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# Ensuring a Post-COVID Economic Agenda Tackles Global Biodiversity Loss

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38 The COVID-19 pandemic has caused severe impacts to global economies on a scale not
39 seen in more than a generation. Stay at home policies, widespread travel cancellations, and
40 restrictions on most communal activities have all dealt a blow to daily economic interactions.
41 Many affluent countries hit hard by the virus, including the US and countries within Europe,
42 have been planning and implementing massive investments of government stimulus in
43 attempts to stave off dramatically rising unemployment and risk of fiscal collapse. Many are
44 casting these efforts as an attempt to 'return to normal' or 'get the economy back on track'. But
45 recent assessments of the state of planetary health from the Intergovernmental Science-Policy
46 Platform on Biodiversity and Ecosystem Services[1] and other global bodies tell us that a return to
47 normal, pre-pandemic business as usual is not acceptable, and will undermine future prosperity
48 of humans and the planet.
49 Rapid degradation of ecosystems and biodiversity over the past 50 years has put
50 enormous stress on the natural systems that supply humanity with food, water and other
51 benefits from nature, and put up to 1 million species at risk of extinction.[2] The IPBES Global
52 Assessment (GA) report, released in May 2019, linked these changes to direct drivers such as
53 land/sea-use change (particularly agricultural expansion), direct exploitation of wild species,
54 climate change, invasive alien species and pollution, all of which, in turn, are shaped by indirect
55 drivers, such as demographic and social changes and economic interests.[1] Indeed, the global
56 economy has expanded rapidly over the last half century, and the accelerating scale of capital
57 accumulation and trade flows in the contemporary era have led to telecoupled and spillover
58 effects, including large-scale habitat destruction that has been linked to the emergence of novel
59 viral diseases, such as COVID-19.[3] Such ecological degradation has long been known to pose

60 substantial threats to economic production because of its potential to undermine the natural
61 resources on which much economic activity is based, as well as problems for human health and
62 work productivity, but until the emergence of COVID-19, such risks seemed distant.[4]

63 Now we are at a crossroads. We must not only address the short-term economic pain in
64 countries under stay at home orders and social distancing recommendations, but also think
65 about what kind of economy we want and need for a sustainable, just, and equitable future in
66 the long-term. Quick 'fixes' to get economies back on track are likely to fail to address the deep
67 pre-existing sustainability and inequality challenges we face, therefore care and consideration
68 of nature and justice need to be part of any solution. Evidence suggests that many citizens of
69 the US and EU countries agree that a post-COVID-19 recovery must reflect attention to values
70 like improving the environment, tackling climate change, and ensuring social equity.[5]

71 While many scientists and politicians have been making the arguments for a COVID-19
72 recovery that is low-carbon[6], there has been much less attention to how to include biodiversity
73 and ecosystems in such a transition for socio-ecological resilience. The few mentions of
74 biodiversity or ecosystem-based actions related to the current pandemic have primarily focused
75 on closing wildlife markets as a potential source of novel viruses, or expanding protected
76 natural areas, rather than attention to the wider issues and drivers that create economic
77 demands and ecological disruptions in the first place.[7,8] Further, initial indications are that
78 biodiversity is not being prioritized in recovery packages; indeed, the EU in late May released a
79 draft 'green recovery' plan to spend more than €1 trillion on economic stimulus measures the
80 same week as a new biodiversity strategic plan funded at only €20 billion, with little overlap
81 between the two approaches.[9] Our concern is that biodiversity is too often seen as an

afterthought: as less important than climate action, or as a detriment to economic expansion or re-employment. In reality, there are a number of steps and policies that would aid economic recovery while at the same time addressing many of the root causes of biodiversity loss, including connections with zoonotic diseases. We revisit some of the analysis from the IPBES global assessment to help provide guidance on restructuring the global economic system to reduce pressures on natural systems and encourage a resilient recovery, which in turn might make pandemics driven by the human-wildlife interface less likely in the future.

**Immediate needs**

Given the need for rapid and massive inputs of capital to combat economic distress, government stimulus measures and relief packages can make choices that have positive impacts on biodiversity and ecosystems and lay the foundations for longer-term resilience. There is clear evidence for existing economic drivers of biodiversity loss (Figure 1), and to reverse these trends national governments could now prioritize a series of steps.

