et al*. 2022, IPCC 2022). Any unemployment that may be created by industry-specific reductions is intended to be mitigated by implementing a public job guarantee, which provides a mechanism for reallocating labour away from damaging and unnecessary sectors toward other forms of production (for example, to produce renewable energy, public transit, public housing, etc.) (Olk *et al*. 2023). With this approach, high-income countries can accelerate progress on decarbonisation and other ecological objectives while improving social outcomes at the same time.

It is important to underscore that the need to reduce *aggregate* production applies only to high-income countries – not to developing countries (although developing countries too can benefit from the general approach of reducing harmful and unnecessary output in order to increase socially beneficial and economically strategic production). Furthermore, it is important to note that degrowth scholarship embraces technological innovation (Hickel 2023). All published post-growth and degrowth scenarios start with rapid technological change and efficiency improvements, accelerated through public investment, and then add sufficiency and equity measures (Victor and Rosenbluth 2009, D'Allesandro *et al*. 2020). For example, scenarios for transport-sector decarbonisation require EVs (technology, efficiency) but also a rapid and large-scale reduction in car use and a shift toward public transit (sufficiency and equity) (Winkler *et al*. 2023). A recent study in *Nature Energy* finds that this approach – efficiency plus sufficiency – can enable the United Kingdom to reduce energy use by more than 50 per cent, without compromising citizens' quality of life, and thus bring Paris-compliant mitigation within reach (Barret *et al*. 2022).

This scholarship clearly contrasts with traditional industrial policy, even in its 'green' formulation. Degrowth questions the pursuit of *aggregate* growth and wants instead to distinguish between socially beneficial and damaging or unnecessary production. Furthermore, in contrast to most of the literature on green industrial policy, degrowth offers an assessment of the ecological crisis that extends beyond just emissions, to include resource use and other ecological pressures (Hickel 2020a, Fanning *et al*. 2022, Parrique 2024). With this approach, additional contradictions of the traditional green industrial policy literature emerge. For example, if high-income countries maintain high and growing production, the decarbonisation strategy will have to require high and growing levels of material extraction in order to build out the necessary renewable energy infrastructure and devices, thus exacerbating ecological pressures associated with resource use. Gregoir and van Acker (2022) find that Europe will have to ramp up its demand for metals – in particular cobalt and lithium – by an extraordinary amount in order to meet its clean energy goals by 2050. With lithium, it is estimated that the world would need a 2,700 per cent increase in extraction compared to 2020 levels (Hickel 2020a). This would have to involve more deep seabed mining, which would have a devastating impact on deep sea ecosystems and biodiversity (WWF 2021). These problems can be mitigated by reducing aggregate energy use.

Traditional frameworks of green industrial policy include elements that are clearly important and needed to meet the challenge of ecological breakdown. But it is clearly also necessary to develop a more progressive framework for green industrial policy – one that considers not only emissions but also material resource use, and which offers a robust alternative to the conventional approach of ever-increasing production and consumption. The remainder of this paper outlines such a framework.

A progressive framework for green industrial policy

Our progressive framework for green industrial policy is rooted in three pillars: (1) scale down ecologically harmful industries; (2) produce for public rather than private benefit; and (3) take steps to achieve global ecological justice. The framework combines traditional green industrial policy perspectives with insights from ecological economics and literature on post-growth and degrowth. Table 1 summarises the framework. The details are outlined in the text that follows.

Table 1. A progressive framework for green industrial policy.

