CHAPTER

3

Providing global public goods to manage interdependence

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Mismanaged interdependence imposes costs, or even setbacks, to human development. But managing it can be enhanced by framing it as providing global public goods, such as global peace and climate change mitigation, as explicit goals.

Applying a global public goods lens to the Covid-19 pandemic yields three key insights about enabling better responses in the future. First, is for a range of different types of global public goods, mechanisms can be designed to address the bottlenecks for each type. Second, what constitutes global public goods is often a matter of choice, and providing them can bring countries together. Third, institutions can be created to enhance the provision of global public goods.

A global public goods lens helps in better managing global interdependence. It shifts us out of zero-sum tribalism that the Report recognizes as a problem and into a frame of mind that rightly matches shared action to shared problems, without assuming that all disputes will dissipate or that diverging interests will not persist. It shifts our thinking from a defensive fatalism or endless problematizing to recognizing human agency, thus enriching clear-eyed, practical conversations about and action on shared futures. In mobilizing shared action, we not only stand a better chance of doing better overall; we also stand a better chance of not leaving people behind. The shift in frame also opens our imaginations to lots of other potential ways forward, and we can sift through those options better and more systematically using what we know about global public goods and what we have learned about them—in research and in practice—over many years. We save time, energy and resources to get to better, more equal outcomes. And then—success can breed success.[1]

A global public goods lens helps in understanding features and patterns that may be shared across a wide range of global challenges, and it can better prepare the world to anticipate new challenges. It does so by enabling a more systematic approach to identifying and addressing emerging challenges characterized by interdependence, even ones we cannot anticipate today.

> "Managing interdependence can be enhanced by framing it as reflecting the need to provide global public goods, such as global peace and climate change mitigation, as an explicit goal

The horrifying human toll of violent conflict, the ravages of climate change, the reconfiguring of global trade, a new cycle of debt distress, the lives lost to Covid-19—all make it clear that we live in a highly interdependent world where physical and digital things, from viruses to misinformation, quickly spill across national borders. As we move further into the Anthropocene, where humans drive planetary change in unprecedented ways, we will have to respond to economic, social and environmental challenges that are planetary in scale. As the previous two chapters demonstrate, global interdependence is being reconfigured, and mismanaging it imposes costs, or even setbacks, to human development. Managing interdependence can be enhanced by framing it as reflecting the need to provide global public goods, such as global peace and climate change mitigation, as an explicit goal. This is already being taken up through proposals to reform multilateral governance[2] and multilateral development banks in order to broaden their mandates to support national contributions to global public goods.[3]

What are global public goods?

We begin with a concrete example that schoolchildren around the world learn about every year: knowledge of triangles. Determining the length of the sides of triangles has long been of concern to mathematicians and philosophers, not to mention engineers and builders. For instance, if we know the lengths of two sides of a triangle, what can we know about the length of the third side? It turns out that for specific kinds of triangles, quite a lot. The Pythagorean theorem[4]—a classic of geometry—gives us a rule to calculate the length of the third side for right triangles. This rule helps us understand other basic shapes, such as circles, and underpins much of what we can build in our minds and in the real world.

The Pythagorean theorem, like much knowledge, exhibits the distinguishing features of global public goods. When someone applies the theorem, it does not detract from anyone else in the world doing the same. The theorem is used, and has been used, by many people at the same time in construction, navigation, mapmaking and numerous other activities.[5] And it is very hard, if not impossible, to prevent anyone from using the theorem[6] because it is not held exclusively by a firm that controls the conditions for its use. Nor is it circumscribed by the borders of a country with the sovereign power to decide how people living in other countries can use it.[7]

These two characteristics—that use by one person does not prevent someone else from using it at the same time and that it is hard to exclude anyone from using it—make the Pythagorean theorem a global public good.[8] So are all mathematical theorems in the public domain, and so are other insights about the natural world and about how economies and societies function and change. In short, ideas and knowledge in the public domain are global public goods.[9]

Other global public goods include identifying and containing diseases with global reach, mitigating climate change, preventing and containing the spread of international financial crises, maintaining international peace and fostering cybersecurity.[10] Some global public goods cannot be envisioned now because we simply lack the knowledge to identify them—in the same way that science and detection technologies only recently made it possible to document the depletion of the ozone layer or establish the human cause of climate change.

"A global public goods lens is useful in managing challenges or opportunities that spill across borders. It is also useful in confronting and redressing dangerous planetary change

Global public goods can also be created; they are not always simply given. For example, through the Montreal Protocol, the world is providing the global public good of avoiding depleting the stratosphere's ozone layer, which shields all life from the sun's harmful ultraviolet radiation. Both technology and social choice shape the conditions of production or consumption that can determine whether someone can be excluded.[11] For example, broadcast television channels have the potential to reach anyone with a receiving device, whereas cable television (an alternative technology) channels are available only to those who subscribe to a cable television service (access was made excludable as a result of a new technology and social choices on how to deploy it).

There is often some discretion, given the state of technology and the inherent characteristics of the good in question, to determine through social choices what is, or is not, a global public good. And some technologies—such as those that sustain our digitally connected world, allowing for the instantaneous sharing of information by practically all 8 billion people living on Earth today—create conditions of interdependence that can call for new global public goods.[12] In the context of the Digital Revolution, this includes what have been described as digital public goods (box 3.1). Thus, providing global public goods, often rightly framed as a problem to be solved, can also be purposefully deployed to mobilize action towards addressing shared challenges.[13]

A global public goods lens is useful in managing challenges or opportunities that spill across borders. It is also useful in confronting and redressing dangerous planetary change.[14]

Cross-border challenges and opportunities as global public goods

The outbreak of a communicable disease that moves across borders has negative spillovers that can be managed through the global public good of communicable disease control. Global public goods always involve international spillovers that reflect uncompensated interdependence among countries (meaning that one country makes decisions without regard to the impacts that those decisions might have on other countries).[15]

In recent decades spillovers with global reach have been driven by policy choices (how much countries allow for the flow of people, goods, services, finance and information), by technologies (which determine the cost, speed and ease of cross-border flows) and by the way the two interact (see chapter 2). Even though policies can constrain cross-border flows, technology may make that hard (many people can easily catch an airplane flight and share information globally over digital networks). But there are some global public goods for which stopping flows at the border—and managing them in that way—is not feasible: this includes what can be considered planetary public goods.

Planetary public goods: An emerging and enduring class of global public goods

The reality that humans share a single planet with one another and other forms of life, today and well into the future, implies that processes of dangerous planetary change can be framed through a global public goods lens.[16] Consider managing the global commons, such as open-seas fisheries (spotlight 3.1). The global commons are widely accessible resources but are not global public goods[17] because their use by someone implies that the resources extracted from them are not available at the same time to someone else, as with fishing on the open seas.[18] But restricting

Box 3.1 Digital public infrastructure and digital public goods

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As this chapter has noted, technologies are among the sources of promise and peril for the world in the years and decades ahead. On the one hand digital public goods—open-source software, artificial intelligence (AI), standards and content—offer opportunities for economics and social development, particularly for low-income countries.[1] On the other hand the rapid development of generative AI in particular has led to concerns ranging from the proliferation of deep fakes and misinformation to a potential destabilizing geopolitical arms race to advance and deploy AI. With the technology continuing to develop rapidly, this is the moment when the future path for the world will be decisively shaped by actions taken now.

One of the areas in which the positive potential has begun to emerge clearly is in identity and payments systems, a technology stack that has come to be known as digital public infrastructure. This consists of a system of identification (which can be biometric), payments structures and data; a digital public infrastructure can be used not only for mobile payments but also for delivering welfare benefits and other public and private services. The best-known examples are the India Stack, founded on the identification platform Aadhar,[2] and Estonia's X-road.[3] Several other countries have begun to adopt these platforms or to digitize identity and public services using other solutions, and under India's leadership the Group of 20 (G20) recently affirmed a commitment to using digital public infrastructure for development.[4]

The initiatives are not without problems, including concerns about access for marginalized groups and errors or procurement delays.[5] Digital public infrastructure should not be seen as a panacea; it is important to avoid techno-hype and to learn from early failures. Nevertheless, digital technologies do offer new opportunities for development, just as the mobile and broadband revolutions from the mid-2000s created economic possibilities for people and businesses in low- and high-income countries alike. While the United Nations Development Programme has emphasized the importance of digital public goods for moving towards the Sustainable Development Goals, the time has come to consider what aspects of digital technology should become development goals in themselves and to engage in granular debate about appropriate policy environments.[6]

At the same time there is a need to ensure that future developments in AI, and in the supporting infrastructure of data centres, undersea cables, chips and data, do not lead to a zero-sum arms race. In the current global environment generative AI and advanced chip manufacture are too often seen only through a national security lens, an essential perspective but only part of the global picture. There have been many international codes of AI principles in recent years—for example, by the G20 and the Organisation for Economic Co-operation and Development (OECD)—but too little substantive, detailed debate about effective global governance given the characteristics and affordances of the technology and the existing structures of market and political power.[7]

Notes

1. For definitions and examples of applications to advance development, see https://www.un.org/techenvoy/content/digital-public-goods (accessed 17 February 2024). **2.** https://indiastack.org/ (accessed 17 February 2024). **3.** https://e-estonia.com/solutions/interoperability-services/x-road/ (accessed 17 February 2024). **4.** G20 2023b. **5.** Howson and Partridge 2022. **6.** UNDP 2023c. **7.** On the G20, see https://www.mofa.go.jp/policy/economy/g20_summit/osaka19/pdf/documents/en/annex_08.pdf; on the OECD, see: https://www.oecd.org/science/forty-two-countries-adopt-new-oecd-principles-on-artificial-intelligence.htm (both accessed 17 February 2024).

