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That Plan from Rio: The Promise and Limits of Multilateral Climate Governance

> What is to be done, I know. What will be done, only the gods know.
>
> —Gerhard von Scharnhorst

THE ROAD TO RIO

In the 1964 classic film *That Man from Rio*, Alain Delon's character uncovers a dastardly plot and flies across the world to save the girl and defeat a bunch of evildoers with clear analysis, colossal energy, and courageous action. Easy as pie. The movie's message: struggling against all odds works; straight thinking and plucky feats lead to elegant solutions. Similar hopes attended the Rio Earth Summit (officially known as the UN Conference on Environment and Development) that took place in 1992 after a long crescendo of attention to environmental degradation—and a few months after the Soviet Union's implosion. Hopes in science-based policies and multilateral solutions were buoyant. The Rio conference was not a stand-alone event but, rather, the culmination of years of environmental challenges and public policy responses that began in the United States with Rachel Carson's 1962 book *Silent Spring*.[1]

US president Lyndon B. Johnson declared in February 1965 that "this generation has altered the composition of the atmosphere on a global scale through radioactive materials and a steady increase in

carbon dioxide from the burning of fossil fuels" (Johnson 1965). In November 1965, the White House published the President's Science Advisory Committee's report *Restoring the Quality of Our Environment* with an introduction by Johnson. It warned of momentous changes—melting of Antarctic ice caps, sea level rise, ocean acidification—pervasive in nature and disregarding political boundaries. The first Earth Day, April 22, 1970, brought millions of Americans into the streets to celebrate. In that same year, President Richard Nixon, a Republican, signed the National Environmental Policy Act and established the National Oceanic and Atmospheric Administration and the Environmental Protection Agency. Bipartisan, science-based, and hugely successful policies were implemented, such as the Clean Air Act (1970), the Clean Water Act (1972), and the Endangered Species Act (1973). The 1972 United Nations Conference on the Human Environment in Stockholm anticipated the concept of sustainability. Its motto was *Only One Earth*, and it put the tension between ecology and economic development—the preservation of nature and the eradication of poverty—squarely on the international agenda.

Environmental policy was very much a conservationist effort that heretofore had been primarily a technical matter. It began to be contested and ideologically fraught. Yet science still prevailed over special interest politics, playing a crucial role in evaluating environmental impacts, setting air pollution standards, and shaping the protection of species.

The First World Climate Conference, held in 1979, called on the world's governments "to foresee and to prevent potential man-made changes in climate that might be adverse to the well-being of humanity" (WMO 1979, 1). The US Senate's discussion of the dangerous warming effect of carbon dioxide emissions on April 3, 1980, was covered by Walter Cronkite on the *CBS Evening News* (Cronkite 1980). Over four decades later, nothing needs to be added to the way the science was summarized—or indeed to the political challenge of climate action.

European and American environmental movements of the 1960s and 1970s campaigned for respectful treatment of nature and

endangered species, and ecological sustainability. They campaigned against pollution, resource depletion, nuclear energy, rapacious multinational corporations, and endless economic growth. They emphasized nature's organic interdependence, diversity, and finiteness, as exemplified by the idea of one Earth (Ward and Dubos 1972) and the four laws of ecology (Commoner 1971):

1. Everything is connected to everything else (there is one ecosphere for all living organisms, and what affects one, affects all).
2. Everything must go somewhere (there is no "waste" in nature, and there is no "away" to which things can be thrown).
3. Nature knows best (any major human-made change in a natural system is likely to be *detrimental* to that system).
4. There is no such thing as a free lunch (the exploitation of nature inevitably converts resources from useful to useless forms).

The Club of Rome's *Limits to Growth* (Meadows et al. 1972) and E. F. Schumacher's *Small Is Beautiful* (1973) castigated the reckless squandering of precious natural resources that deprived succeeding generations of their fair share. They inspired campaigns for blue skies, unspoiled rivers, healthy forests, material sufficiency, and "appropriate" technologies. Green parties sprang up in many industrialized countries, conspicuously in Germany, where Die Grünen (the Greens party), founded in 1980, was elected to the Bundestag (Federal parliament) in 1983 and fielded its first government minister in 1985.