***1). Shift from environmentally harmful subsidies to beneficial ones***. In an era of rising fiscal red ink, environmentally harmful subsidies make neither economic nor ecological sense. In 2015, agricultural support potentially harmful to nature amounted to US$100 billion in OECD countries alone, while fossil fuel subsidies, which generate both end carbon emissions and water and land pollution at sites of extraction, range between US$300-680 billion per year and result in estimated global damages of US$5 trillion in reduced natural functioning, offsetting any economic advantage they confer.[10] Many governments subsidize fishing by national fleets, estimated to be over US$35 billion per year, often encouraging overfishing and exceeding the net economic benefit obtained.[11] Overall, the amount of finance mobilized to promote

104 biodiversity is conservatively estimated to be outweighed by environmentally harmful subsidies
105 by a factor of ten.[10]

106 Subsidies are not in and of themselves inherently bad; they are a useful tool for
107 governments to make investments in areas that can promote ecosystem resilience. But now is
108 the time to eliminate those subsidies that drive biodiversity loss and carbon emissions,
109 although unfortunately, the current turmoil in global oil markets is driving some countries to
110 the opposite conclusion. Many of the existing subsidy policies were put in place for other
111 reasons, such as to maintain the economic viability of rural areas, or support new industries,
112 but such objectives can be achieved with positive approaches that promote public goods,
113 rather than the over-exploitation of natural resources with significant long-term costs.
114 However, subsidy reform often is challenged by vested interests.[12] Studies of reform successes
115 undertaken by a handful of countries suggest the need to act quickly when presented with
116 windows of opportunity that may be outside the influence of domestic policy makers and
117 unrelated to the environment (for example, current human health crises); build alliances
118 between economic and environmental interests in common; devise targeted measures to
119 address potential impacts on competitiveness and income distribution; build a robust evidence
120 base on the social costs and benefits of reform; and encourage broad stakeholder
121 engagement.[13]

122 Existing positive subsidies with outcomes on biodiversity that could be expanded in
123 COVID-19 recovery plans include support to farmers who conserve and better provision
124 ecosystem health on their lands, used within both the US Conservation Reserve Program and
125 the EU Common Agricultural Policy. However, in both cases, positive subsidies to encourage

126 environmentally friendly farming practices (for example, conservation set-asides, organic
127 agriculture, low-intensity systems, integrated farm management, and preservation of landscape
128 of high-value habitats) are usually outweighed by other government subsidies that encourage
129 overproduction and agricultural expansion.[14]

130 The pandemic has further revealed that shorter supply chains are more resilient and
131 contribute to local food sovereignty, which may reverse previous trends towards vertical
132 consolidation and extended global trade in agricultural products.[15] One additional form of
133 public subsidy that can be used to support this transition to local foodsheds is through public
134 procurement. Just as government purchases of medical supplies has spurred needed
135 production for the COVID-19 response, the power of public purchasing of food grown using
136 biodiversity-protecting agro-ecological methods can increase local production and encourage
137 an upscaling of environmentally sound investments.[16]

138 ***2). Expand new taxation policies for environmental harms***. Environmental policy has a long
139 history of using environmental taxes to reduce pollution and increase resource use efficiency,
140 such as gas taxes or plastic bag fees; however, very few direct consumption or other taxes have
141 been designed specifically to preserve biodiversity. Many taxes on activities or products
142 exerting negative (and often indirect) effects on ecosystems and biodiversity rely either on the
143 polluter-pay principle or on the user-pay principle, which can serve to nudge people towards
144 certain behaviors (such as bottle recycling fees), but most existing taxes are too low to
145 significantly reduce negative impacts.[17] Currently, given the need to rapidly raise sources of
146 revenue for local, state and national governments, ecosystem-related taxes could be increased
147 and expanded, including resource extraction taxes (e.g. timber); pesticide taxes; diffuse

148 pollution taxes, including water pollution charges and taxes; air pollution and gasoline taxes,
149 given that air pollutants harm ecosystems through acidification and eutrophication of inland
150 waters; carbon taxes; and waste and packaging taxes.[18] The experience of a recent carbon tax
151 in France, which was met by protests from the Yellow Vests movement, may seem a
152 discouraging example, but in fact well-designed taxes that include a way to address equity
153 concerns so that they do not unfairly fall on certain populations are likely to receive more
154 public support.[19] For example, proposals for a carbon fee/tax that is paired with a dividend can
155 help solve these problems, since a majority of mostly low and middle income households would
156 receive more in dividends than they would spend in higher taxes.[20] However, rather than
157 seeking to increase taxes on some industries causing environmental damage, some post-COVID
158 recovery packages are actually moving in the opposite direction by reducing taxes and relaxing
159 regulations, a short-term strategy for economic stimulus that is likely to have longer-term
160 negative health and environmental consequences (Figure 2).[21]
161 Governments can also seek to reform tax havens and retain more revenue at home in
162 an era of tightening belts. Offshore and hidden accounts reduce the amount of financing
163 available to governments for global public goods provisioning, and provide bad actors with
164 opportunities to avoid financial scrutiny, reducing the impact of policies such as certification or
165 supply chain monitoring. A recent study of tax havens found that 70% of known fishing vessels
166 implicated in illegal fishing are flagged in a tax haven, and that nearly 70% of foreign capital to
167 the largest companies raising soy and beef in the Amazon, prime drivers of deforestation, were
168 channeled through tax havens.[22] Preventing companies who use tax havens from reaping any