the depletion of the global commons—for example, avoiding depleting the ozone layer—can be framed as a global public good.[19] Some negative environmental externalities such as cross-border air pollution cannot be stopped at borders. Migratory birds fly across countries and sometimes continents, interweaving nature from different territorial demarcations.[20] These examples of interdependence justify the long-standing international management of environmental challenges, as reflected in the growing number of multilateral environmental agreements, which have accelerated since the 1980s.[21]

Knowledge and awareness of some of these global environmental externalities are increasing—enabled in part by technologies for monitoring biophysical flows and in part by scientific advances in understanding their interactions. For example, recent advances in hydrology have determined that water cycles depend on what happens not only with surface water (including rivers and lakes, with well-known transboundary challenges) or groundwater (including aquifers) but also with terrestrial moisture recycling (moisture that enters the atmosphere via evaporation or plant transpiration and travels with the wind across countries and even continents, eventually falling as rain).[22] Terrestrial moisture recycling accounts for 40 percent of annual precipitation on land—and as much as 75 percent in some places.[23] So these are

very important global processes in determining local rainfall patterns, which can be crucial for supporting agriculture or predicting floods and droughts. As an example of the global interdependence associated with moisture recycling, consider how tropical forests contribute substantially to land evaporation globally.[24] Deforestation in one region can reduce rainfall in regions far away, with particularly serious implications for rainfed agriculture.[25]

> "A planetary public goods lens, as part of a broader global public goods lens, provides an analytical framework that brings structure to a wide range of challenges and opportunities associated with global interdependence and can be leveraged to mobilize action at multiple levels

Patterns of disruption of planetary biophysical processes, including on global terrestrial moisture recycling, are reaching an unprecedented speed and scale.[26] This suggests that we are living in an entirely new geological epoch: the Anthropocene.[27] There are, of course, better known manifestations of these disruptions—including, most prominently, the depletion of the ozone layer, climate change and threats to the integrity of ecosystems and biodiversity, all of which have been analysed through a global public goods lens.[28] At-the-border policies can do little or nothing to manage or restrict the spillovers associated with these disruptions, given that they emanate from the reality of all humans living on a shared planet. Planetary public goods are thus a special category of global public goods, and the reality of the Anthropocene will persist well into the future.[29] So providing planetary public goods is not only of crucial importance today but also a challenge that will persist for future generations.[30] That includes considering the biosphere (the thin layer of life that surrounds the planet and in which we and our development are embedded) a planetary public good. The provision of this specific planetary public good could be assessed by the extent to which the biosphere's global integrity is preserved. The biosphere and its global integrity mediate large-scale responses in the Earth system that could affect its suitability for complex human societies.[31]

A planetary public goods lens, as part of a broader global public goods lens, provides an analytical framework that brings structure to a wide range of challenges and opportunities associated with global interdependence and can be leveraged to mobilize action at multiple levels.[32] Doing so requires adding more structure to what is required to provide global public goods beyond simply defining them.

What does it take to provide global public goods? They are not created equal

Recall the Pythagorean theorem. How did this global public good come about? Although attributed to Pythagoras, it was known hundreds, even thousands, of years before Pythagoras to people living in Babylon, Egypt and the Indian subcontinent.[33] Once it became known, as with ideas more generally,[34] it took the form of a global public good. This simple example shows that global public goods are ubiquitous and plentiful, shaping how economic activity as well as political and social life is organized.[35] It also shows that, despite being available for everyone, global public goods do not benefit everyone equally.[36] For ideas,[37] such as the Pythagorean theorem, emanating once in one country would be enough for the global public good to be provided.[38] Many global public goods are of this type, but there are other types of global public goods for which the level of provision is determined by the aggregation of country contributions in other ways.[39]

How country contributions aggregate to determine the level of provision of global public goods

Global public goods can be classified as different types, including by how the aggregation of individual country contributions affects the level of provision. There are many different methods of aggregation.[40] Three key types of global public goods are considered here, distinguished by their aggregation method: best-shot, summation and weakest-link (table 3.1). Different global challenges fit within each of these three types, so by bringing a framework that finds commonalities across issues that seem widely disparate, a global public goods lens can tailor management of these issues without reinventing the wheel every time. Learning from successful efforts in managing global challenges in one area can inspire responses in other areas that share similar features,

Table 3.1 Recommendations for how to improve the provision of different types of global public goods

Aggregation	Provision prognosis	Recommendations
Best-shot (for example, scientific breakthrough)	Likely to be provided if incentives are strong enough for the best shooter to contribute	Rich or dominant country fosters provision, but multilateral institutions can pool actions or coordinate among multiple potential best shooters
Summation (for example, climate change mitigation)	Tendency for underprovision due to free or easy riding because contributions are perfectly substitutable	Grants and loans are needed to foster fairness, and multilateral institutions are needed to monitor and track contributions
Weakest link (for example, disease control)	More likely to be provided if interests and capacities are similar; if there is a need to shore up poor countries, free riding concerns may emerge if support is to be pooled across high countries; risk of a "spoiler" blocking provision	Capacity building is essential to enhance the contributions of those least able to contribute; income redistribution makes provision more likely

Source: Human Development Report Office based on Buchholz and Sandler (2021).

in terms of how the aggregation of country contributions determines the level of provision of global public goods.

Best-shot global public goods. When the contribution of the country that contributes the most determines the level of provision, we are in presence of a best-shot global public good. Potentially only one country is enough to fully provide a best-shot global public good. Consider an Earth-destroying asteroid. It needs to be diverted or destroyed only once to protect everyone on the planet.[41] Though a seemingly far-fetched scenario, one country, the United States, is investing in the global public good of protecting the planet from this threat—and successfully diverted the orbit of an asteroid, in a test of the capabilities that might be required.[42] The test was done unilaterally, and if the world were to ever confront an incoming asteroid, presumably the country would act alone in providing the global public good of diverting it.[43] In a scenario where multiple countries have the interest and ability to contribute, the country that contributes the most single-handedly determines the level of provision of a best-shot global public good.[44]

Summation global public goods. Even if one country were to unilaterally stop emitting greenhouse gases, the atmospheric concentration of those gases would still be determined by what all the others emit.[45] Thus, stabilizing the concentration of greenhouse gases (critical for climate stability) is a summation global public good. Each ton of greenhouse gas emissions is perfectly substitutable by the emissions from any other country—that is, from the atmosphere's perspective it does not matter where emissions reductions come from.[46] Unlike best-shot global public goods, the sum of the contributions from countries—often, as in stabilizing the concentration of greenhouse gases, from most if not all countries—determines the level of provision of summation global public goods.

Weakest-link global public goods. Many more types of global public goods associated with different ways of aggregating country contributions could be explored, but a third one merits special attention: when the level of provision is determined by the country least able to contribute. This is the case for communicable disease control: even if all countries but one are able to control the spread of the disease, the world as a whole is left vulnerable to the threat, because a disease outbreak can occur in the country with the least ability to control the disease.[47] This type of aggregation corresponds to a weakest-link global public good, since the country that contributes the least determines the level of provision of the global public good for the world as a whole. Other examples include the surveillance of a financial crisis that could spread across countries.[48]

When the country that contributes the most determines the level of provision: Best-shot global public goods

For best-shot global public goods, if at least one country sees that provision is in its interest and can contribute what is required (making it the best shooter), it will likely (but not inevitably) provide the global public good when it has the resources to do so.[49] Before the creation of multilateral financial institutions after World War II, the provision of international liquidity of last resort was a best-shot global public good: it took only one country to be able and willing.[50]

If several countries are pursuing the provision of the same best-shot global public good, coordinating efforts to enable the best shooter or pooling efforts to seek complementarities (through multilateral organizations, for instance) enhances efficiency and often the prospect of success.[51]

Best-shot global public goods are a double-edged sword. They are likely to be provided when resources are aligned with the interests of the best shooter, but they leave the world vulnerable to a situation where the best shooter is able but unwilling to contribute. Thus, countries may be motivated to pool resources[52] for multilateral approaches that make the world less vulnerable to a misalignment between the ability and the willingness to contribute to a best-shot global public good. Even then, higher income countries with more resources and capacities are essential in providing best-shot global public goods, given the need for concentrated action.

"Best-shot global public goods are a double-edged sword. They are likely to be provided when resources are aligned with the interests of the best shooter, but they leave the world vulnerable to a situation where the best shooter is able but unwilling to contribute

It is possible to think of other ways of solving the misalignment of ability and willingness to provide best-shot global public goods. For example, a country with enough resources to provide a best-shot global public good might be compelled to contribute as a demonstration of leadership or by being responsive to an appeal to conform with international norms. And agents other than states—for instance, civil society organizations and philanthropic foundations—can play a key role in shaping those norms, both across and within countries, so that countries with resources do provide best-shot global public goods.[53]

When every country's contribution adds cumulatively: Providing summation global public goods

Countries pursuing exclusively their self-interest typically face incentives to contribute little, or not at all, to summation global public goods, because of the possibility that some countries may free ride (not contribute) or easy ride (contribute few resources).[54] Thus, countries will tend not to contribute enough to reach what would be collectively desirable for the world.[55] Since countries vary in both interests and resources, these differences further exacerbate the challenge of providing summation global public goods.