The year 1988 saw great leaps forward in climate politics. On June 1, 1988, the joint statement of US President Ronald Reagan and Soviet leader Mikhail S. Gorbachev, after their summit in Moscow, pledged to expand "cooperation with respect to global climate and environmental change, including . . . environmental protection, such as protection and conservation of stratospheric ozone and a possible

global warming trend" (Joint Statement 1988). A few weeks later, NASA scientist James Hansen testified before the US Senate Committee on Energy and Natural Resources that the greenhouse effect was measurable and was causing extreme weather events. Before the end of the month, the World Conference on the Changing Atmosphere: Implications for Global Security, held in Toronto and chaired by Canada's ambassador to the UN Stephen Lewis, resolved to reduce emissions. Its strongly worded statement identified human pressures on nature as "an unintended, uncontrolled, globally pervasive experiment whose ultimate consequences would be second only to those of a global nuclear war" (WMO 1988, 292).

Within months, the UN General Assembly noted with concern in its second resolution on climate change "that the emerging evidence indicates that continued growth in atmospheric concentrations of 'greenhouse' gases could produce global warming with an eventual rise in sea levels, the effects of which could be disastrous for mankind if timely steps are not taken at all levels" (UNGA 1988). The Intergovernmental Panel on Climate Change (IPCC) was established, and *Time* magazine declared endangered Earth "Planet of the Year" with a compelling cover photo.

In the early 1990s, the scientific consensus, although already broad and deep, was still couched in terms of probabilities, not certainties, even in the "World Scientists' Warning to Humanity," signed by some 1,700 of the world's leading scientists, including the majority of science Nobel Prize laureates extant:

> Increasing levels of gases in the atmosphere from human activities, including carbon dioxide released from fossil fuel burning and from deforestation, may alter climate on a global scale. Predictions of global warming are still uncertain—with projected effects ranging from tolerable to very severe—but the potential risks are very great. (Union of Concerned Scientists 1992)

The Rio Earth Summit of June 1992, decided on by the UN General Assembly in 1989, was unprecedented in size, scope, and spirit. The world's governments assumed a "common but differentiated responsibility"[2] for the management—conservation, protection, and restoration of the integrity—of Earth's ecosystems and reached numerous agreements, including: Agenda 21, Rio Declaration on Environment and Development, and Rio Forest Principles (all three in 1992 in Rio); Convention on Biological Diversity (1993); United Nations Framework Convention on Climate Change (1994); and United Nations Convention to Combat Desertification (1996).

The grandiose aspirations behind this avalanche of agreements—to square the circle of ecological sustainability and economic development—were checked by the reality of unenforceability, by the disconnect between countries' foreign policy pronouncements and their domestic stratagems, and by the opening for grandstanding. US President George H. W. Bush announced, untethered from reality, that

> the United States fully intends to be the world's preeminent leader in protecting the global environment. We have been that for many years. We will remain so. We believe that environment and development, the two subjects of this Conference, can and should go hand in hand. A growing economy creates the resources necessary for environmental protection, and environmental protection makes growth sustainable over the long term. (Bush 1992)

In hindsight, there was a whiff of naivete—some would call it cynicism—in the assumption that environmentalism, continued economic growth in the Global North, and accelerated economic development in the Global South could be reconciled, for, of course, they could not be and cannot be. However, it would be facile to fault the UN, a crucial forum for the establishment of norms, or to discount the value of structured international gatherings to draw attention to issues that transcend borders.

THE ROAD FROM RIO

The Rio Earth Summit was the peak of international consensus regarding global environmental challenges and requisite policy responses. Formulated at a high level of generality, their implications in terms of costs, sacrifices, and transformations became clear only over time, especially once the domestic opposition of vested interests got organized to undermine them. Since Rio, what has asserted itself is the sticky reality that in today's interconnected world, the interests, priorities, resources, and powers of global actors are difficult, perhaps impossible, to reconcile. This does not undermine the value of a global deliberative body, establishing global norms, instituting scientific authority, institutionalizing review mechanisms, and organizing periodic stocktaking conferences. But the process is agonizingly slow and circuitous, with success and failure determined mostly at national levels.