Policy area	Policy rationale	Key policy instruments
Scale down ecologically harmful industries	Ecologically harmful and socially unnecessary production needs to be scaled down, to directly reduce energy and material use and to liberate productive capabilities to be redirected toward other objectives.	Credit policy Central banks can impose rules on commercial banks to limit the quantity of money they can lend to 'problem' sectors. End planned obsolescence Stronger consumer protection laws (e.g. longer warranties on consumer products) and 'right to repair' laws. Remobilise liberated capabilities Industrial policy to redirect liberated resources and productive capabilities towards environmentally and socially beneficial goals.
Organise production more around public benefit	Because production is predominantly organised around profit maximisation, it chronically underproduces ecologically and socially useful goods and services. A greater role for public finance, public services and credit guidance is needed to ensure necessary production.	Credit guidance State-led credit guidance frameworks by banks and financial institutions to guide investment to desired sectors. To this end, greater coordination between policy levers of the state is needed. Increase (decrease) profitability of useful (useless) investments More forceful carbon taxes, green subsidies, bans and phase-outs. Universal public services Ensure sufficient production of and access to healthcare, education, affordable housing, public transit, public land, etc. Public job guarantee Ensure universal access to employment opportunities advancing key social and ecological objectives.
Global ecological justice	Solutions should reflect that the global North and the world's wealthiest bear overwhelming responsibility for ecological breakdown, while the global South needs ecological policy space for development.	More ecological policy space for the global South More policy space for the global South to pursue industrial policy, and climate remittances/ reparations for the global South. However, the South should take advantage of the economic opportunities from the green transition. A democratically determined transition within and between countries Curtail corporate money in politics, strengthen anti-trust legislation, and democratise global governance. Reduce the power of global elites Progressive taxation to reduce the wealth and purchasing power of the ultra-rich.

Scale down ecologically harmful industries

Energy intensive, ecologically harmful and socially less-necessary industries must be reduced in order to enable sufficiently rapid decarbonisation and achieve ecological objectives. It makes little sense to continue increasing production of things such as SUVs, mansions, yachts, private jets, fast fashion, and industrial beef in the middle of a climate emergency. Yet, remarkably, this is not yet considered within existing green industrial policy frameworks. In fact, there is not yet even a plan established for reducing fossil fuel production – a sector that clearly needs to be wound down.

Interestingly, some definitions of industrial policy already recognise that part of the goal of industrial policy is not only to increase productivity growth, but also to manage the decline of certain industries (e.g. Chang 1994, Chang *et al*. 2016). Managing the decline (or attempting to manage the decline) in employment potential and international competitiveness of the UK steel industry or the US automotive industry are instructive examples in recent years. Although this aspect of industrial policy has historically focused mainly on responding to industrial decline that occurs for other reasons (i.e. not as part of a plan), and has had little to do with ecological concerns, it can offer a starting point from which to consider the challenges ahead.

When thinking about what type of industries and sectors to scale down, some cut across the entire economy and some can be more traditionally understood as 'industries'. The fossil fuel industry and the advertising industry are among those that cut across the entire economy and have caused massive ecological damage. The fossil fuel industry has started receiving more attention in climate debates, but the advertising industry is still a tangential discussion point. Advertising is irrational from a social and environmental point of view. A core objective of the advertising industry is to push people to buy things they do not actually need or want, which many CEOs will openly admit (Hickel 2020a). Scaling down the advertising industry is more practically feasible than traditionally understood. Many governments already place restrictions on where, what, and how companies can advertise. Such restrictions and regulations can be expanded, for example by legislating against the use of psychologically manipulative techniques and liberating public spaces from ads.

In terms of specific industries to scale down, governments should target those that are most energy – and resource-intensive, and most unnecessary for human well-being. The aviation industry is a good example, given that this industry is difficult to decarbonise and disproportionately serves wealthier classes (Gössling and Humpe 2020). It is increasingly clear that commercial aviation will need to decline if we are to meet the Paris climate targets, barring some breakthrough technology that can achieve rapid decarbonisation in the sector. Another, perhaps less obvious one, is the beef industry. The beef industry is closely linked to soil degradation and deforestation worldwide. Some 60 per cent of agricultural land use globally is connected to the beef industry through grazing and animal feed production (Boucher 2012). Beef is also one of the most resource-inefficient foods in terms of the land and energy it requires per calorie and per unit of protein. Scaling down beef production and consumption, especially in the Americas and Europe, would substantially reduce emissions from agriculture and land-use change, and liberate land for ecological regeneration and carbon sequestration.

There are several policy approaches that can be leveraged to scale down specific industries. The most powerful and effective approach is to implement a credit policy framework. Central banks have the power to impose rules on commercial banks to limit the quantity of money they can lend to 'problem' sectors (and, as we will see in the next section, redirect capital toward more beneficial objectives). Such an approach could be used to reduce lending to the fossil fuel industry, for example, and thus ratchet down production of fossil fuels. Ultimately, the state holds the power of money creation. This power should be understood as a public good; whoever creates money controls production, mobilising the labour and resources of society. In capitalist economies, this power is largely franchised out to commercial banks, which create money when they make loans. Wielding the power of credit, commercial banks get to determine the allocation of investment and therefore

determine what gets produced. They make these decisions based on whatever production is most profitable, or generates the safest returns, regardless of whether it is beneficial or destructive.