169 benefits of post-COVID recovery money from public coffers is one possible action that could be
170 taken.
171 ***3). Institute criteria to guide greener investments that support biodiversity.*** In the short term,
172 as the private sector seeks grants and loans to shore up payrolls and ensure the possibility of
173 longer-term viability, governments should seek to prioritize support for those businesses that
174 do not harm biodiversity, and put restrictions on those that accept investment. For example,
175 after the 2008-9 automotive company bailout in the US, the Obama administration had
176 leverage to work with car manufacturers to increase fuel economy standards, and the 2009
177 American Recovery and Reinvestment Act provided numerous loans and tax credits towards
178 greener vehicle development.[23] Similar plans could be required for businesses receiving bailout
179 funds, including having biodiversity risk mitigation plans, requiring disclosures of impact, and
180 building ecosystem considerations into decision-making; so far, only Canada has proposed that
181 bailout funds to large corporations will require adherence to carbon disclosure standards.
182 Evidence suggests that currently few strings are being attached to stimulus and bailout money
183 for private corporations, such as airlines, which outside of France have not been required to
184 tackle reduced carbon emissions as part of their receipt of public funds. Other relevant
185 examples could include requirements for any financial support to the cruise industry to
186 minimize their considerable contribution to ocean pollution.[24] Such measures and standards
187 need to be combined with transparency as to where bailout funds and stimulus investments are
188 being directed, so as to harness public scrutiny of these efforts.[25]
189 For the financial sector, including banks, wealth and pension funds, private equity,
190 insurance companies, and others, a mix of regulations and incentives would encourage

investments in sectors and technologies that reduce pressures on nature.[26] Privately funded large-scale land acquisitions in many tropical countries, particularly for export commodities, have been implicated in higher rates of deforestation, even outside the investment lands.[27] The FIRE sector (finance, insurance and real estate) is increasingly implicated in biodiversity loss; for example, increased farmland prices resulting from investments in specialized real estate trusts may drive agricultural expansion that leads to ecosystem alteration.[28] Trends towards securitization (bundling of nontraded assets or debt and risk transformed into a tradable asset) represented in commodity index funds, futures markets, and derivatives markets have grown dramatically, are increasingly complex, and are increasingly disconnected to actual material flows of goods.[29, 30] For example, futures contracts are a key factor in the production and trade of agricultural commodities such as soy, coffee, tea and palm oil. While they offer potential income stability to manage risks for producers, they are also an opportunity for speculation and hedging on price movements that have environmental implications: there is evidence that speculation in agricultural derivatives markets contributed to higher and more volatile food prices in 2007 and 2008, which in turn drove investment in the expansion of production.[31]

However, the financial sector is also an important potential pressure point to curb the negative impacts of public and private actors on the environment.[32] The Network for Greening the Financial System has noted that central banks can play a key role to ensure environmental standards are set and met (as well as move quickly), and the EU's new sustainable finance guidelines are one example; these standards provide for liability of banks for the socio-environmental impact of their investments, and could be accelerated in the post-COVID recovery.[33] Indeed, research shows that banks that adopt environmental standards show less

213 exposure to risk.[34] Emphasizing the risks of 'stranded assets' (such as oil reserves) has been an
214 effective strategy to guide disinvestment in the fossil fuel sector[35]; this model could be
215 translated to biodiversity concerns by emphasizing the risks that come with agribusiness
216 investments that might have liabilities around pesticide pollution or loss of crucial pollinators,
217 as one case study has shown.[36] While securities, derivatives, and other speculative financial
218 instruments bring with them considerable ecological and economic risks, more sustainable and
219 secure options exist in capital markets, such as 'green' bonds, which raise funds for both private
220 and public investment in sustainable projects, and these may seem more attractive in a
221 recovery economy. Green bonds have raised hundreds of billions for renewable energy and
222 infrastructure for low-carbon futures[37]; however, similar initiatives for biodiversity are not yet
223 in place, as less than 3% of the existing bond market goes to agriculture and forestry
224 investments.[38]

225 Improved financial standards also need to be tied to public disclosure of information on
226 investments. Studies of corporate social responsibility standards, certification, disclosure, and
227 other voluntary actions by companies and investment sources suggest that these tools can be
228 effective given the right circumstances.[39] For example, shareholder activism and socially-
229 conscious investment around climate often uses information from the Carbon Disclosure
230 Project to evaluate risks and impacts of participating corporate entities[40]; similar reporting and
231 disclosure around biodiversity impacts would help direct investment. However, these voluntary
232 instruments are usually limited due to a lack of systematic monitoring and reporting of impacts
233 of sourcing practices; lack of follow-up within commodity chains, leading to concerns about
234 'greenwashing'; and insufficient economic benefits for companies to adopt sustainable

235 practices in the first place.[41] Investment standards and statutes could expand fiduciary
236 responsibilities to address some of these problems[42]; for example, use of third-party beneficiary
237 standing would allow outside parties to take legal action if principles adopted by companies are
238 not followed.