Diverse interests must be reconciled, and agreement reached on how much countries will voluntarily contribute. Fairness becomes paramount in shaping agreement.[56] Addressing fairness may require international transfers or resources from countries that have larger endowments or that have contributed most to the problems, as with greenhouse gases in the atmosphere, determined by current and past emissions.[57] Many negative impacts of climate change will happen faster and with greater intensity in the regions that have contributed the least to climate change.[58] And international transfers may be motivated not by altruism but by a desire to redress injustices, which may be required to enhance the prospects of widespread contributions to a summation global public good.[59] Global public goods often require new and additional resources, and it is crucial that these are not siphoned off from flows provided with a different motivation, such as official development assistance.[60]

When it all boils down to the country that contributes the least: Providing weakest-link global public goods

In contrast to summation global public goods, the incentives look very different for weakest-link global public goods. If all countries share similar interests and resources, there is no incentive for any country not to contribute.[61] Of course, countries' endowments and interests differ, so when interests are shared, prospects for providing weakest-link global public goods improve as resource inequality declines across countries,[62] providing a strong rationale for international transfers of resources or capacities[63] from those that have them to those that do not.[64] But which better-endowed countries make the transfers (box 3.2)? Richer countries may find themselves facing free-riding concerns—and thus incentives to not contribute to these transfers. And perhaps counterintuitively, the higher the number of rich countries, the larger these free-riding concerns may be.[65]

As with best-shot global public goods, weakest-link global public goods are also somewhat of a

Box 3.2 What drives countries to contribute to global public goods?

Assumptions about human behaviour and their implications for how countries act in the international context shape perspectives on prospects for the provision of global public goods, as well as proposed measures that could be put in place to enhance their provision when those prospects are dim.[1] For example, some have argued that a hegemonic country was needed to provide the global public good of an international lender of last resort during global economic crises prior to the establishment of the Bretton Woods institutions.[2]

Given that countries generally act independently to preserve their autonomy (particularly with respect to security concerns),[3] it is reasonable to assume that prospects for providing global public goods will have to be explored in a context where the global community remains a system of politically autonomous states with diverse interests, preferences, resources and power, and thus heterogeneous willingness and ability to contribute to global public goods. It is also reasonable to assume that countries try to anticipate and strategically react to other countries' actions.[4]

To take a first pass at considering prospects for providing global public goods and ways to improve them when needed, one can start from the assumption that countries will consider contributing to global public goods based on the extent to which that contribution advances either their interests or preferences, constrained by the resources available to them.[5] This narrow premise is relaxed later in the Report.

Notes

1. As argued for the behaviour of states more broadly in Kirshner (2022). **2.** This is the argument put forward by Kindleberger (1986, p. 11), who was sceptical of relying on rules during those periods: "Let me conclude by emphasizing once again my concern that politicians, economists, and political scientists may come to believe that the system should be run at all times by rules, including regimes, not people. Rules are desirable on trend. In crisis the need is for decision." For arguments in the same vein, see Keohane (1984) and Axelrod and Keohane (1985). **3.** Kirshner 2022. **4.** This is what is assumed in most of the literature (Buchholz and Sandler 2021), including in Barrett (2003a), which is a rare case where economic analysis and international relations theory are marshalled to explore the provision of global public goods. **5.** This is what Ruggie (1998) described (critically) as a neo-utilitarian premise.

double-edged sword. Imagine a country that decides not, or is unable, to contribute to a weakest-link global public good (not curbing the spread of invasive species, not eliminating transnational terrorism or criminal networks or not stopping nuclear arms from proliferating). Then, the whole world is at risk. A country that decides not to contribute to a weakest-link global public good can act as a spoiler, impeding provision for everyone.[66]

Applying a global public goods lens to the response to Covid-19

Control of the transmission of the virus that causes Covid-19 (SARS-CoV-2) can be viewed through the prism of a weakest-link global public good: control cannot be achieved until it occurs in every country.[67] So the country with the least ability to control the virus's transmission determines the level of provision of this global public good for everyone else. The prognosis for providing weakest-link global public goods is favourable when countries have similar interests and resources, but the situation becomes more muddled in a world beset by disparities in both. Applying a global public goods lens early in the pandemic highlighted those challenges and potential remedies, including the crucial importance of transferring resources and capacity to countries less able to control virus transmission.[68]

Multiple global public goods are at play in addressing a pandemic. Several are not weakest-link global public goods, leading to some of the challenges in provision that can be expected with other types of global public goods.[69] Since Covid-19 was caused by a novel virus, these challenges were exacerbated by scientific uncertainty, as well as policy ambiguity and inconsistency.[70] The pandemic response involved providing weakest-link global public goods (controlling virus transmission), summation global public goods (pooling resources to shore up weak links) and best-shot global public goods (the science behind developing the vaccines, sequencing the genome of the virus). Multiple challenges at multiple scales with different agents made for a longer pandemic, with highly unequal access to the vaccines and the lasting human development effects documented in chapter 1 that burdened low- and middle-income countries in particular.[71] Explaining the challenges of providing different types of global public goods may enable better responses in the future.

Thus, the underprovision of global public goods, very costly globally, can also drive inequalities (spotlight 3.2). The impact of the Covid-19 pandemic should not have come as a surprise, given that the failure to control the transmission of some global communicable diseases results in the loss of lives, the inability of people to lead healthy lives and huge global economic costs.[72] In contrast, the returns to communicable disease control are very high, particularly for the weakest-link global public good of disease eradication. For the eradication of smallpox (certified in 1979),[73] the benefit-cost ratio was estimated to be more than 100 to 1,[74] and the benefits accrue in perpetuity to future generations.[75] Not all communicable diseases are eradicable,[76] but those that are (such as polio) continue to inspire efforts by the international community, precisely because the net benefits are so high.[77] Still, the weakest-link nature of disease eradication can be cruel. Although two of the three wild polio viruses have been eradicated (type 2 in 2015 and type 3 in 2019),[78] polio eradication efforts have not yet succeeded—and have missed several target dates—because the third strain (wild polio type 1) persists in only a few small areas in Afghanistan and Pakistan and vaccine-derived type 2 continues to circulate.[79]

> "The underprovision of global public goods, very costly globally, can also drive inequalities

Three key insights emerge from the ensuing analysis. First is the need to consider a range of different types of global public goods with different aggregations and to design mechanisms that increase the chances of addressing the bottlenecks for each type of global public goods.[80] Second is that what constitutes a global public good is often a matter of choice, and the need for the provision of global public goods can be harnessed to bring countries together. Third is that institutions can be designed and created to enhance the provision of global public goods.

Too little disease surveillance

A key global public good for communicable disease control is disease surveillance, which itself can be considered a weakest-link global public good.[81] Underprovision may result from countries lacking the capacity to undertake surveillance. As of late March 2020, the World Health Organization (WHO) reported that 30 percent of countries lacked a Covid-19 national preparedness and response plan, and only half had national infection prevention and control programmes, as well as water, sanitation and hygiene standards for health care providers.[82]

But countries may face incentives that work against full disclosure of disease outbreaks to the international community, which can be exacerbated for a novel pathogen for which pharmaceutical solutions are not yet adequate.[83] Such incentives include fear of punitive actions by others in the form of trade and travel restrictions.[84] These unilateral measures were taken during the Covid-19 pandemic. For instance, South Africa reported to the world the new Omicron variant in November 2021, only to have several high-income countries ban flights from South Africa.[85] So, inequality in both resources and capacities—and in preferences to disclose outbreaks—worked against providing the global public good of Covid-19 surveillance. And measures that might have enhanced provision—contributing resources and capacities to countries in need and coordinating responses to the disclosure of new variants in a predictable way—were often lacking.

Lack of equitable access to vaccines

To deliver equitable access to future pandemic vaccines in 100 days[86] requires efficiently providing best-shot global public goods associated with science and technology and shoring up potential weak links in surveillance and vaccine production capacity.[87] That potentially includes creating vaccine manufacturing hubs, such as the Partnership for African Vaccine Manufacturing under the auspices of the African Union's African Centres for Disease Control and Prevention,[88] and establishing a global treaty on pandemic prevention, preparedness and response under the World Health Assembly.[89]

A global public goods account about how the inequity in access to Covid-19 vaccines unfolded can help prepare better in the future (spotlight 6.3). For example, the complex prognosis for providing weakest-link global public goods helps in understanding what happened. To shore up countries with little surveillance capacity and access to vaccines, the goal of achieving

global disease control[90] was invoked ("No one is safe, until everyone is safe" is the headline on the homepage of the COVID-19 Vaccines Global Access, or COVAX, initiative[91]). This argument could have provided incentives for high-income countries to financially support potential weakest links, but then these countries confronted the free-riding challenge about who should contribute and how much.[92] Thus, although each country had an incentive to contribute to advance its self-interest, the need to pool resources turned the challenge into one with the characteristics of a summation global public good—because each country could free ride on the contribution of others.[93]

There was a manifest lack of coordination in implementing predictable responses to reports of disease outbreaks or new variants—not for lack of effort by the WHO on several fronts, from guidance on travel to support for disease surveillance. Much of this guidance was ignored.[94] Ethical and moral arguments, some proposed with exceptional precision, failed to influence country behaviour.[95] The implications of these actions by high-income countries still run deep in the perception that many middle- and low-income countries felt left behind and treated unfairly.[96]