Credit policy represents a democratically ratified framework to guide commercial bank lending in line with social and ecological objectives rather than just profit maximisation. Of course, commercial credit is not the only source of investment in the economy. Large firms can also draw on their accumulated profits to make investments. The fossil fuel industry is a good example of this: firms regularly use windfall profits to expand production, or to invest in other ventures that are profitable to them, even if they are clearly harmful. To deal with this, the credit policy framework can be expanded to include broader investment guidance, to ensure that the investments of wealthy individuals and major firms are in alignment with democratically ratified objectives. For instance, under such a framework individuals and firms would face limits on the quantity of money they could invest in certain damaging sectors.

In addition to this, there are several other options available. One is progressive taxation, which can cut the purchasing power of the rich and reduce their unnecessary consumption. Taxation can also be used to target particular products (such as harmful products or luxury goods) that should be reduced. Another option is to make ecologically harmful investments less profitable (while making green transition-related investments more profitable). This kind of shift can be driven by introducing more robust carbon taxes, more generous green subsidies, and gradual bans and phase-outs (Lutkenhorst *et al*. 2014, Christophers 2025). The more fundamental problem is, of course, that private capital has too much control over our collective productive capabilities, a problem we will discuss in greater detail in the following section. A third approach to achieving industry-specific scale down is to fund public awareness campaigns that educate the public about ecologically harmful industries, and more sustainable alternatives. Clearer eco-labelling and environmental transparency laws can also be helpful. Such policies can help scale down specific industries that are highly consumer-driven, such as the beef industry and the aviation industry. Fourth, industry-specific scale down will be challenging if corporations that damage our environment can influence political decisions, both domestically and internationally. Limiting corporate power in politics therefore becomes essential. Furthermore, it is necessary to support international agreements that push forcefully to phase out fossil fuels, such as the Fossil Fuel Non-Proliferation Treaty (Fossilfueltreaty 2024). There are already examples of countries that have achieved some success with industry-specific scale down and reorganisation of production by using a mix of these policies, such as France (banning harmful chemicals), China (redirect investment towards renewable manufacturing), the United Kingdom (phasing out coal power), and Germany (advancing clean steel production) (Ergen and Schmitz 2023, Stechemesser *et al*. 2024).

Another key policy tool is intervention to end the practice of planned obsolescence. Planned obsolescence can be tracked back to the early 1990s, when lightbulb manufacturers in the United States and Europe formed a cartel (led by General Electric) and successfully plotted to shorten the lifespan of incandescent bulbs from an average of 2,500 h down to less than 1,000 h (Krajewski 2014). Today, production for disposability is visible everywhere, from phones and computers to toys and furniture. It has become especially worrying in smartphone manufacturing. Between 2010 and 2019, tech companies sold a total of 13 billion smartphones. In 2020, less than 3 billion of them were in use (Hickel 2020a). The problem of planned obsolescence can be addressed in several ways. For example, via the channel of consumer protection laws, one could require firms to make products that last longer. If manufacturers of consumer goods were held to guarantees of 10 years rather than 2 years – the latter being the norm – product longevity would increase. Countries should also look to enforce 'right to repair' laws, making it illegal for companies to produce things that cannot be repaired by users or independent mechanics. Such measures would help reduce total energy and material use. It would also reduce the number of landfills with e-waste, which are currently a major environmental hazard as they leak mercury, arsenic, and other toxic substances into the land.