239 ***4). Funding work programs and universal basic income with an ecosystem focus***. In the
240 immediate aftermath of the economic crisis, government-supported work programs can be
241 essential in reducing widespread unemployment. Just as the Works Progress Administration
242 and Civilian Conservation Corps were used in the US during the Great Depression, jobs in
243 ecological restoration and green infrastructure could be a source of both employment and
244 ecological benefits.[43] Given current demands for increased racial justice, and the
245 disproportionate impact COVID-19 has had on communities of color, such employment
246 programs can be targeted to these harder-hit areas, such as in urban ecosystem restoration and
247 green infrastructure.[44] A recent survey of economists found that stimulus measures focused on
248 green infrastructure (both biodiversity and climate) were rated among the most positive
249 potential measures, delivering both short and long term economic and societal benefits, while
250 airline bailouts were rated as the worst stimulus option.[6] Experience shows that these
251 investments work; marine restoration projects funded as part of the American Recovery and
252 Reinvestment Act (ARRA) in 2009 generated more jobs per million USD invested than many
253 other sectors, such as fossil fuels.[45] Many payments for environmental services (PES) programs
254 globally have been used to support employment in activities such as invasive species removal,
255 reforestation and restoration, and other investments in both people and nature[46], and these
256 could be rapidly upscaled, as they usually have more demand than finances allow.

The COVID-19 pandemic has also opened space for consideration of "emergency basic income" proposals, such as paying US$2000 per person monthly until the pandemic subsides, as a quick, efficient, non-bureaucratic method to put cash into people's hands for basic needs.[47] Given the precariousness of many households revealed during this crisis, longer term universal basic income (UBI) support and other policies could emerge as well in the wake. UBI could have biodiversity impacts in that a subsistence-level UBI has been suggested as a way to facilitate simpler lifestyles with smaller ecological footprints, and to valorize unpaid work such as child raising or volunteer activity that typically has a lower carbon footprint than paid labor.[48] UBI subsidies could also be raised via sources like carbon or pollution taxes, as noted above, in which the revenue is then distributed as a per capita dividend. Similar programs that have tied payments to environmental behaviors, such as some conditional cash transfer (CCT) programs and payments for environmental services, show that such programs can work if incentives are structured appropriately and local monitoring and legitimacy is strong.[49] In fact, recent analysis of a CCT program in Indonesia shows that it reduced deforestation, although it was not designed for conservation ends.[50]

**A roadmap for longer-term economic strategies and priorities**

In the longer-term, both governments and market actors must aim to achieve a more sustainable economy that better integrates the protection of nature. The relentless expansion of the current global economy underpins the drivers of biodiversity loss, as well as contributing to continuing inequality, and a transformative change of the economy is urgently needed.[51, 52] The GA assessed a series of possibilities, based on evidence of effectiveness of existing policies and scenarios of what future worlds might look like, declaring a need for “incorporating the

279 reduction of inequalities into development pathways, reducing overconsumption and waste
280 and addressing environmental impacts, such as externalities of economic activities, from the
281 local to the global scales."[1] Below we focus on some key steps that can be taken over the
282 longer-term to ensure transformative economic change (Figure 3).
283 ***1). Rethink production models***. Shorter and more localized supply chains are likely to be
284 inevitable in a post-COVID-19 world, as the current just-in-time models have revealed
285 themselves to be vulnerable to interruption.[53] Many supply chains already faced systemic risks
286 inherent in the dependency of business on ecosystem services that are overused or poorly
287 managed.[54] For example, over the past several decades, commodity chain verticalization in
288 agribusiness has created the conditions for overproduction with negative impacts for
289 biodiversity, driven in part by private equity investments that pressure many producers to cut
290 costs, the collapse of international commodity agreements that have resulted in increased
291 production even when not met by demand, and current trade rules that encourage
292 unsustainable sourcing.[28] Shifting from global supply chains to more localized production needs
293 to balance efficiency with resilience, and will require new production sites and models, such as
294 new breeds or crop practices for shorter food supply chains. All these will need to be planned
295 sustainably and with the participation of multiple stakeholders, including consumers. Such
296 restructuring of supply chains can partially address the existing ecologically unequal exchange
297 embodied in land intensive commodities, which have depleted natural stocks of originating
298 countries.[55]
299 At the same time, global trade will continue to be needed, particularly as not all areas
300 can supply sufficient food in localized supply chains.[56] Thus these efforts can be supported by

301 reformed trade agreements, which need to shift from their dominant focus on trade
302 liberalization towards securing fairness, equity and sustainability, including rules that provide
303 greater policy space for governments to prioritize and support local production standards.[57]
304 Work within WTO has aimed at eliminating economically distorting subsidies, but could be
305 expanded by creating a true "green box" for biodiversity-friendly initiatives to encourage
306 elimination of ecologically harmful subsidies and overproduction stimulated by trade
307 distortions. Other work within trade regimes has included the EU's consideration of carbon
308 border taxes to discourage leakage, and similar steps could be taken for green production
309 supply chains that avoid land-based emissions and preserve biodiversity in particular.[58]
310 Reforming global trade and production will also require multinational corporations to move
311 away from the paradigm that their primary financial aim is to maximize dividends for
312 shareholders, which often encourages unsustainable overproduction.[59]
313
314 ***2) Rethink ways to reduce excess consumption.*** Consumption is a major driver of unsustainable
315 production, and the GA encouraged countries to focus on "improving standards, systems and
316 relevant regulations aimed at internalizing the external costs of production, extraction and
317 consumption (such as pricing wasteful or polluting practices, including through penalties);
318 promoting resource efficiency and circular and other economic models; voluntary
319 environmental and social certification of market chains; and incentives that promote
320 sustainable practices and innovation."[1] The COVID-19 pandemic may accelerate trends towards
321 reduced consumption, given massively reduced travel and rethinking what counts as a good
322 quality of life.[60] However, many immediate stimulus measures that have been proposed focus

323 on *increased* consumption, such as reductions in VAT taxes, without much attention to the
324 ecological impacts of such actions.