The science enabling the Covid-19 response: Best-shot global public goods were provided

Development of the Covid-19 vaccines was possible only because key best-shot global public goods could be provided. The most direct best-shot global public good was provided by the scientists who sequenced and published the genomic makeup of the SARS-CoV-2 virus that causes Covid-19.[97] The other best-shot global public goods were the scientific findings published in journals over at least two decades that, among other things, demonstrated how the spike protein in coronaviruses was a prime target for at least some types of vaccines—including the first to be licensed for Covid-19.[98] Public funding for science underpinned these best-shot global public goods, with the US National Institutes of Health alone allocating $17.2 billion to vaccine technologies between 2000 and 2019.[99] But both ex ante and ex post coordination challenges impeded the provision of Covid-19 vaccines as a global public good,[100] despite advocacy to do so.[101] Some countries even actively attempted to attract efforts in other countries to develop a vaccine for their own camp.[102]

> "Development of the Covid-19 vaccines was possible only because key best-shot global public goods could be provided

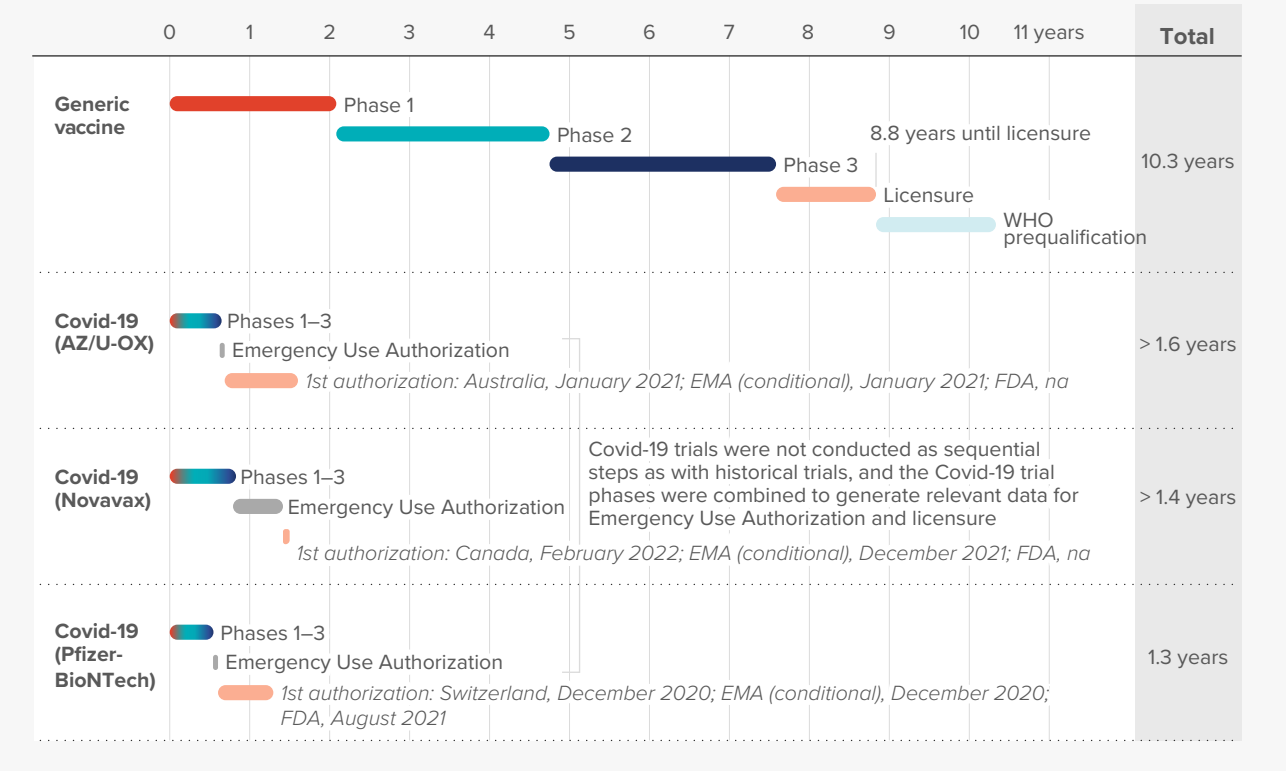
The development of Covid-19 vaccines was a remarkable achievement—as the prognosis for providing best-shot global public goods should have led one to expect. The capacities were concentrated in high-income countries, home to almost two-thirds of the Covid-19 developers as of April 2020, one month after the declaration of the pandemic on 11 March 2020,[103] most based in North America and Europe.[104] The capacities were aligned with interests, as well as a large mobilization of public financing and widespread agreement on the need to prioritize vaccine efforts.[105] Clinical development and approval of vaccines typically takes 5–10 years, with only 10 percent of vaccine candidates receiving approval.[106] But as a result of the massive public resources mobilized,[107] the first emergency use authorization for a Covid-19 vaccine by a stringent regulatory authority (the US Food and Drug Administration, FDA) was issued on 11 December 2020, less than a year after the pandemic was declared (figure 3.1).[108]

Much of the public finance took the form of advanced purchase agreements by high-income countries that far exceeded those countries' needs.[109] For instance, the United States provided $29.2 billion in public funds to purchase vaccines (from the start of the pandemic up to March 2022), $2.2 billion to support clinical trials and $108 million to support manufacturing and basic and translational science.[110] This "advanced market commitment" has long been advocated as a potentially powerful incentive for vaccine and drug discovery and for technological innovation more broadly.[111] This appears to have been the key driver for private sector engagement in Covid-19 vaccine development, given the substantial de-risking produced by the advanced purchase agreements.[112]

Institutions to facilitate global public goods

The response to Covid-19 involved pursuing best-shot global public goods (understanding the science

Figure 3.1 Authorization for Covid-19 vaccines was unprecedently fast



EMA is European Medicines Agency. FDA is US Food and Drug Administration. na is not applicable. WHO is World Health Organization.
Source: Wellcome Trust 2022.

behind vaccines, sequencing the genome of the SARS-CoV-2 virus), summation global public goods (pooling resources to shore up weak links) and weakest-link global public goods (controlling the spread of the virus). Multiple challenges at multiple scales with different agents made for a longer pandemic with highly unequal access to vaccines and with lasting economic effects that burdened low- and middle-income countries in particular. Understanding the challenges of providing different types of global public goods with different aggregations might enable better responses in the future.

In fact, a global public goods lens opens the possibility of enhancing the provision of global public goods through institutions that reshape incentives, provide information and transfer resources.[113] Many different types of institutions—and even agents such as civil society organizations and processes such as social movements—can play these roles, at multiple scales,[114] but four types of international institutions have a bearing on the provision of global public goods:[115]

- *Multilateral organizations.*[116] By pooling resources from countries, creating economies of scope and reducing transaction costs, these organizations efficiently support the provision of multiple global public goods. They include the United Nations and its specialized agencies, funds and programmes (including the nternational Labor Organization, the United Nations Environment Programme and the WHO), as well as international financial institutions such as the IMF and the World Bank (which are formally UN specialized agencies with autonomous governance). Multilateral organizations can directly fund global public goods (the IMF providing liquidity during a balance of payment crisis) or coordinate actions among countries (the WHO during health emergencies, the International Criminal Police Organization—better known as INTERPOL—in the case of transnational crime).
- *International treaties.*[117] Often negotiated under the auspices of multilateral organizations, international treaties bring multiple services that support global public good provision: disseminating

scientific information (to reduce uncertainty during negotiations), convening negotiating parties, and monitoring and fostering compliance after treaties are ratified. Such treaties frequently support global public goods associated with managing environmental spillovers.[118] Examples include the United Nations Framework Convention on Climate Change, the Montreal Protocol on Substances that Deplete the Ozone Layer and the Convention on International Trade in Endangered Species. Effective treaties often must jointly provide more than one global public good. For instance, an effective climate treaty might need to provide at least two global public goods: climate change mitigation as well as new ideas and technologies that lower mitigation costs.[119] A treaty on pandemic prevention, preparedness and response might also need to provide several global public goods, as is currently being considered.[120]

- *Clubs.* Countries can form clubs when it is possible to exclude nonparticipants from the benefits of global public goods.[121] The incentive structures of clubs—given the enhanced prognosis for provision associated with them: excludability implies that free riding is not a concern—make them relevant for enhancing global public good provision.[122]
- *International regimes.* Global transport and communication regimes provide global public goods that enable maritime trade and electronic telecommunications, often under the jurisdiction of multilateral institutions, such as the International Maritime Organization or the International Telecommunication Union.

These institutions are being mobilized to draw lessons from the Covid-19 pandemic and enhance the response to future pandemics. The lessons from the pandemic point to the need for very high ambition: the global resources needed for pandemic preparedness and response over 5–10 years are estimated to be in the hundreds of billions of dollars.[123] But the benefits would also be extremely high,[124] as the loss of lives and livelihoods and the economic toll of the pandemic made clear (chapter 1). The benefits from pandemic vaccines go well beyond health alone.[125]

The analysis in this chapter emphasizes how institutions that reshape incentives, information and resources can enhance the provision of global public goods when countries are assumed to be advancing their interests. As we move into part II of the Report, chapter 4 explores further insights continuing with this premise but also presents a wider vista on potential determinants of collective action. That enlarges the scope for potential interventions to enhance collective action. It also reveals the crucial importance of looking within countries to the emerging patterns of political polarization.