The idea that scaling down certain areas of the economy is beneficial for society sits uncomfortably with many economists, especially if scale-down results in a reduction in aggregate production (i.e. a reduction in GDP). Interestingly, there are many instances whereby policies that make people's lives better (not only from an environmental perspective but also from a social perspective) would directly reduce GDP, all else being equal. GDP is a metric of output measured in prices. Transitioning to lower-cost provisioning systems therefore results in GDP decline. Take transport, for example. Public transport costs less than half as much as car-based transport per passenger per kilometre (Wardman 2014). A transition toward more public transport would therefore cause GDP in the transport sector to decline, even if people increase their travel mobility. Healthcare is another example. The United States spends more on healthcare per capita than almost all European countries, but generally scores lower on life expectancy and other health outcomes. The comparison with Spain is a striking example. Spain's healthcare spending per capita is one third of that of the United States but their life expectancy is six years longer (World Bank Data 2024). If the United States shifted to a healthcare model like Spain's, GDP in the healthcare sector would decline.

This implies that the level of GDP is not important in and of itself. GDP is a metric of aggregate output as measured in market prices, where $1 million worth of weapons is considered equivalent to $1 million worth of healthcare. Clearly, when it comes to human well-being and social progress, it is not aggregate output that matters but rather *what* we are producing and for whose benefit. Rather than targeting an increase in GDP, policymakers should target an increase in the specific forms of production that are necessary to improve social and ecological outcomes. This was understood by Simon Kuznets (1962), the economist who developed the GDP metric, who noted:

> given the variety of qualitative content in the over-all quantitative rate of economic growth, objectives should be explicit: goals for 'more' growth *should specify more growth of what and for what*. It is scarcely helpful to urge that the over-all growth rate be raised to x percent a year, without specifying the components of the product that should grow at increased rates …

Clearly, there are obvious and direct ecological and social benefits from scaling down certain economic activities. There is also another, less obvious, benefit from doing this. Scaling down ecologically harmful activities would *liberate productive capabilities* (in the form of labour, knowledge, materials, etc.), which can in turn be remobilized for innovation and production required for a true green and socially just transition. Factories that are currently producing SUVs can produce electric buses instead; computer scientists and engineers working on advertising algorithms can work on green innovation instead; and materials used to build casinos can be used to build affordable housing instead. Obviously, reskilling the labour force to achieve these goals does not happen overnight, but it's far from impossible to achieve. A progressive industrial policy framework can redirect collective labour and resources towards environmentally beneficial goals.

We see then that degrowth of certain areas of the economy would enable the acceleration of other, more environmentally friendly and socially useful, areas of the economy. Of course, a remobilisation of productive capabilities towards true green and social goals does not simply happen by scaling down certain activities. It is critical to ensure that spare capacity is remobilized in a democratic manner. The private sector has a poor track record of doing so, and it therefore becomes necessary to increase public control of or guidance over productive capabilities. This is where this paper turns next.

Organise production more around public benefit

Control over finance and money translates into control over our collective labour and resources. In today's economic system, capital – by which we mean the major financial firms, the commercial banks, the largest corporations, and the wealthiest 1 per cent – has overwhelming control over financial assets and therefore determines production. For capital, the purpose of production is not to achieve social and ecological progress, it is to maximise and accumulate profit. This is why

many societies chronically overproduce many damaging and unnecessary things, like fossil fuels and superyachts (which are highly profitable to capital), and at the same time chronically underproduce socially useful things, like renewable energy, public transport, affordable housing, and universal healthcare services (which are less profitable or not profitable at all). In this sense, it is not surprising that the private sector has a poor track record of investing in environmentally beneficial activities (Christophers 2022, 2024).

Credit guidance frameworks can help overcome this problem. In the previous section we described how credit policy can reduce lending to and investment in damaging sectors that must be scaled down. A similar approach can also be used to actively steer private finance toward more socially and ecologically beneficial activities, thus ensuring sufficient investment in necessary but less-profitable production in line with democratically ratified objectives. Credit guidance was used extensively in the post-war period (Monnet 2018). It helped many European states build up industrial capacity and accelerate innovation in key sectors. In the contemporary world economy, China represents a strong example of credit guidance in action (Sperber 2024). In China, major financial institutions and banks are controlled by the state, which allows the government to strategically allocate capital in line with long-term objectives. Green industrial policy has been a core aspect of state-led credit guidance in China and has achieved remarkable success: China is now the global leader in the manufacturing of many renewable energy devices, such as photovoltaics, EVs, lithium-ion batteries, and wind turbines. Credit guidance also holds other potential economic benefits, such as offsetting inflationary pressures and potentially preventing debt bubbles.