325 Steps to reduce excess consumption can include both incentives and regulations:
326 targeting consumer behavior with tools such as education initiatives, choice architecture, and
327 collaborative consumption (such as sharing and reuse), as well as resource use caps and
328 changes in incentives and subsidies.[61, 62] The idea of circular economies and decoupling
329 resource use and economic growth is slowly catching on in some European countries, but is not
330 yet widespread elsewhere.[63] Some have posited that transitions within economic sectors, such
331 as from resource-intensive production of natural resources to more service or financially-
332 oriented economies (which may be accelerated by COVID-19 work-from-home trends), would
333 lead to smaller environmental impacts. Evidence suggests, however, that consumption by those
334 working in the services sectors may outweigh gains from shifts in production, indicating that
335 both production and consumption strategies need to go hand in hand.[64] Overall, the conclusion
336 of several recent reports is that no sustainable future that meets both human needs and stays
337 within planetary boundaries is possible without decreases in consumption among the wealthier
338 nations.[65]

339 ***3). Shift fiscal policies to reflect environmental values.*** Currently governments have a great
340 deal of concern about how they will balance budgets and manage long-term fiscal stressors,
341 particularly subnational areas with yearly requirements for balanced budgets and the inability
342 to borrow or go into debt. This is forcing hard choices that have long-term consequences; for
343 example, New York City, facing a budget deficit of US$7 billion in lost tax revenue since the
344 pandemic, has proposed a more than 10% cut to the city's parks department budget, despite

345 green space having been an important physical and mental health benefit during lockdown
346 policies.[66]
347 In light of these challenges, ensuring that state fiscal policies continue to reflect
348 environmental values and encourage biodiversity is important, and novel financing can help
349 subnational areas balance their budgets. For example, ecological fiscal transfers (EFT) are a
350 policy instrument used to redistribute tax revenues among public actors based on ecological or
351 conservation-related indicators. States have long redistributed public revenues from higher to
352 lower levels of government to help the latter cover their expenses in providing public goods and
353 services, but comparatively new is the rationale to use fiscal transfers for biodiversity or
354 conservation. EFT use ecological indicators (such as the quantity and quality of protected areas
355 or forest areas) as part of fiscal redistribution formulas, e.g., as a means to compensate
356 municipalities for their conservation expenses or paying for the spillover benefits of related
357 areas beyond municipal boundaries.[67] To date, there are only a few countries globally that have
358 implemented EFT (such as Brazil, India, Portugal and France), although there is good potential
359 to do so with low transaction costs.[68, 69] For example, India now distributes 7.5% of its national-
360 level tax revenue based on state forest cover indicators.[70] Such approaches can be encouraged
361 and expanded to assist local governments in supporting conservation while also providing
362 opportunities for citizens to enjoy more green spaces.
363 ***4). Ensure continued international conservation funding***. Although governments will be
364 financially strapped for the foreseeable future, and international aid flows are likely to
365 decrease, there will still be a need to support international funding for conservation and
366 sustainable development initiatives, both in the immediate short-term as well as over time.

367 Currently, most countries spend only a fraction (less than 1%) of their GDP on "biodiversity-
368 related activities", either for domestic support or foreign environmental aid[71], and while private
369 investment has been substantial in the past[72], it is likely to be under strain given current
370 economic challenges. Even before the pandemic, existing funding was insufficient: for example,
371 fully implementing activities under the existing Aichi Biodiversity Targets was estimated to
372 require up to US$ 440 billion in investment to seriously tackle biodiversity loss.[73] Increasing
373 corporate contributions towards conservation, such as from agribusiness and fishing industries
374 that depend on healthy ecosystems, has been suggested as part of a revamped global
375 biodiversity accord.[74]

376 Now, needs are even greater. Rising unemployment and food insecurity in the global
377 South as a result of COVID-19 will likely increase pressure on local ecosystems, such as
378 expansion of agriculture or the wildlife trade, which damages biodiversity and enhances the risk
379 of future epidemics. Indeed, there is evidence that falling ecotourism dollars and reduced
380 ranger activity as a result of COVID-19 is leading to more poaching in some areas.[75] Some small-
381 scale fisheries, which employ 90% of people in the fishing industry, have virtually collapsed as
382 China has no longer imported their products since the virus emerged.[76] Thus ensuring
383 employment and livelihood protections for these workers in resource sectors and conservation
384 areas has been suggested as a priority for global aid packages.[75] However, increasing funding
385 for nature conservation alone will not be sufficient if the indirect drivers of biodiversity loss are
386 not addressed, and therefore needs to be in concert with the other steps outlined above.