The global commons of ocean fisheries

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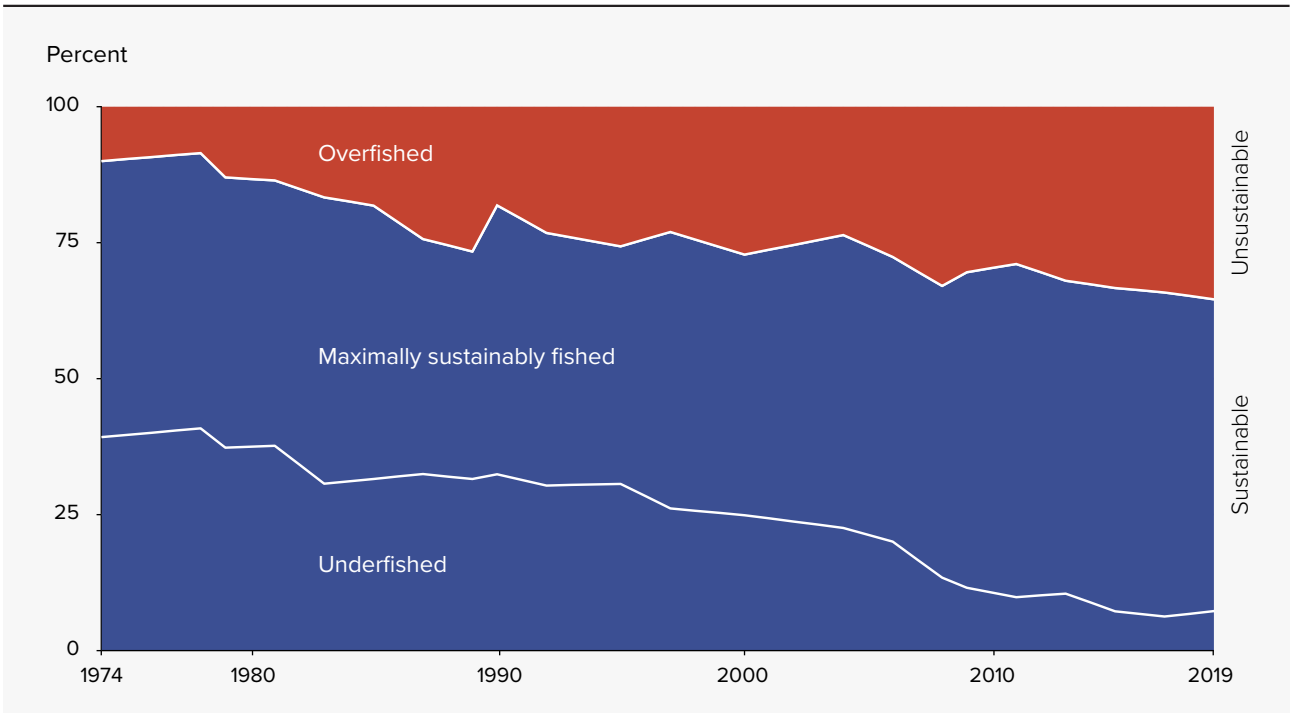
About one-third of the world's ocean fisheries are overfished (figure S3.1.1). A major reason for this is the underlying property rights regime: under international law all countries may exploit these resources on the high seas.[1] As Garrett Hardin says in his classic article, "The Tragedy of the Commons," if a resource is held in common, all potential users have an incentive to exploit it without regard to the effects on the others. "Freedom in a commons," he says, "brings ruin to all."[2]

A clear example of ruin is collapse of the formerly superabundant cod fishery in the northwest Atlantic Ocean. However, overexploitation short of collapse also results in big losses. If exploitation were reduced in the short run, stocks would rebuild. Annual net benefits in the long run could increase from $3 billion to $86 billion.[3]

What to do? If overexploitation is caused by the resource being held in common, the obvious remedy is to change the access rules. In the 1970s the world took a major step in this direction by establishing an entirely new property right, Exclusive Economic Zones (EEZs). EEZs extended every coastal state's exclusive right to manage fishery resources from 3 miles from shore (the old territorial sea) to 200 miles (at the same time EEZs were established, the territorial sea was extended from 3 miles to 12 miles). Because most fisheries are found in this zone, the creation of EEZs eased overfishing at a stroke.

Unfortunately, EEZs, by themselves, cannot eliminate overfishing. Some fisheries overlap different EEZs. Some straddle EEZs and the high seas. Some are highly migratory. Finally, some fisheries are exploited only in the high seas. Another problem is that

Figure S3.1.1 About one-third of the world's fishery stocks are overfished



Source: FAO 2022.

some coastal states lack the capacity to regulate access to fisheries within their EEZs.

Two radical proposals

What more can be done? The Global Oceans Commission (GOC 2014), inspired by research by White and Costello (2014), has proposed closing the high seas to fishing. Fisheries economist Rögnvaldur Hannesson has proposed extending today's EEZs to their maximum extent, eliminating the high seas entirely.[4] These are radical proposals. Will they help?

The first thing to note is that neither proposal is ideal. Neither would have any effect on fisheries found only within existing EEZs, where 96 percent of the commercial catch is taken.[5] Also, neither is suited to addressing exploitation of the only species caught exclusively in the high seas, the Antarctic toothfish (also known as the Chilean sea bass). Territorial claims to Antarctica are disputed, making extension of such claims contentious. Moreover, and rather obviously, closing these waters to fishing would mean zero profits, not higher profits.

Though neither proposal could sustain an ideal outcome, either or both might improve the status quo. Both would likely reduce harvests of highly migratory and straddling fisheries by blocking exploitation by distant water states (except through access agreements with coastal states). However, neither proposal would eliminate the common property problem that exists among coastal states. In addition, both proposals would restrict coastal states' access to at least parts of the existing high seas, raising fishing costs. It is possible, and perhaps even likely, that both proposals would be worse than the status quo.[6]

Regional seas

Versions of the two proposals have already been implemented on a regional scale.

All six coastal states on the Black Sea claim an EEZ, fully enclosing this small regional sea.[7] Similarly, all nine states on the Baltic Sea claim an EEZ, fully enclosing it. Until recently, the Mediterranean Sea was mainly open. For example, though France claimed an EEZ in the Atlantic Ocean in 1972, it did not claim one in the Mediterranean until 2012. Similarly, Spain claimed an EEZ in the Atlantic in 1978 and in the Mediterranean in 2013. Italy claimed an EEZ in 2021. Many claims in the eastern Mediterranean are motivated by an interest in developing natural gas resources. Several areas are disputed. Not long ago, states on the Mediterranean refrained from claiming an EEZ out of concern that it would only stimulate others to do so, restricting where the fleets of all states on this regional sea could fish. The equilibrium has now been broken. As the breadth of the Mediterranean is less than 400 miles in every direction, this regional sea is now fully enclosed. The effect of this change in property rights on fisheries conservation and rents has yet to be determined.

In 2010 in the Western and Central Pacific Ocean the eight Parties to the Nauru Agreement blocked access by purse seiners to high seas areas surrounded by their EEZs by making access to their EEZs contingent on states not fishing in the high seas pockets.[8] Because the surrounding EEZs are much larger than the high seas pockets and fishing exclusively in the high seas pockets is uneconomic, this move proved an effective deterrent. However, closing high seas areas only increased fishing in the adjacent EEZs and did not demonstrably help fisheries conservation.[9]

Closing these high seas pockets was made possible by an accident of geography: the leverage enjoyed by mainly small island states having adjacent EEZs. By contrast, the two radical proposals noted above would require a change in international law. A question not addressed by Hannesson or the Global Oceans Commission is how their proposals would come to be accepted in law.

Property rights established in customary law

We are used to grand ideas such as enclosure of the seas and closure of the high seas being achieved by international negotiations leading to adoption of a new treaty. But even though EEZs emerged as the United Nations Convention on the Law of the Sea was being negotiated and are codified in that agreement, this new property right was recognized as applying in customary law long before the Law of the Sea entered into force. The two radical ideas for changing existing property rights arrangements would also need to

be established in customary law. The reason is simple: treaties apply only to the countries that consent to be bound by them. A country can thus easily avoid being bound by a new rule established in a treaty by choosing not to participate in the treaty. By contrast, customary law applies universally. Though the United States has not ratified the Law of the Sea, it accepts that EEZs apply in customary law.

However, compared with treaties, customary law is an inscrutable institution. Custom is not negotiated explicitly. Nor does it require the explicit consent of individual countries. A customary law exists if states behave in accordance with the law—and do so in the belief that they are legally obligated to.[10]

Because custom is founded on beliefs, some scholars of international law have questioned whether it exists, let alone whether it has had any effect.[11] Does custom really shape behaviour, or is custom just a name given to behaviours that reflect national self-interests?

One way to know whether custom exists and has real effects is to identify situations in which a country would be better off deviating from a customary rule yet refrains from doing so (again, because it believes doing so would violate international law). The Grand Banks, a famously rich fishing ground off Canada's eastern shore, protrudes beyond the country's 200-mile EEZ in two places, the "Nose" and the "Tail" (a nearby third area, the Flemish Cap, lies entirely outside the EEZ). If custom merely codified actions that reflected national self-interest, Canada would have claimed an extended EEZ in these areas. We know this because, Canada and the European Union, especially Spain, previously clashed over fishing in them. In 2002, after years of overfishing by foreign fleets, a Canadian parliamentary committee investigated whether Canada should assert unilateral control over these areas. Despite its obvious self-interest motive for doing so, the committee recommended against the change, reckoning that other countries would oppose it.[12] Canada's adherence to the 200-mile limit is thus strong evidence of customary law's sway over state behaviour.