Public finance mechanisms can also be leveraged to increase investment in socially and ecologically necessary production, and are particularly important in cases where the necessary production is not profitable at all. Any government that has sufficient monetary sovereignty can issue the national currency to invest directly in implementing a public job guarantee, improving public services, insulating buildings, innovating more efficient technologies, and establishing a national renewable energy system, without being limited by the question of profitability (Kelton 2020). Increasing public finance in this manner may risk driving inflation if the new production stretches the productive capacity of the economy. But this risk can be avoided by implementing measures to reduce other, less-necessary forms of production (and by using taxation to reduce the purchasing power of the rich), which reduces excess demand and prevents inflationary pressures (Olk *et al*. 2023). The degrowth-oriented measures described above therefore liberate real resources that can be redirected toward increasing production for the public good.

We have mentioned the public job guarantee and universal public services above. The idea of a job guarantee is to prevent unemployment that may arise from reducing output in certain sectors, and enables labour to train and participate in socially meaningful production and the ambitious public works that are necessary for the transition (Kaboub 2008, Sylla 2023). The job guarantee programme can also be used to establish living wages and good labour conditions, therefore compelling private firms to meet similar standards or risk losing staff. This is a crucial stabilising mechanism in striving towards universal employment, good livelihoods, and sufficient production of necessary goods and services regardless of fluctuations in *aggregate* output. The idea of universal public services – by which we mean not only education and healthcare but also affordable housing, childcare, and sufficient quantities of water and clean energy for household consumption – is to ensure that necessary goods and services are always being produced and available to all, again irrespective of changes in aggregate output.

Currently, many states take a passive approach to green industrial policy, limiting their intervention to fixing 'market failures', for example through carbon taxes, emission trading schemes, and subsidies for renewables, as outlined above (Gabor and Braun 2025). Although these can be useful, governments must take a more active approach to investment if we are to achieve rapid reductions in emissions and bring resource use to sustainable levels. In this kind of system, the direction of investment is determined by the state, the public, and the people, rather than by capital. In practice, this means more public provision of essential goods and services, public finance and credit policy in

line with democratically ratified objectives, and greater democratisation of private sector production in the form of worker/community ownership of firms.

We also need greater financial coordination between various policy levers of the state, be it monetary policy, fiscal policy, credit policy, or financial repression policy (Gabor and Braun 2025). For many state bodies, this would transform business-as-usual, but nothing less is necessary given the scale and urgency of the challenges we face. Central banks in particular need to change the way they operate, from simply focusing on 'market-fixing' and short-term price stability, towards taking a more active role in credit guidance (Kedward *et al*. 2024).

Reorganising the economy to produce for public benefit would also enable our societies to shift toward more community-centred living, in turn helping us to more rapidly decarbonise and reduce material footprints (Hickel 2020a; Kallis *et al*. 2020, Schmelzer *et al*. 2022). Many cities and countries have started implementing policies for that purpose. For example, many European cities have started incentivizing more use of public transport and less use of private vehicles. Oslo has made large parts of its city centre inaccessible for cars, London has introduced ultra-low emission zones, and Milan has vastly expanded its bicycle network. Research has demonstrated that sufficiently rapid decarbonisation does not only require more electric vehicles, but also requires a large-scale reduction in car use (Winkler *et al*. 2023).

More broadly, public provisioning is crucial in the age of ecological breakdown. In the 1950s and 1960s, assets such as land and housing were in fact often in the hands of the public, but since the wave of neoliberalism starting in the 1970s, land and housing were sold off in abundance to the private sector (Harvey 2007). These should be restored to public ownership, so they can be provisioned to people under more accessible conditions. The housing market has become especially problematic. Housing has become so financialised that most people now see houses as investment assets to generate returns rather than places for people to live in. The deregulation of the housing market has paved the way for rent hikes, growing deficits of social housing, and a growing number of dilapidated houses being put up for rent. In England, there has been a net loss of 20,000–35,000 social homes nearly every year since 1981. In 2023, there were 1.4 million fewer households in social housing compared to 1980 (Shelter 2024).