387 ***5). Address inequality*.** Economic inequality is problematic on its own, but it also generates
388 poorer environmental outcomes; for example, income inequality is associated with excess

389 consumption among richer classes[77], and more unequal countries also tend to have higher rates
390 of loss of biodiversity.[78] Inequality works in several ways, by both increasing risks and changing
391 collective incentives to tackle environmental problems. For example, burdens of environmental
392 risk also tend to fall on those of lower income classes; poorer and minority communities often
393 face "pollution inequity", in that they are not just exposed to more pollution but their
394 ecological footprints are smaller and they cause less pollution.[79] Inequality can also decrease
395 people's motivation to participate in biodiversity conservation measures if they do not see the
396 potential benefits of doing so[80], and can undermine democratic decision-making to protect
397 collective public goods.[81]

398 Traditional policies to tackle inequality, such as fairer taxation, fees on wealth transfer,
399 and other measures, can be combined with attention to biodiversity: for example, VAT taxes on
400 luxury goods with higher negative environmental costs.[82] Minimum wage policies also have
401 potentially positive environmental impacts[83], and sustainable life cycle assessments for
402 products could, for example, include living wages for employees as a criteria.[84] Moving towards
403 a more sustainable economy may create inequalities in and of itself, such as job displacements
404 in certain sectors (e.g. oil and gas).[85] The concept of just transitions captures the idea that any
405 transformation to a more sustainable economy should not fall on the backs of those already
406 suffering disproportionate impacts. Combining economic measures to reduce inequality with
407 stimulus investments in major retooling of energy, land use and other sectors can help facilitate
408 this more just transition.[86]

409 ***6). Adopt new economic metrics and models*.** The GA called for "a shift beyond standard
410 economic indicators such as Gross Domestic Product (GDP) to include those able to capture

411 more holistic, long-term views of economics and quality of life."[1] Changing the metrics used to
412 assess the economy reflects the increasing evidence of the limitations and biases of dominant
413 measures such as GDP and HDI (Human Development Indices) and the ways in which they
414 promote economic growth and associated unsustainable practices.[87] Replacing or broadening
415 them with alternative measures of social welfare would allow inclusion of diverse values and
416 indicators of well-being.[88] Metrics like the Index of Sustainable Economic Welfare or the
417 Genuine Progress Indicator (GPI) often subtract "bads" like environmental degradation and
418 biodiversity loss in monetary terms and add in "goods" not traditionally included in GDP, such
419 as the value of unpaid work.[89] Other approaches such as Material Flow Accounting (MFA) and
420 Natural Capital Accounting that incorporate environment and ecosystems, and which can
421 account for the movement of resources across geopolitical borders, have been developed in the
422 past two decades.[90, 91] Increasingly, accounting systems such as the UN System of National
423 Accounts are adopting these new metrics[92], and recently, local, regional and national
424 governments, including different US states, have shown interest in these measures as well.[93]
425 While there is as of yet insufficient empirical evidence of the effectiveness of the new
426 environmental accounting approaches, they are helpful as a tool to facilitate dialogue on the
427 diverse values of nature and biodiversity.
428
429 ***Conclusion: Envisioning a Sustainable Economic Future***
430 Disruptive change has been identified as an important impetus to dramatic sustainability
431 transformations.[94] We currently have a unique opportunity to seize the moment and consider
432 the economy we want and need for a sustainable, just, and equitable future in a post-pandemic
433 world.[95] Simply tinkering with the status quo was always unlikely to be sufficient to meet the

434 large-scale challenge represented by the biodiversity crisis[1], therefore taking advantage of the
435 current COVID-19 crisis to change course and rethink conservation[96] as well as how we manage
436 the global economy seems opportune. As we formulate a recovery agenda, as well as the post-
437 2020 biodiversity framework of the Convention on Biological Diversity, both should have
438 targets specifically related to altering the economic and financial system to tackle the drivers of
439 biodiversity and ecosystem loss. Such measures to protect biodiversity as we have outlined
440 here can be combined with other suggested approaches for a low-carbon recovery, given that
441 climate change poses a very real threat to species health and ecosystem functioning as well.[1]
442 There is evidence for public support in the US for combining biodiversity, climate and economic
443 policies into one[97], and some have suggested the postponed UN climate and biodiversity
444 meetings be joined together, as both are now rescheduled for later in 2021.
445 The fact that we are not seeing progress on tying stimulus measures to transformative
446 economic change is worrisome, and indeed, some post-COVID recovery measures are taking us
447 in the wrong direction. Reducing taxes, subsidizing fossil fuel production, and relaxing
448 environmental regulations are all 'recovery' steps currently being taken by countries from the
449 US to Vietnam (Figure 2 and Supplementary Material). Even more ambitious proposed policies,
450 like the Green New Deal in the US, which focuses on investments in both low-carbon
451 infrastructure and ecological restoration, tackles economic problems only through a vision of
452 expanded Keynesian welfare economics.[98] Such an approach does not adequately tackle the
453 larger issue of how to reform other economic drivers of biodiversity loss and climate change we
454 have outlined here, such as expanded global trade and financialization of production.
455 Integrating biodiversity across economic and public sectors will require ambition and vision that