The Kyoto Protocol, for instance, operationalized the Rio target, the stabilization of "greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system" (UN 1992). It was stillborn because it required reduction of carbon dioxide emissions by industrialized countries but not by emerging economic giants such as China, India, and the Republic of Korea—no matter that such lopsided reductions were intellectually plausible and historically fair. Between 1850 and 2002, the world's developed countries accounted for three-quarters of historic emissions and developing countries for only one-quarter (Baumert, Herzog, and Pershing 2005, 113; for longer time series and interactive maps, see Saussay 2019).

The US signed but never ratified the Kyoto Protocol. Canada did ratify it in 2002 but withdrew in 2011. The Kyoto Protocol, having proved to be a nonstarter, quietly expired in 2012. As the cause of a warming climate—fossil fuel combustion—became clearer, so did the costs of prevention, mitigation, and adaptation measures, the climate debate evolved from an esoteric meteorological subject to a highly charged political one.

The stunning economic growth of China, India, and South Korea also immensely increased the carbon dioxide emissions of those countries. Since 1990, China's gross domestic product has grown from $361 billion to $18,000 billion; India's from $320 billion to $3,400 billion; and the Republic of Korea's from $485 billion to $1,700 billion. China's annual emissions quadrupled from 2,400 million to 11,500 million tons; India's from 600 million to 2,700 million tons; and Korea's more than doubled from 250 million to 600 million tons. In 1990, the US emitted 100 percent more than China, but now emits 50 percent less; the EU's emissions (including the UK) were 50 percent more than China's but are now 75 percent less.

These dynamics and the unwillingness of most players, especially China and the US, hampered any international agreement and led to the near collapse of the 2009 UN Climate Change Conference in Copenhagen (COP15). Surprisingly, six years later in Paris, COP21 was a splendid success diplomatically. Instead of assigning emission reduction targets to industrialized market economies only, the Paris Agreement requested that all countries develop national decarbonization plans that, in sum, should hold "the increase in the global average temperature to well below 2°C (3.6°F) above pre-industrial levels and [support] efforts to limit the temperature increase to 1.5°C (2.7°F) above pre-industrial levels" (UN 2015). These voluntary emission reduction announcements, called "nationally determined contributions" (NDCs), which are to become increasingly ambitious, were reported for the first time upon ratifying the agreement, then in 2021 and every five years thereafter. The US, EU, Japan, and South Korea have pledged to achieve climate neutral economies by 2050, China by 2060. Importantly, a green climate fund, to be replenished annually by $100 billion after 2020, was to support developing countries' mitigation and adaptation efforts. All of this was unanimously agreed to.[3]

Yet agreeing is not the same as doing, and targets are easier set than met. In the world of diplomacy, the task is to negotiate, promulgate objectives, and arrange words inoffensively—constructive ambiguity is the operative term—to buy time while sufficient momentum

builds to overcome underlying problems and inherent contradictions. Thus, agreements are not usually what they purport to entail, and commitments are more easily made than honored.

In the case of the Paris Agreement, the hope was unsurprisingly short-lived because—like Kyoto, Agenda 2030 (UNGA 2015), the Global Migration Pact (UNGA 2018), and other multilateral agreements—it suffers from the triple defects of being uncoordinated, nonbinding, and unenforceable. To be sure, this does not mean that multilateral agreements are perforce inoperable, only that their utility is limited—quite like New Year's resolutions. After marshaling the international community to reach agreement on scientifically validated targets, actually *achieving* them requires different mechanisms. Multilateral fora have important functions of convening, standard-setting, monitoring, and validating, which are not to be discounted but also not to be overrated.

What, then, derailed the Rio promise and the Paris Agreement? Both are far off target, because very few countries are on track to meet even their modest goals. The problems have become much worse, yet the whys and wherefores of sluggish mitigation have become much clearer. Economic growth has been relentless, especially in OECD countries, but also in China and India, where primary energy consumption has also shot up. Inequality has surged everywhere.