Global ecological justice

High-income countries – and specifically their investors and firms – are mainly the ones causing ecological breakdown. They are responsible for 74 per cent of global excess resource use and around 90 per cent of global excess carbon emissions (Hickel 2020b, Hickel *et al*. 2022, Fanning and Hickel 2023). 'Excess' is here defined as emissions and resource use that overshoot safe planetary boundaries. By contrast, lower-income countries (lower-middle-income countries and low-income countries) are responsible for less than 1 per cent of global excess resource use and emissions. This latter group of countries make up more than half of the world's population, meaning that more than 50 per cent of the world's population is responsible for less than 1 per cent of global excess resource use and emissions.

Clearly, countries in the global North are the ones that need to rapidly reduce their energy and resource use. As such, degrowth does not and should not apply in all parts of the world. In fact, lower-income countries produce and consume *too little* and need to increase their energy and resource use to meet human needs and achieve economic development objectives. The literature on economic development is unambiguous on this matter: in order to improve living standards and well-being, lower-income countries need to develop their industrial, technological and productive capabilities (Amsden 1992, Chang 1994, Szirmai 2012, Nayyar 2013, Hauge 2023). Although one can debate the degree to which the process of economic development needs to entail growing energy and resource use, the process is currently impossible without increasing energy and resource intensity (Semieniuk 2025). In this sense, global South countries need to have greater 'ecological policy space' in their formulation of industrial policy. In other words, countries that bear no

responsibility for global ecological breakdown, either historically or at present, should not face the same ecological constraints in their formulation of industrial policy. Put differently, high-income countries need to address their own ecological overshoot before preaching sustainability to lower-income countries.

This does not mean lower-income countries should pursue 'dirty' industrial policy rather than green industrial policy in all sectors. As mentioned above, countries are currently competing to develop capabilities in green industries/technologies, including electric vehicles, photovoltaics, and batteries. It would be unwise for countries in the global South to ignore the economic opportunities that the green transition offers. Many countries in the global South are in control of large deposits of minerals and metals required for the renewable energy transition. These countries should look to add value in the manufacturing process rather than only exporting the minerals and metals in raw form (UNCTAD 2023), or at minimum cooperate to ensure that any raw material exports achieve good prices on international markets. There are also many dangers of ignoring or delaying a transition into green technologies. This includes the danger of technological lock-in into carbon intensive sectors, missing out on first-mover advantage into strategic industries, and having to resort to high-cost restructuring measures in the future (Perez 2016, Pegels and Altenburg 2020, Lebdioui 2024).

So, the case for greater ecological policy space for countries in the global South simply means that they should have more leverage and choice in terms of how they formulate their industrial policy. If industrial policy in the global South (both green and non-green) entails an increase in energy and resource use in order to meet human needs, this is acceptable and needn't pose an ecological problem so long as it is within or near their fair-shares of ecological boundaries.

In the global North, by contrast, industrial policy needs to include a degrowth element, as we have described above. On top of this, it is essential that Northern industrial policy incorporates principles of global ecological justice. The green transition will require sourcing critical minerals that are currently located largely in the South. These must be procured on fair terms, in a way that ends unequal exchange, and ensures good labour standards, wages and prices for Southern workers and producers, in line with the 'Common Framework for Extraction' as outlined by the Havana Conference of the Progressive International (Progressive International 2024).

Whether countries in the global South pursue 'traditional' or 'green' industrial policy, many global challenges remain. Most importantly, given that the global North has essentially appropriated the planet's ecological commons, countries in the global South are not only facing constraints with respect to formulating industrial policy, but they are also disproportionately bearing the costs of climate change. Many researchers are now calling for high-income countries to compensate or to provide reparations to lower-income countries for climate-related damages and appropriation of our ecological commons (Burkett 2009, Perry 2020, Taiwo 2022). With respect to carbon emissions, a recent study calculates that countries in the global North will need to compensate countries in the global South with a total of $192 trillion by 2050 for appropriating their atmospheric fair shares of the Paris-compliant carbon budget and therefore compelling them to decarbonise faster than would otherwise be required (Fanning and Hickel 2023). This is using standard abatement costs as published by the IPCC, assuming an optimistic scenario whereby all countries decarbonise to 'net-zero' by 2050. The exact numbers can of course be debated, but clearly large transfers are owed for atmospheric appropriation and climate-related damages in the global South.