few countries seem willing to undertake, although a handful of roadmaps to 'build back better' have been proposed by influential organizations.[99, 100] Overall, envisioning and implementing a new economic paradigm that tackles these many challenges will be a substantial task, requiring a transformative approach that entails a reshaping of multiple incentives that steer economies in ways that preserve, rather than undermine, biodiversity. Taking advantage of this unique crisis situation before us, we should take bold steps to address the economic drivers of biodiversity loss and set our world on a path to ecological and social sustainability.

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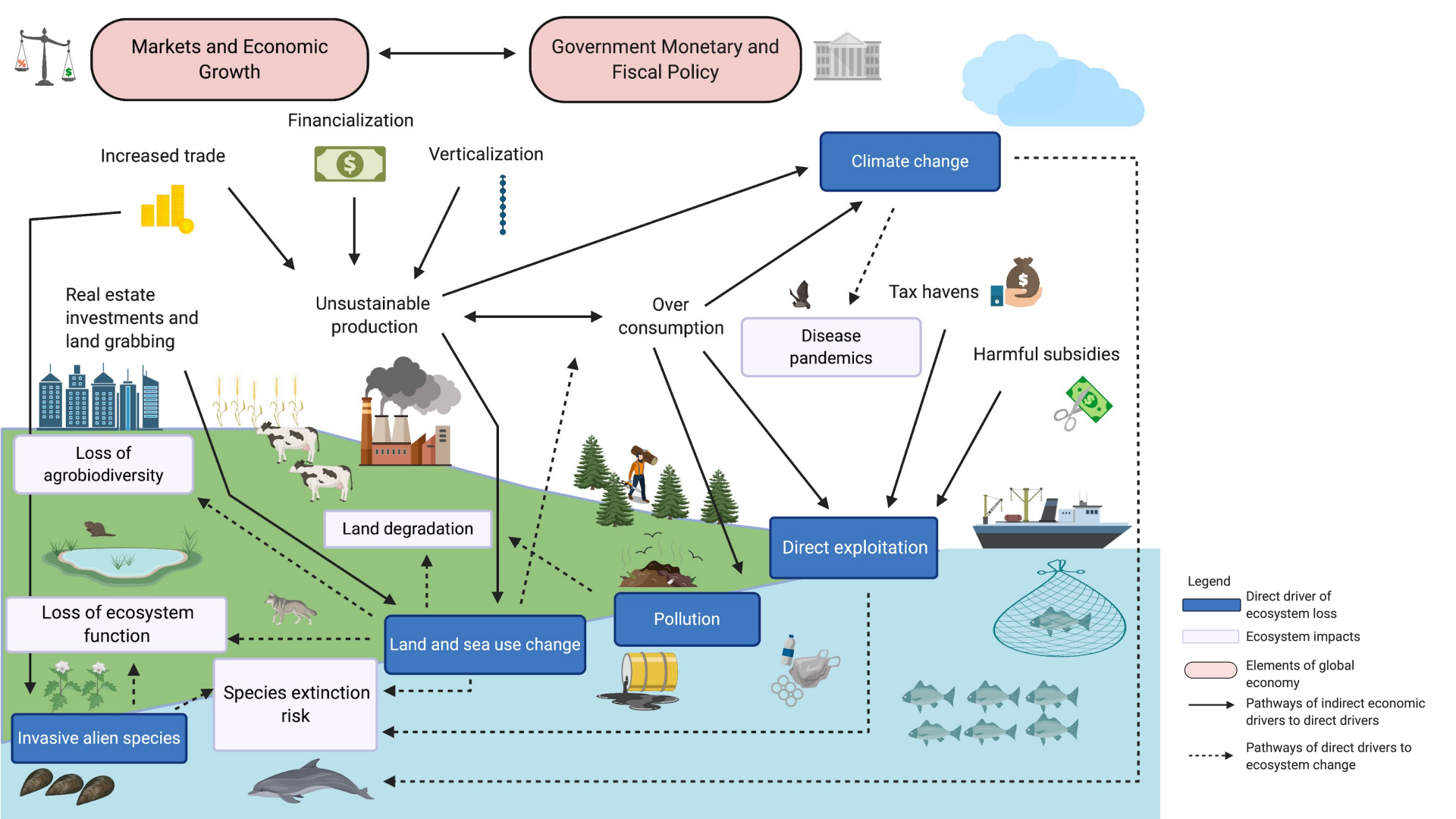
764 **Figure One**. Economic Drivers of Biodiversity Loss and Ecosystem Change

765 The Global Assessment identified five main direct drivers of ecosystem change over the past 50 years (blue boxes),
766 leading to different aspects of nature decline (purple boxes). Economic pressures were identified as a key indirect
767 driver in the GA, and important elements of changes in economic supply and demand that drive ecosystem loss are
768 shown here.