More broadly, globally, unauthorized fishing is 80 percent lower just inside EEZs than just outside them.[13] This strongly implies both that coastal states are enforcing their existing EEZs (presumably, because the EEZs are valuable to them) and that they could profit by extending their EEZs even further. But under customary law, a state can legally extend its EEZ only if others agree with the change, which is likely to cause others to extend their EEZs. Though a state would clearly gain by extending its EEZ unilaterally, it might ultimately lose when others extended their EEZs as well. Custom has a restraining influence on behaviour.[14]

So far, countries have shown little interest in asserting either of the radical proposals at the global level. But they have deviated from the rule of freedom on the high seas in one special case.

Under the Law of the Sea, "states of origin" of anadromous species—salmon, which spawn in inland waters—are recognized as having a "primary interest in and responsibility for such stocks." States may fish for salmon but "only in waters landward of the outer limits of the exclusive economic zones." Because this provision is accepted by consensus and reinforced by state practice, "the customary international law of freedom of fishing no longer affords any right to harvest [anadromous species] without the agreement of the state of origin," effectively banning directed fishing for salmon in the high seas.[15]

Salmon are found in both the North Pacific and North Atlantic Oceans but are harvested in the high seas only in the North Pacific.[16] Because salmon move through the EEZs of different states of origin in the North Pacific, the ban transforms what would have been an open access resource into a resource owned in common by states of origin only. By limiting the number of countries with access to the fishery, the ban likely lessens overexploitation. It also likely aids efficiency because efficient management requires targeting "specific species, specific age groups, and individual runs," which is possible only "at the time the fish approach the state of origin and segregate themselves for the return to their rivers of origin."[17] Also, the fish at this point are of maximum size and congregate in large numbers. Finally, to ensure sustainability, inland waters must be protected for spawning. By giving states of origin special rights to fish for these species, the high seas ban also gives these states an incentive to safeguard access by salmon to their spawning grounds. For salmon, a prohibition on high seas fishing clearly enhances efficiency.

Why was this exception allowed? When the Law of the Sea was being negotiated, the only states to make

proposals for anadromous species were Canada, Ireland, Japan, the Soviet Union and the United States—all states of origin. Moreover, no states protested states of origin having a special claim to anadromous stocks,[18] even the states with the most to gain from high seas fishing (Japan in the Pacific Ocean and Denmark, custodian for Greenland and the Faroe Islands, in the Atlantic Ocean). This situation did not apply to fisheries in general.

Nothing stops countries from enclosing the high seas or from closing them to fishing under customary law. Indeed, theory suggests that states will do so when it enhances efficiency.[19] States might not have embraced either radical proposal because they remain unconvinced that it would solve the overfishing problem.

Cooperative agreements established in treaty law

How to overcome overfishing? To Garret Hardin, there is only one solution: "mutual coercion, mutually agreed upon by the majority of the people affected."[20] This solution, however, presupposes that a democratic institution exists with the power to impose and enforce an outcome. Such institutions exist at the national level—but not at the global level. Moreover, it is hard to see how such an institution could emerge. After all, the territorial sea is an extension of a coastal state's land-based territory, and an EEZ is an extension of that state's territorial sea. A more limited proposal would give the exclusive right to fish on the high seas to a single party, a global high seas fisheries organization. However, most high seas fisheries overlap with EEZs, and there are good reasons for managing fisheries as coherent units—the logic of regional fisheries management organizations.

Elinor Ostrom agrees with Hardin's diagnosis of the reasons for the tragedy of the commons but disagrees strongly with his conclusion of the need for a centralized solution.[21] To Ostrom, if users of a common property resource lose from overexploitation, they have an incentive to cooperate to avoid overexploitation. Indeed, Ostrom provides numerous examples where cooperation has succeeded, but they are all at the local level. In a later paper, Ostrom and co-authors recognize that cooperation at the international level is harder.[22] They give several reasons for this, but one stands out: the rule of "voluntary assent to negotiated treaties."[23] As noted previously, under international law countries are free to enter into cooperative agreements or not as they please. Treaties, including treaties that establish regional fisheries management organizations, must be self-enforcing.[24]

The most critical issue for successful treaty design is participation: how to get all countries wishing to exploit a fishery to join the agreement. The Law of the Sea tries to do this by requiring that states establish regional fisheries organizations for the purpose of managing a fishery. The UN Fish Stocks Agreement goes further. Article 7 says that "coastal States and States fishing on the high seas have a duty to cooperate," and Article 8 says that these states shall satisfy "their duty to cooperate by becoming members of [a regional fisheries management organization (RFMO)]." Critically, Article 8 also says, "Only those states which are members of such an organization.... Shall have access to the fishery resources to which those measures apply." In other words, if a country wishes to exploit a fishery, it must become a member of the cooperative enterprise established to manage the fishery. The problem here is that this requirement applies only to countries that choose to participate in the Fish Stocks Agreement. The Global Oceans Commission called for universal ratification of this agreement, but urging participation does not create an incentive for participation.[25] Selective trade measures can help in some instances, but the freedom to exploit a fishery should ideally be coupled in customary law with the obligation to participate in the organization that manages the fishery.

However, if too little participation is a problem, so is too much participation. If all the countries exploiting a resource participate in an agreement that sustains their full cooperation, their success will encourage entry, weakening their incentive to cooperate in the first place. The Fish Stocks Agreement says that states having a "real interest" in a fishery may become members of an RFMO, but who gets to decide which states have such an interest? The Law of the Sea answered this question for salmon but not for fisheries in general. A second need for customary law is thus to limit access. RFMOs could address equity concerns by charging a fee for access to high

seas areas within their territories (such as the Nose and Tail of the Grand Banks, and the Flemish Cap, all three of which are situated within the territory of the Northwest Atlantic Fisheries Organization) and distributing the revenue to all countries, including nonparticipating countries, according to an agreed formula. The high seas were determined to be free at a time when fisheries were believed to be available in limitless supply.

Conclusion

Overfishing is a persistent and growing problem for which there is no simple remedy. Property rights solutions, established in customary law, and regional fishery management organizations, established in treaty law, both help. But each on its own falls short of sustaining an efficient outcome. Further progress will likely come from advancing both approaches in combination.

NOTES

1. FAO 2022.
2. Hardin 1968, p. 1244.
3. World Bank 2017.
4. Hannesson 2011.
5. Schiller and others 2018; http://www.seaaroundus.org.
6. Barrett forthcoming.
7. A portion of this is now disputed due to Russia's invasion of Ukraine.
8. The members of the Parties to the Nauru Agreement are the Federated States of Micronesia, Kiribati, the Marshall Islands, Nauru, Palau, Papua New Guinea, the Solomon Islands, Tokelau and Tuvalu.
9. Sibert and others 2012.
10. Bodansky 1995.
11. Goldsmith and Posner 1999.
12. Standing Committee on Fisheries and Oceans 2002.
13. Englander 2019.
14. Barrett forthcoming.
15. Burke 1991, p. 118.
16. Burke 1991.
17. Burke 1991, p. 103.
18. Copes 1977.
19. Barrett forthcoming.
20. Hardin 1968, p. 1247.
21. Ostrom 1990.
22. Ostrom and others 1999.
23. Ostrom and others 1999, p. 282.
24. Barrett 2003a.
25. The Global Ocean Commission (GOC 2014) lists 30 states that are members of RFMOs and have not ratified the UN Fish Stocks Agreement. Since 2014, when the commission's report was published, six countries on the list have ratified the Fish Stocks Agreement, raising the total to 93 participating countries.

SPOTLIGHT 3.2

Assessing the net benefits from global public goods and their distribution

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A six-step framework can be used to assess the net benefits from providing global public goods, as well as the distribution of those benefits.[1] Identifying the social, economic and other benefits (or costs) of adequate global public good provision can improve understanding of whether and to what extent different countries might support stronger international cooperation around certain global public goods.

Methodology

Step 1: Characterize current provision

Setting a clear benchmark for adequate provision is the first step in assessing a global public good. For example, in eradicating a communicable disease, the global public good can be deemed adequately provided when the disease is completely eliminated from nature. Given measures of disease exposure in a population (ranging from 0 percent to 100 percent, for example), one can then assess the extent to which this global public good has been provided. Other global public goods may require an alternative approach. For example, for trade facilitation in the context of a multilateral trade regime, bringing all countries that are below a certain benchmark (say, the median) up to that benchmark might be a practical target for adequate provision.

Step 2: Establish the global costs (or benefits) of current provision

Assessing the full range of costs associated with underprovided global public goods may not always be possible, particularly if data on certain aspects of these costs have not yet been developed. Nevertheless, it is usually possible to estimate at least some of the largest costs to provide a basis for policy action. For example, disease eradication could reduce social and economic costs too myriad to map in their entirety, but existing health data could be used to estimate the years of healthy and productive life lost due to disability and early death stemming from a disease. Reducing a disease burden by some amount could then be associated with an estimate of the benefits gained.