How do we achieve this kind of global ecological justice? How do we achieve degrowth in the global North, more leverage for industrial policy in the global South, and compensation for atmospheric appropriation? First, the green transition needs to be democratically determined, both within countries and between countries. Given the growing calls for a rapid green transition, states are increasingly out of step with public opinion. A recent survey of more than 80,000 people across forty countries found that 70 per cent of people think that climate change is a very serious problem. Fewer than 3 per cent said that climate change is not serious at all (Newman *et al.* 2020). Another study by the World Inequality Lab found that strong majorities in Europe and the

United States support high-income countries compensating low-income countries for climate-related damages (Douenne *et al*. 2023).

The path towards a democratically determined transition is ambitious, but not unrealistic. Greater democratic control over, and public ownership of, capital needs to be achieved (as described above), and corporate money in politics must be curtailed. A first step towards curtailing corporate money in politics is stronger anti-trust legislation, banning political donations from the for-profit private sector, and supporting worker-based ownership structures. On a global scale, global governance structures must be democratised. Currently, countries in the global South have minimal power in shaping the agenda of powerful international organisations like the IMF, the World Bank and the WTO (Gallagher and Kozul-Wright 2022). In addition to giving more power to developing countries *within* these organisations, we need to support global governance initiatives coming *from* the global South (more on this below), and create an international order based on the principles of global justice and shared prosperity. Such an order should be founded on the principles of full respect for sovereign equality among states, an equitable multilateral trading system responsive to the demands of the poorest nations, and an international monetary system that does not bestow exorbitant privilege upon a select few members (Progressive International 2024).

Countries in the global South can also do a lot to put pressure on countries in the global North, and are already doing so. For example, 13 nation states in the Pacific, led by Vanuatu and Tuvalu, have signed a fossil-fuel non-proliferation treaty (Fossilfueltreaty 2024). Their motivation for signing this treaty is that the world needs a binding plan to transition away from fossil fuels, especially seeing that the Paris Agreement doesn't even mention fossil fuels. Countries in the South also have more power to leverage industrial policy when they come together to form trade alliances, rather than being beholden to unfair trade agreements with the North. By now, it has been well-documented that the rules-based system of global governance and international trade established by the global North vastly favours wealthy states and corporations headquartered in those states, at the expense of industrialisation and economic development in the global South (Wade 2003, Shadlen 2005, Gallagher and Kozul Wright 2022, Lebdioui 2024, Stiglitz 2024). It is therefore welcome to see progress in South-South cooperation. The Regional Comprehensive Economic Partnership (RCEP), signed by Asia-Pacific Nations in 2020, is now the largest trade bloc in history. The African Continental Free Trade Area (AfCFTA) is another example, created in 2018 by fifty-four of the fifty-five African Union nations. We are also seeing traditional North–South lending institutions being challenged by new South-South initiatives. The most prominent examples are the New Development Bank, established by the BRICS states, and the Asian Infrastructure Investment Bank, initially linked to China's Belt and Road Initiative.

The distinction between the global North and the global South is important. But we must also pay attention to national class dynamics. The working classes in the global North have no control over finance and the means of production, no control over energy policy, no control over national legislation, and minimum responsibility for ecological breakdown. Meanwhile there are certain elite class factions in the global South who are aligned with the interests of multinational capital and who hold substantial responsibility for pollution. Mounting evidence suggests that in order to reduce energy and resource use, we need to deal with the global elite, not only by reducing their consumption but also by reducing their power over our collective productive capacities (Barros and Wilk 2021, Cozzi *et al*. 2023, Khalfan *et al*. 2023).

Overwhelmingly, it is the world's wealthiest that are overshooting carbon budgets and surpassing sustainable thresholds of resource use. Recent research shows that millionaires alone are on track to burn 72 per cent of the remaining carbon budget for 1.5 degrees (Gössling and Humpe 2023). In 2019, the total carbon emissions from the richest 1 per cent in the world were the same as the total carbon emissions of the poorest 66 per cent in the world, the latter being more than 5 billion people (Khalfan *et al*. 2023). In 2022, the average private jet emissions from the most jet-setting celebrities exceeded 3,000 metric tons (Yard 2022). This is about 500 times higher than the average person's *total* emissions in a year. This is before accounting for the energy and resource

use that goes into producing private jets. Industrial policy has an important role to play here, especially in terms of directing production away from producing items that only or primarily cater to the rich.