Globally since 1992:

- the gross domestic product quadrupled from $25.5 trillion (or from $4,700 on average for each of the then living 5.5 billion people) to $101 trillion (over $12,000 for each of 8 billion people, albeit exceedingly unevenly distributed);
- direct primary energy consumption grew by nearly two-thirds from 100 TWh to 159 TWh, while the share of fossil fuels—oil, gas, coal—increased from 84 percent to 86 percent;

- the number of motor vehicles more than tripled from 500 million to 1.6 billion;
- the number of airline passengers nearly quadrupled from 1.2 billion to about 4.5 billion;
- international tourist arrivals more than quadrupled from 500 million to 2.4 billion;
- the production of plastics more than tripled from 132 million tons to over 400 million tons;
- annual emissions of carbon dioxide have not been reduced but, to the contrary, have gone up by more than 50 percent, from 23 $GtCO_2$ to 37 $GtCO_2$;
- the bottom 50 percent of the world population emitted only 16 percent of global greenhouse gases, while the top one percent emitted 23 percent;
- the growth in emissions of the richest 1 percent was three times that of the poorest 50 percent;
- the share of CO_2 in the atmosphere has increased by over 50 percent, from the "safe" level of 367 ppm to 422 ppm (about 440 ppm corresponds to the 1.5°C [2.7°F] warming threshold of the Paris Agreement);
- more CO_2 has been emitted than in the 250 or so years since the beginning of the Industrial Revolution in the eighteenth century; and
- Earth Overshoot Day—when humanity has used up the ecological resources and services that Earth can regenerate in a given year—moved from October 21 to August 2.

Humans have become a geological force, decisively influencing "the state, dynamics and future of the Earth System" (Subcommission on Quaternary Stratigraphy 2019). The whole range of Earth's vital signs flashes code red. There is a significant risk of self-reinforcing climate feedback loops—irreversible tipping points—that threaten to push the planet into chaos beyond human control. Once carbon-cycle

feedbacks become significant, atmospheric CO_2 levels will continue to rise even if net zero is reached. The last time atmospheric CO_2 amounts were as they are today was more than 4 million years ago, when temperature levels were 2°C–3°C (3.6°F–5.4°F) higher than during the preindustrial era, and the sea level was 15–25 meters (50–80 feet) higher than today (Lindsay 2022).

> The current speed of human-induced CO_2 change and warming is nearly without precedent in the entire geological record, with the only known exception being the instantaneous, meteorite-induced event that caused the extinction of non-bird-like dinosaurs 66 million years ago. In short, whilst atmospheric CO_2 concentrations have varied dramatically during the geological past due to natural processes, and have often been higher than today, the current rate of CO_2 (and therefore temperature) change is unprecedented in almost the entire geological past. (Lear et al. 2021)

In its latest report, the IPCC, synthesizing years of peer-reviewed analyses, states with *very high confidence* that there "is a rapidly closing window of opportunity to secure a livable and sustainable future for all" (2023, 24). To limit warming to 1.5°C (2.7°F), global emissions must reach net zero CO_2 by 2050 or earlier, which requires *annual* decreases of about 1.4 $GtCO_2$ (i.e., similar to the COVID-related reductions in 2020) and a 43 percent reduction of greenhouse gas emissions by 2030 compared with 2019 levels (Friedlingstein et al. 2022).

Carbon dioxide, the biggest contributor to global heating, is an "infinite-lifetime gas," called so because as a cumulative pollutant, it stays in the atmosphere for centuries (Allen et al. 2016). Therefore, today's warming climate is both a stock issue (the cumulative buildup over time of greenhouse gases, particularly carbon dioxide) and a flow issue (current emissions). Burning fossil fuels has warmed the planet since preindustrial times on average by 1.2°C (2.2°F; Europe

by at least twice as much)—with staggering consequences in terms of financial loss, nature destruction, and suffering.