Step 3: Assess the global costs of corrective actions

Different global public goods have varying provision technologies. Adequately providing some global public goods may depend on the success of the least capable contributor (often called the weakest link). Countering international terrorism is an example, as it depends on the efforts of the country facing the most challenges in controlling its borders. But some global public goods such as vaccine development and discovery depend on the country or stakeholder with access to the right technology and the strongest scientific capabilities (called the best-shot). The cost of corrective action can then be estimated based on the required inputs and the nature of the provision technology for a global public good, as well as the benchmark for adequate provision.[2]

Step 4: Evaluate the global benefits from corrective actions

As noted earlier, estimating the costs of underproviding some global public goods offers an intuitive estimate of the potential benefits (from costs avoided) from adequate provision. But other global public goods offer completely new benefits that can be enjoyed across borders. For example, the multilateral trade regime could be expanded to allow for new value creation and facilitate new sources of global economic growth. Such institutional developments

might also have social and economic costs due to their disruptive side effects (hence the next steps in assessing the net benefits as well as their distribution across countries and stakeholders).

Step 5: Indicate the likely global net benefits from enhanced provision

Based on the previous steps, it should be possible to juxtapose the benefits from adequate provision of a global public good against the costs. In some cases adequate provision of a global public good averts costly outcomes, whereas in others the result is enhanced human welfare and new sources of economic growth. Both count on the benefits side of adequate provision of global public goods as described earlier, and in many cases indirect benefits are not yet factored in. For many global public goods these figures of new benefits or benefits expressed as averted costs easily outweigh the costs of adequate provision, hence motivating—at least on the whole—the rationale to cooperate across countries.

Step 6: Describe the cross-country distribution of net benefits from enhanced provision

A final step in the methodology clarifies the interests of each country involved in providing the global public good. When the net benefits to a country are high, it will likely support the adequate provision of the global public good, but it could decide to free ride from other countries attempting to provide the global public good. This is possible if inputs across countries are interchangeable (such as reductions in carbon emissions). For some global public goods with noninterchangeable inputs, each country's inputs are needed for adequate provision, so expected net benefits should be positive. And when the net benefits are low or even negative for countries whose cooperation is needed for adequate provision, this step helps clarify how international cooperation mechanisms could arrive at fair and stable outcomes—such as by introducing compensation and capacity-building mechanisms to finance and support participation. These burdens could be shouldered by the countries that stand to gain the most and that can pay for adequate global public good provision. Such a financing mechanism is not necessarily the same as foreign aid—rather it facilitates compensation to enhance international cooperation.[3]

Applications

Applying the methodology to five global public goods—eradicating smallpox, eradicating polio, adequately providing the multilateral trade regime, promoting climate stability and promoting faster recovery from pandemics—highlights not only the global nature of net benefits to be derived from their provision but also the underlying distribution of net benefits, which might motivate international cooperation to provide these or other global public goods.

Eradicating smallpox

Smallpox has been completely eradicated, with no reported infections worldwide. The World Health Assembly officially declared the eradication of smallpox in 1980. Retrospective measurements suggest that the global cost associated with eradicating smallpox was $300 million (in 1967 US dollars). Developing countries contributed $200 million, industrial countries, $100 million.[4] Since 1980 the annual global benefits have been estimated at $1.42 billion, with $1.07 billion allocated to developing countries and $350 million to industrial countries.[5] Smallpox eradication has resulted in a substantial global net present value benefit of approximately $80 billion ($1.42 billion a year from 1966 to 2022). Developing countries have received about 75 percent of these net benefits, industrial countries, about 25 percent. The overall benefit-to-expenditure ratio for global smallpox eradication stands at 159:1.[6]

Eradicating polio

As of 2023, polio eradication efforts remain insufficient, with around 99.9 percent progress since the programme's inception in 1988.[7] In 2022 the primary poliovirus strain (WPV1) was identified in only three countries, Afghanistan, Mozambique and Pakistan, resulting in 30 cases that year.[8] According to the latest estimate from 2021, the direct global cost of eradicating polio from 1988 to 2018 is projected to exceed $34 billion (in 2019 US dollars).[9] Assuming successful

eradication by 2023, the global net present value benefit is an estimated $61 billion, and the anticipated global net benefit from 1988 to 2029 is an estimated $28 billion. This figure is notably lower than previous estimates due to the delays encountered in eradication efforts. Low-income countries are expected to receive around $8 billion in benefits and lower middle-income countries around $21 billion, while other countries are projected to lose $1–$2 billion in costs.[10] Low- and lower middle-income countries would be the main beneficiaries of polio eradication, while most of the cost burden (approximately 60 percent) would fall on lower middle-income countries.[11]

Adequately providing the multilateral trade regime

Technology creation and diffusion have become central in international trade discussions, particularly given recent trade frictions on the technology front.[12] Góes and Bekkers (2022) explore the potential effects of increased and persistent large-scale geopolitical conflicts between different trade blocs on economic growth and technological innovation. Another way to view this type of study is to consider decoupling and economic dis-integration scenarios as de facto deliberate underprovision of the multilateral trade regime. So, the corrective action would be to (at least) avoid the decoupling and preserve the status quo welfare levels established in the baseline (no decoupling) scenario.

Using a multisector multiregion general equilibrium model with dynamic sector-specific diffusion, their modelling shows that decoupling the global trading system into two blocs would reduce global welfare in 2040 by about 5 percent (compared with the baseline scenario). The largest losses would be offset by positive technology spillovers from trade benefitting low-income regions. In scenarios with full decoupling and retaliatory tariff hikes across two main trade blocs (Eastern and Western), the welfare effects are asymmetric. Western bloc countries would experience losses of 1–8 percent compared with the baseline scenario, while Eastern bloc countries would experience losses of 8–12 percent. So, the distribution of net losses from decoupling—tantamount to a deliberate underprovision of the multilateral trade regime and a regression towards trading blocs—is skewed against low-income countries with lower productivity, which would likely belong to the Eastern bloc.

Promoting climate stability

Climate stability, which aims to stabilize greenhouse gas concentrations in the atmosphere to prevent dangerous human interference with the climate system, remains inadequately addressed. This global public good requires international cooperation to avert and mitigate the risks of climate change. In one example of how benefits significantly outweigh the costs of climate change mitigation, Yang, Meng and Suh (2023) examined stranded fossil fuel costs and the associated financial losses incurred by fossil fuel industries and related sectors due to the abandonment or devaluation of their assets. They estimated the cost of abandoning fossil fuels at $19 trillion, which presents a considerable economic challenge, primarily for fossil fuel–dependent countries. However, this cost is outweighed by the substantial benefits from climate change mitigation efforts, totalling $63 trillion globally by 2050.

The net benefit, calculated at $45 trillion globally, emphasizes the economic and environmental advantages of collective global efforts to lessen global dependence on fossil fuels and switch to cleaner energy sources. The distribution of the net benefit falls disproportionately to developing countries, even as many low-income countries are likely to need assistance managing the transition (see table S3.2.1 for a further breakdown).

Preparing for pandemics

SARS (first identified in November 2002), MERS (first identified in June 2012) and COVID-19 (first identified in December 2019) suggest that countries should indeed prepare in advance for pandemics that are likely to manifest. Recent calculations by Glennerster, Snyder and Tan (2022) reveal that global losses from pandemics could reach $700 billion a year, with losses based on mortality, output contractions and human capital losses. They also estimate that investing about $60 billion upfront to expand production capacity for vaccines and other supply chain inputs for pandemic response, with an additional $5 billion a year thereafter, could help ensure

Table S3.2.1 Summary of global public good assessments: Five cases

Global public good	Status	Estimated costs of corrective action	
		Overall	Disaggregated
Smallpox eradication (figures are in 1967 US dollars; see Barrett 2004)	Fully eradicated since 1980	→ $300 million (one-time cost)	→ Industrial countries: $100 million (one-time cost) → Developing countries: $200 million (one-time cost)
Polio eradication (figures are cumulative from 1988 to 2029 in 2019 US dollars; see Thompson and Kalkowska 2021)	99.9 percent eradicated as of 2023	→ $53.5 billion	→ Upper middle-income countries: $10.6 billion → Low- and lower middle-income countries: $42.9 billion
Multilateral trade regime (figures are based on a model analysing dynamic effects from trade, with a focus on technology, and the potential effects of increased and persistent large-scale geopolitical conflicts between different trade blocs on economic growth and technological innovation; see Góes and Bekkers 2022).	At risk of underprovision due to protectionist strategies and trade wars in recent years	na	na
Climate stability (figures refer to the results of addressing stranded fossil fuel costs; Yang, Meng and Suh 2023)	na	→ $19 trillion in stranded asset costs	→ High- and upper middle-income countries: $17.7 trillion → Low- and lower middle-income countries: $2 trillion
Pandemic recovery (figures refer to the results of investment in vaccine production capabilities and other preparedness measures; Glennerster, Snyder and Tan 2022)	na	→ $60 billion upfront to expand production capacity for vaccines, with an additional $5 billion a year thereafter	na

na is not applicable.
Source: Barrett 2004; Góes and Bekkers 2022; Glennerster, Snyder and Tan 2022; Hertel 2004; Thompson and Kalkowska 2021; Yang, Meng and Suh 2023.

the capability to vaccinate 70 percent of the population against any new disease within six months. This could be considered an estimate of the cost of adequately providing the global public good of disease control and pandemic response. The resulting global benefit could reach $800 billion (in terms of losses avoided), making the net present value of global public good provision about $400 billion. While Glennerster, Snyder and Tan (2022) do not elaborate fully on the distribution of these global net benefits, they outline how the expected net benefits for some "pivotal countries" could be high enough that they find reason to undertake unilateral investments in pandemic response preparedness. An investment programme in the United States could generate a net present value benefit of $61 billion (implying a gain of $47 billion over the counterfactual programme with lower preparedness investment). Similarly, advanced investment by Brazil could generate $19 billion (implying a gain of $15 billion).[13]