Conclusion

This paper has proposed a progressive framework for green industrial policy that addresses the shortcomings of existing approaches in the face of urgent ecological challenges. By combining insights from traditional green industrial policy perspectives with literature on ecological economics, post growth and degrowth, we have outlined a three-pillar approach that aims to achieve core ecological objectives while enabling just economic transformations.

The first pillar calls for scaling down ecologically harmful industries and sectors to directly reduce energy and resource use, using credit policy and other mechanisms. This approach recognises that the continuous growth in energy and resource use is unsustainable and that certain industries need to be strategically downsized. This not only reduces ecological harm but also liberates productive capacity that can be redirected towards more environmentally and socially beneficial ends.

The second pillar advocates for reorganising the economy to produce for public rather than private benefit, with greater public control and guidance over investment and production. This involves scaling up public investment in ecologically necessary production, aligning policies with democratically determined green transition goals, and increasing public provision of essential goods and services. It also calls for greater financial coordination between various policy levers of the state and a more active role for banks in credit guidance towards environmental objectives.

The third pillar emphasises the need for global ecological justice and greater 'ecological policy space' for the global South to pursue industrial development. Recognising that high-income countries are primarily responsible for ecological breakdown, this approach calls for differentiated climate responsibilities. It argues for ensuring lower-income countries have more leverage in formulating their industrial policies while advocating for compensation or reparations from the global North for climate-related damages and appropriation of ecological commons.

This progressive framework represents a departure from traditional green industrial policy approaches. It acknowledges that the scale and urgency of the ecological crisis requires more than just market-based solutions or incremental changes. Instead, it proposes a fundamental restructuring of economic priorities and approaches to industrial policy, with a focus on reducing overall resource use in high-income economies while enabling sustainable development in the global South.

The kind of progressive transformation we call for requires changes to the status quo, shifting away from an economic system that relies primarily on growth-oriented solutions. Luckily, these changes are in high demand. In the research community, a survey of nearly 800 climate policy researchers around the world found that 73 per cent support positions that call for moving towards a world that is not growth-focused (i.e. post-growth) (King *et al*. 2023). Among the public, a consumer research study found that 70 per cent of people in 20 high-income and middle-income countries support the statement that 'overconsumption is putting our planet and society at risk' (Sustainable Brands 2014). Even in the United States, where support for consumerism and growth is supposedly strong, 70 per cent of people believe that 'environmental protection is more important than economic growth' (Yale Climate Opinion Maps 2018). On the climate justice front, strong majorities in the global North support compensation to the global South for climate-related damages (Fabre *et al*. 2023).

Clearly, the systemic change we call for is not out of step with the public or with scientists. Of course, even strong public support for a policy framework does not mean it will be implemented. Indeed, it is reasonable to expect very strong resistance from elite factions who benefit so prodigiously from the existing arrangement. The path forward will require not only protest and demonstration – the dominant mode of popular political engagement over the past decades – but the

establishment of mass-based political parties that can represent the interests of the working-classes, achieve power, and implement industrial policy measures that can resolve the social and ecological crises of the twenty-first century. Meaningful, systemic socio-economic change has often been unpopular with policy elites, including the British suffragette movement, the civil rights movement in the United States, and the anti-apartheid movement in South Africa (Malm 2020). Nelson Mandela, recognising that the anti-apartheid movement was calling for change that was deemed unrealistic by policy elites at the time, pointed out that 'It always seems impossible until it's done'.

Although the framework we outline above calls for systematic transformation, the policy pathways are not simply thought experiments. They build on real-existing implementation, both at present and historically, including carbon taxes, credit guidance, anti-trust legislation, consumer protection laws, and public ownership structures. But we do indeed question the status quo of the capitalist economic system more fundamentally than existing frameworks for green industrial policy.

It is time for green industrial policy frameworks to consider the views of climate scientists and the public more seriously. While we should continue to take lessons from existing frameworks for green industrial policy, we must advance this field in a more progressive direction. Our aim with this paper is to move the needle in that direction.

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