About 2,500 $GtCO_2$ have been emitted since 1850, which leaves 380 $GtCO_2$—or about nine years at current emission levels—for a not more than 50 percent likelihood to limit global warming to 1.5°C (2.7°F) (Friedlingstein et al. 2022). Decades of procrastination have skyrocketed the rate at which emissions must, but probably will not, fall. The IPCC acknowledges that "global warming is more likely than not to reach 1.5°C" (2023, 12).

THE ROADBLOCKS TO NET ZERO

The environmental discourse in the run-up to Rio was mainly about pollution and resource depletion. Subsequently, in an increasingly fragmented and unequal international order, it shifted to the consequences of resource usage—global heating and biodiversity loss—even while the growth of everything reached higher than ever levels, at least in the industrialized North, China, India, and a few other countries. In the past decades, the environmental paradigm evolved as it became clear that the problem is less the depletion of raw materials and more the consequences of using them. In the case of fossil fuels, for example, this means that rather than conserving them for future generations, they should remain in the ground and the world economy must reduce its energy intensity. This radical transformation is inevitable—the chickens coming home to roost—yet vexing because the climate crisis is the flipside of a phenomenal success story and the result of legitimate, legal, and by and large fruitful economic activities bolstered by unprecedented levels of fossil fuel combustion. The ever-greater consumption of goods and services, the production of which underpins the vigor of the world economy, has lifted billions out of poverty and created unprecedented levels of wealth and well-being. Even though the unrelenting growth of everything is eroding the basis of human life on Earth, in the Global North an ever-expanding material lifestyle is considered an acquired right, while in the Global South it is an aspired right. The world consumer class will

grow from 4 billion to 5 billion people in 2031, and consumer spending in 2024 is projected to increase by $2.3 trillion, "which is equal to global military spending or adding another Germany to the global consumer economy" (Fengler et al. 2023).

Precisely because the material achievements are such an extraordinary triumph, switching the world economy's energy basis is very hard. The beneficiaries are happy to stay the course, no less than those who desire to join the better-off. Thus, while the planetary climate emergency demands a Churchillian "blood, toil, tears and sweat" wake-up call, a "nothing to see here, all's under control" message is less risky politically and more successful. Because they would not be elected, mainstream candidates will not run on a message of sufficiency, restraint, and de-growth—and a best-case scenario of matters not getting worryingly worse. As the saying goes, it is difficult to get politicians to understand something when their campaign contributions depend on their not understanding it.

This, in a nutshell, is why not a single industrialized country is on track to meet the requirements of the Paris Agreement—and why the extreme weather that convulsed much of the globe in the summer of 2023 is so ominous, with sweltering heat, rampant wildfires, choking air, flooded cities, parched fields, dried-out lakes, the hottest day of recorded history (Rannard 2023) following the hottest week, the hottest month (Adkins 2023), and an even hotter hottest month (Mishra 2023). The US National Oceanic and Atmospheric Administration (n.d.) projected that half the world's oceans would experience "marine heat waves" by September 2023.

> China set an all-time high of nearly 126 degrees Fahrenheit, while Death Valley hit 128 degrees, two shy of the highest reliably measured temperature on Earth. Phoenix was expected to observe a record-breaking 19th consecutive day at or above 110 degrees Tuesday. And in the Middle East, the heat index reached 152 degrees, nearing—or surpassing—levels thought to be the most intense the human body can withstand. (Dance 2023)

Given the palpable crisis humanity is sleepwalking into, the lethargy of politicians, the business community, and the public is perplexing—particularly in view of ever more sophisticated analytical methods and forecasting models and the consensus regarding anthropogenic climate change among scientists from around the world in atmospheric physics, biochemistry, geology, geography, geophysics, geochemistry, glaciology, meteorology, oceanography, paleoclimatology, paleoceanography, paleontology, and more. No other subject has a quality assurance apparatus comparable to the IPCC, with its hundreds of researchers scrutinizing tens of thousands of peer-reviewed publications and basing conclusions on a systematic, consensual word-by-word examination. Among these experts, the urgency to decarbonize the world's economies is virtually uncontested, and there is little dissension about the implications of the various heating paths, the measures and costs to avoid them, and the Anthropocene's catastrophic trajectory if heating exceeds 1.5°C (2.7°F).