Estimated benefits (or costs) from global public good provision (or underprovision)		Estimated net benefits (or costs) from global public good provision (or underprovision)	
Overall	**Disaggregated**	**Overall**	**Disaggregated**
→ $1.42 billion in benefits (annual)	→ Industrial countries: $350 million (annual) → Developing countries: $1.07 billion (annual)	→ About $80 billion in benefits (cumulative from 1967 to 2022)	→ Industrial countries: $20 billion → Developing countries: $60 billion
→ $81.6 billion in benefits	→ Upper middle-income countries: $8.8 billion → Low- and lower middle-income countries: $72.8 billion	→ $28.1 billion in benefits	→ Upper middle-income countries: –$1.7 billion (cost) → Low- and lower middle-income countries: $29.8 billion
→ Decoupling the global trading system into two blocs would lead to a 5 percent loss in global welfare in 2040 relative to the baseline scenario	→ Western bloc countries: 1–8 percent loss in welfare relative to the baseline scenario → Eastern bloc countries: 8–12 percent loss in welfare relative to the baseline scenario	→ 5 percent loss in global welfare in 2040 relative to the baseline scenario	→ Western bloc countries: 1–8 percent loss in welfare relative to the baseline scenario → Eastern bloc countries: 8–12 percent loss in welfare relative to the baseline scenario
→ $63 trillion in benefits from climate change mitigation	→ High- and upper middle-income countries: $19.6 trillion → Low- and lower middle-income countries: $45.5 trillion	→ $45 trillion	→ High- and upper middle-income countries: $1.9 trillion → Low- and lower middle-income countries: $43.5 trillion
→ $800 billion in losses a year due to underprovision (based on mortality, output contractions and human capital losses)	na	→ $400 billion in net present value benefits to the world	→ US investment programme could generate a net present value benefit of $61 billion (implying a gain of $47 billion over the counterfactual programme) → Advanced investment by Brazil could generate a net present value benefit of $16 billion (implying a gain of $12 billion over the counterfactual programme)

NOTES

1. As proposed in Conceição and Mendoza (2006).
2. For further elaboration on these production technologies for global public goods, see Kaul and others (2003) and Sandler (1998).
3. See Kaul, Grunberg and Stern (1999) and Kaul and others (2003).
4. Barrett 2004.
5. Barrett 2004.
6. Barrett 2013b.
7. Lee and others 2023.
8. Lee and others 2023.
9. Thompson and Kalkowska 2021.
10. Thompson and Kalkowska 2021.
11. Thompson and Kalkowska 2021.
12. This section draws from Mendoza (2023).
13. Glennerster, Snyder and Tan 2022; Mendoza 2023.

SPOTLIGHT 3.3

How inequity in access to Covid-19 vaccines unfolded: An account using a global public goods lens

Controlling the transmission of the virus that causes Covid-19 (or achieving herd immunity through vaccines, which at times during the pandemic seemed feasible)[1] is a weakest-link global public good. Until pharmaceutical interventions (vaccines and treatment) were available, control of the virus's spread had to rely on nonpharmaceutical interventions (such as social distancing), which imply fully understanding the mechanisms of transmission, which took time to establish. Thus, measures emphasized reducing social interaction (in schools, economic activities that implied face-to-face contact, travel), which some countries were better able to shoulder than others.[2]

Nonpharmaceutical interventions can be effective in controlling disease spread (and have even been used as a basis to pursue disease eradication),[3] but they require that countries with fewer capabilities and resources be supported, which happened to only a limited extent with Covid-19. For instance, the International Monetary Fund (IMF) adopted a general allocation of $650 billion in special drawing rights (SDRs) only at the end of August 2021 and distributed it in proportion to existing country quotas in the IMF, implying that only $21 billion was allocated to low-income countries.[4] Even though the SDR allocation represented a larger share of gross domestic product (GDP) for low-income economies than for advanced economies,[5] 35 percent of IMF members in emerging markets and 50 percent in low-income countries considered the allocation insufficient.[6] Moreover, because interest rates have increased since the allocation, IMF members with negative SDR positions have had to shoulder higher financing costs. So, while the concessional (grant element) of the SDR allocation was 82 percent in August 2021, it had declined to 34 percent (just below the 35 percent concessionality threshold) in 2023.[7]

Once vaccines became available, the WHO and its partners, including philanthropic organizations, established an institutional framework to provide equitable access to vaccines (COVAX), which was initially and for some time underfinanced.[8] The availability of vaccines brought about two benefits. First, as with any vaccine, it provided a pharmaceutical intervention to control the virus's spread, contributing to controlling the disease within countries while reducing transmission risk to other countries. Second, where available and deployed at scale, vaccines enabled the relaxation of the strict social distancing measures that had curtailed social and economic life, but these benefits were concentrated within borders. Inequities in access to vaccines across countries hampered the provision of the weakest-link global public good of global disease control, ultimately extending the duration of the pandemic for all.[9] The economic toll of social distancing measures (not only in schooling but also in access to health and other services) deepened the asymmetries between countries able to restart their economies and reopen their schools and those less able to do so because they were deprived of the ability to deploy vaccines.[10]

The inequity in access to Covid-19 vaccines is a moral stain on the international community, contributing to a longer and deadlier pandemic than might have happened with more equitable access to vaccines.[11] More than 2 billion people were vaccinated within 8 months in 141 countries, averting 2.4 million excess deaths. But a counterfactual with equitable distribution of vaccines, with vaccination in each country proportional to its population, would have saved roughly 670,000 more lives.[12]

Starting more aggressively with public support for vaccine development in high-income countries might have put other countries at a disadvantage: as much as three-quarters of the delay in vaccine deliveries to low- and middle-income countries has been attributed to the signing of advanced purchase agreements in these countries later than in high-income countries.[13] In contrast to Covid-19, during the Ebola outbreak in

West Africa, most of the incidence and burden of the disease were in low-income countries, though there were concerns in high-income countries: there was little alignment between resources and country interests and preferences, and more than 70 months passed between the outbreak in December 2013 and the FDA approval of a vaccine in October 2019.[14]

In addition to differences in the timing of advanced purchase agreements, inequities in access to Covid-19 vaccines were also due to the fact that some key innovations remained under patent protection.[15] The vast majority of vaccine developers (72 percent) were private firms,[16] most of which entered purchase agreements on a commercial basis.[17] While firms played crucial roles in the development and deployment of vaccines, their commercial motivations might also have hindered faster deployment at scale in several low- and middle-income countries.

NOTES

1. The WHO advocated for vaccine use to move towards herd immunity (WHO 2020). Estimates on the threshold that would deliver herd immunity were hotly debated in the press (McNeil Jr. 2020), but more recent analysis suggests that herd immunity may not be feasible (Malinzi and others 2023; Morens, Folkers and Fauci 2022). Defining with precision what herd immunity means is also crucial, given that the concept is often interpreted differently (Bullen, Heriot and Jamrozik 2023).
2. UNDP 2020a.
3. This is the case for efforts to eradicate dracunculiasis (Guinea-worm disease), for which no treatment or vaccine exists. The disease spreads by drinking contaminated water, so efforts to provide safe drinking, along with early detection and surveillance, are key to controlling the disease (Biswas and others 2013). These measures have been very effective, sharply reducing cases (from around 3.5 million a year to only 13 in 2022) and nearly eliminating the disease in most of the world (with 199 countries, territories and areas certified by the WHO as free of dracunculiasis transmission; WHO 2023). Humans were thought to be the only reservoirs of the disease, which provided prospects for eradication using nonpharmaceutical interventions, but the recent detection of the disease in animal hosts, including domestic dogs, makes that prospect uncertain (WHO 2023).
4. IMF 2021a. The IMF encouraged countries with strong external positions to voluntarily channel resources to the countries most in need (IMF 2021b). And the G20 followed with pledges that slightly surpassed the target of channelling $100 billion by June 2023 (IMF 2023b).
5. About 2.39 percent of 2021 GDP, compared with 1.25 percent for advanced economies.
6. IMF 2023b.
7. IMF 2023b; Shenai and others 2023.
8. Still, by January 2022 COVAX had distributed about a billion vaccines to around 140 countries (Budish and others 2022). And despite an increase in international development assistance to health in 2020 and 2021 (Micah and others 2023).
9. Bollyky and Bown 2020.
10. There were also other intersecting precarities that shaped the ability of some countries and communities to respond, such as in many parts of Africa, as analysed in detail in MacGregor and others (2022).
11. As widely forewarned (see, for instance, Bollyky and Bown 2020). Until the first vaccines were authorized by a stringent regulatory authority, there had been 70 million Covid-19 cases and 1.6 million deaths worldwide (Saville and others 2022). As of the end of September 2023, there had been 762 million cases and 6.8 million deaths (see https://covid19.who.int/), so in the "vaccine era," cases were multiplied by 10 and deaths by 4.
12. Agrawal, Sood and Whaley 2023.
13. Agarwal and Reed 2022.
14. Excler and others 2021.
15. Pilkington, Keestra and Hill 2022; Wouters and others 2021.
16. Le and others.
17. Sachs and others 2022.