What, then, prevents an effort at the appropriate scale to preserve human civilization as we know it? Projecting Earth's heating path is based on verifiable data, while the reasons not all of humanity's scientific, technological, financial, and governmental resources are marshaled to combat a planetary emergency can be conjectured. They have to do with politics, power, and psychology.

For starters, technology is moving in the right direction. In the past decade, renewable electricity costs fell by up to 90 percent, and renewables are now the most efficient energy source for electricity and are expected to continue providing around 95 percent of the world's new generating capacity (Bond et al. 2022). China's solar and wind power generation in 2022 was more than twice the electricity use of Canada, and far more than Brazil's, Japan's, or Russia's consumption. In 2023, its solar and wind output could approach the total power output of India (Ritchie 2023).

Governments should boost renewables and rigorously apply the user pays principle to fund them. Pricing their full costs into goods and services would remedy the blatant market failure that allows fossil fuels to be sold for far below the true costs. Until this

market failure is corrected, the damage caused is externalized, which means the cost is paid not by those who produce, sell, or burn fossil fuels and enjoy the benefits, but by others—future generations, poor people, and nature—who neither benefit nor have a say in the matter. The atmosphere is used as a free good and a cheap dumping ground. Since a free lunch is impossible, there is a quantifiable social cost of carbon. The German Environmental Protection Agency (Umweltbundesamt) assesses the cost of one ton of carbon dioxide at between €195 (≈ $220) and €680 (≈ $750), with the lower amount applying if the welfare of the current generation is valued higher than that of future generations, and the higher amount if the welfares of current and future generations are equally weighted (Matthey and Bünger 2023).

A carbon tax or fee—phased in over time to minimize or prevent disruption—eventually reflecting the true cost of burning fossil fuels, is the most elegant way to shift incentives from fossil fuels toward renewables. It is Economics 101, in fact, and the subject of the most widely supported public statement by economists in history (*Wall Street Journal* 2019). Yet governments decline to avail themselves of this silver bullet, preferring half measures that work only partially. President Joe Biden's signature environment policy, the Inflation Reduction Act of 2022 (IRA), includes $369 billion in clean energy tax credits and funding for climate and energy programs, but neither a carbon fee nor a system of tradable emissions' permits. While it will significantly reduce emissions (by 32–51 percent below 2005 levels by 2035), the US will fall short of meeting its pledge under the Paris Agreement (50–52 percent). Even the most optimistic scenario would have the US in 2035 emit per capita four times the maximum global average needed to keep the 1.5°C (2.7°F) goal within reach—much higher, in roughly a decade from now, than today's per capita emissions of the EU and China, not even to mention India's or Africa's.

Globally, several carbon taxing and emissions trading regimes exist, yet they cover only about one-fifth of global emissions, and their average price is just $3 (≈ €2.7) per ton of carbon dioxide (Par-

ry 2021). Instead of prices that truly reflect costs—and thus would massively reduce emissions and make carbon capture economically worthwhile—most government interventions work in the opposite direction by favoring fossil fuels through economically distorting financial subsidies that, globally, amount to a mind-boggling $5.9 trillion (7 percent of GDP). Eight percent of the subsidy

> reflects undercharging for supply costs (explicit subsidies) and 92 percent for undercharging for environmental costs and foregone consumption taxes (implicit subsidies). Efficient fuel pricing in 2025 would reduce global carbon dioxide emissions 36 percent below baseline levels, which is in line with keeping global warming to 1.5 degrees, while raising revenues worth 3.8 percent of global GDP and preventing 0.9 million local air pollution deaths per year. (Parry, Black, and Vernon 2021, 2)

Such commonsense policies face stiff opposition because decarbonizing the world's economy disrupts the commercial interests of powerful actors, most prominently the fossil fuel industry, rent-seeking fossil fuel producing countries, and the wealthy everywhere, whose lifestyle is particularly carbon-intensive. As per the adage "when an idea collides with an interest, the latter prevails," the scientifically postulated decarbonization imperative runs up against the business models, if not the raison d'être, of powerful industries, most particularly Big Oil, the purveyors of fossil fuels.

> One of the most demoralizing things about the world's response to the climate crisis is the fossil fuel industry's continued success in blocking the pollution-cutting actions that are in the interest of all of humanity. The solution to our predicament couldn't be clearer: We need to stop burning fossil fuels and pumping pollution into the atmosphere. . . . Too many powerful people in government,

> business and civic organizations have clung to the fantasy that some of the most powerful and destructive companies in history would eventually face reality and transform on their own initiative into clean and sustainable operations. (*Los Angeles Times* 2023)

Big Oil's influence over policy in the United States comes close to state capture—that is, "oligarchs manipulating policy formation and even shaping the emerging rules of the game to their own, very substantial advantage" (Helman and Kaufmann 2001). It is alarming to what extent the fossil industrial complex has succeeded in hijacking the international institutions established to mitigate global heating. For instance, fossil fuels are not even mentioned in the Paris Agreement, and at the 2022 COP27 in Egypt the attempt to address the biggest source of planet warming emissions failed after a number of countries vetoed phasing out all fossil fuels, determinedly supported by 636 registered fossil fuel lobbyists. The president-designate of COP28, Sultan Ahmed Al Jaber, whose day job is managing director of the Abu Dhabi National Oil Company, claims against all evidence that it is possible to "accelerate a transition that puts our economies on the path toward a new low-carbon, high-growth, sustainable economic model in a way that is both transformational and just" (Al Jaber 2023). This is ideology—or fantasy—because infinite growth collides with the physics of a finite world and because nature cannot support 10 billion people living in the style of the American or European middle class.

Switching to lower carbon intensity would be inconvenient and expensive for consumers, car manufacturers, airlines, cement producers, the chemical industry, and agriculture, but it is not impossible. In contrast, oil and gas companies—and OPEC members—do not sell mobility, well-tempered housing, and mechanical power. They sell the energy that is the result of millions of years of stored photosynthesis, plants that converted solar energy into biomass. They dig or pump up these organic materials, refine them, transport them,

and retail them—recurrently—in franchised petrol stations, or pipe them into homes, factories, and power stations. Renewables involve a one-time installation of hardware that requires minimal maintenance over its decades-long operational life span. Since solar and wind power is forever free, there would no longer be a steady income stream for energy purveyors—and certainly no possibility to benefit from shortages and price spikes, such as the war profiteering as a result of Russia's aggression against Ukraine that, in 2022, doubled Big Oil's profits and deposited a $219 billion windfall into its coffers (Bousso 2023).

With oil prices surging, companies quickly backpedaled the plans—unveiled during the COVID-19 crisis in 2020, when prices briefly went below zero—to slow oil and gas investments and shift toward renewables (Yoder 2023). The emissions' reduction commitments were in any event limited to the production process and did not include the sold product that accounts for the bulk of the footprint. Big Oil's blinkered focus on short-term profits inevitably exacerbates the cost, urgency, and difficulty of decarbonizing the world's economies.

> Oil, natural gas and coal accounted for around four-fifths of total energy supply worldwide in 2021. In the [Net Zero Energy] Scenario, this share falls to around two-thirds in 2030 and less than one-fifth in 2050. . . . Between 2021 and 2050, coal demand declines by 90%, oil declines by around 80%, and natural gas declines by more than 70%. (IEA 2022, 133)

Production cuts of this magnitude would render unviable many operational and planned fossil fuel projects. Still, exploration continues apace. Since the 2015 Paris Agreement, 60 major global banks have collectively poured $5.5 trillion into fossil fuels. In 2022, fossil fuel financing amounted to $669 billion (Banking on Climate Chaos 2023). Five years ago, BlackRock, the world's largest asset manager, embraced ESG (environmental, social, and corporate governance) principles and

suggested other companies should do the same (Fink 2018). Sensing that such virtue signaling is no longer necessary, the investment giant appointed Amin Nasser, the CEO of Saudi Aramco, the world's largest oil company, to its board of directors (Sorkin et al. 2023).

Since the fossil industrial complex would be most affected by a net zero scenario that would fundamentally alter its business model and inevitably strand many of its assets, it has a history of influencing political decisions. For decades, it has gone out of its way to greenwash its dirty practices, shift responsibility, change the subject, discredit science, fund climate deniers (lately climate delayers), and spend camouflaged resources on a massive scale.

In the 1970s, Big Oil's research departments established conclusively the cause of global heating, namely the burning of fossil fuels, while the companies in their public communications promoted doubt and declared the science unsettled. No less nefarious was the strategy to transfer responsibility from corporate producers to individual consumers, brilliantly tapping into the mania of environmentalists to fixate on individual lifestyle decisions, such as flying, owning a car, or consuming meat and dairy. In 2004, British Petroleum, one of the largest oil companies and heaviest polluters in the world, hired the public relations professionals Ogilvy & Mather to create an individual carbon footprint calculator and to promote the stance that climate change is not the fault of Big Oil but that of individuals (Kaufman 2020).

Indeed, people in the industrialized North bear a significant moral responsibility for global heating, but more as citizens than as consumers. Since it is government action or inaction this decade that will decide if limiting warming to 1.5°C (2.7°F) remains within reach, those living in OECD countries, as community members, voters, and activists, determine how ambitiously climate mitigation will be pursued, or if a "greenlash" triumphs.

Focusing on civic duty does not, of course, imply blindness to egregious carbon inequality and the voracious consumption of the top 10 percent of global carbon emitters that generates almost half

of all greenhouse gas emissions. To the contrary, it underlines that climate justice and social justice are flipsides of the same coin.

CONCLUSION

International negotiations will continue, but the battlefield has shifted to national politics, where the speed and scope of a renewable energy revolution will be decided. Although the benefits—financial, environmental, health—will be overwhelming, opposition to climate policies is growing because the public support in principle for them quickly fragments in light of short-term costs and because governments have never candidly communicated the nature and magnitude of the climate crisis. Nor, given the inevitable consequences of inaction, have they advocated investments in climate mitigation as a kind of insurance. The decades-long casual procrastination—it has been called predatory delay—will strike future generations, even future governments, as reckless. Now it is too late for homeopathic fine-tuning adjustments. Mitigating global heating requires, as did the COVID pandemic, war-like measures and fundamental changes. Failure to act defers the unavoidable transformation to crisis conditions, possibly involving internal turmoil and external armed conflict. Why not demand a monthly president's, prime minister's, chancellor's report on the state of the planet and on what their country and other countries are doing collectively to save it?

As much as it is coming into focus that the climate crisis is in fact a fossil fuel crisis, the old mantra that mitigating global heating can be achieved without cost, inconvenience, or change is fading, as is the illusion that a technical deus ex machina, such as carbon capture or solar radiation management, will allow the extractive business to continue for a while longer. While the fossil era is over, whatever Big Oil's rearguard actions, the open question is: Before the climate tips, will whatever is politically possible prove to be ecologically sufficient, or will the ecologically necessary miraculously become politically possible?

If only that plan from Rio would be resuscitated.

NOTES

1. A supplemental list of relevant sources—government acts, resolutions and policy documents of international organizations, news media reports, and scholarly analyses—is available at https://www.socres.org/online-supplements.
2. The concept of common but differentiated responsibilities (CBDR), enshrined as Principle 7 of the Rio Declaration on Environment and Development (https://www.un.org/en/development/desa/population/migration/generalassembly/docs/globalcompact/A_CONF.151_26_Vol.I_Declaration.pdf), takes into account that carbon dioxide stays in the atmosphere for centuries and that the mitigation responsibility, therefore, includes both current and historical emissions. The cumulative historical emissions from 1850 to 2002, i.e., before the takeoff of China and India, were: US = 29 percent, EU = 27 percent, Russia = 8 percent, China = 8 percent, Japan = 4 percent, India = 2 percent; developed countries as a group = 76 percent, developing countries = 24 percent (Baumert, Herzog, and Pershing 2005, 113).
3. With the exceptions of Iran, Libya, and Yemen, most of the 195 parties to the UN Framework Convention on Climate Change have ratified the Paris Agreement.

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