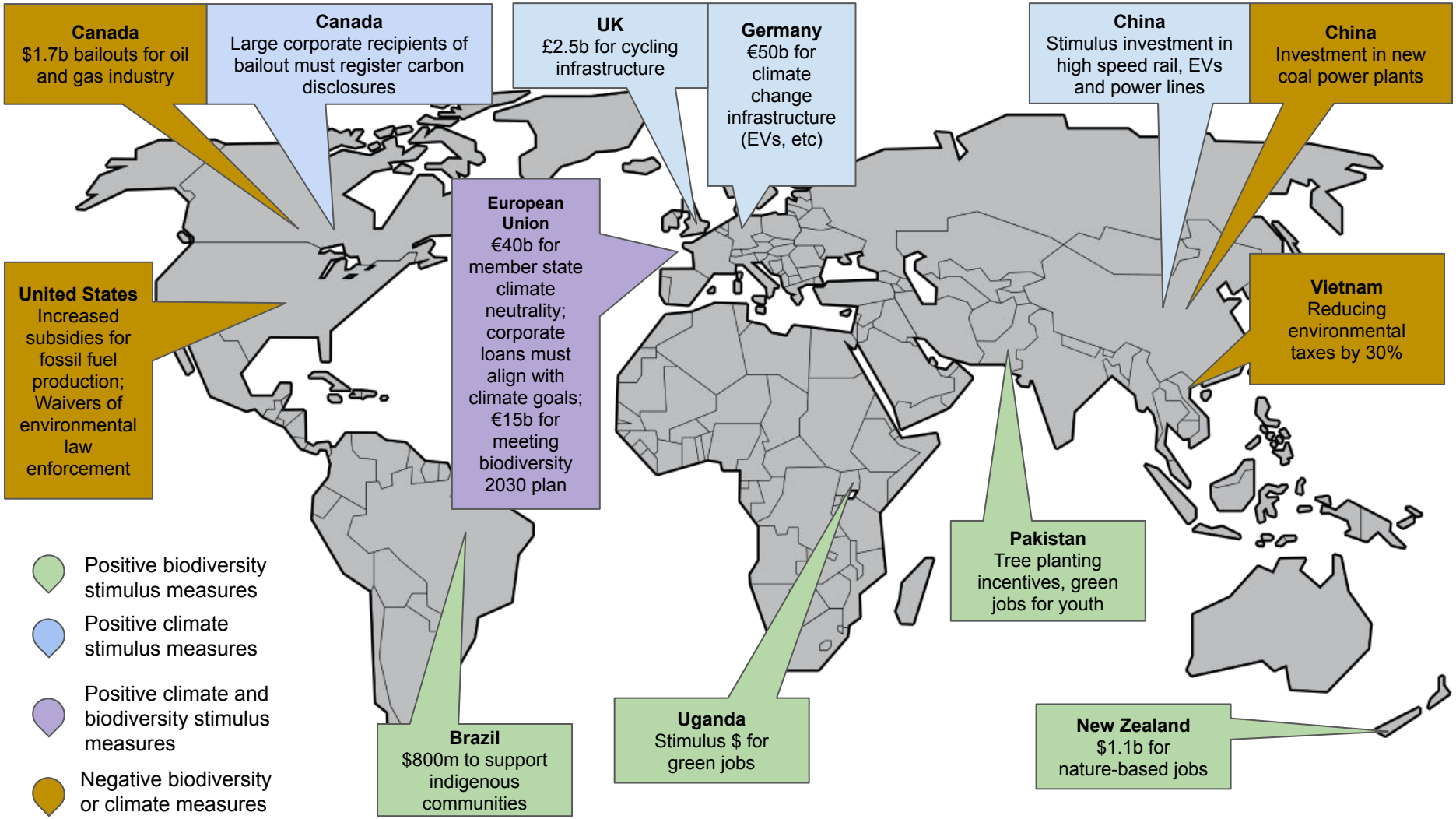
769


Markets and Economic Growth
Government Monetary and Fiscal Policy
Financialization
Increased trade
Verticalization
Climate change
Real estate investments and land grabbing
Unsustainable production
Over consumption
Tax havens
Disease pandemics
Harmful subsidies
Loss of agrobiodiversity
Land degradation
Direct exploitation
Loss of ecosystem function
Land and sea use change
Pollution
Species extinction risk
Invasive alien species
Legend
Direct driver of ecosystem loss
Ecosystem impacts
Elements of global economy
Pathways of indirect economic drivers to direct drivers
Pathways of direct drivers to ecosystem change

770 **Figure 2**. Current post-COVID economic stimulus and recovery packages

771 As of June 2020, a number of governments have adopted or proposed economic recovery packages, including
772 stimulus funding, in response to the COVID-19 pandemic. Only a limited number of countries have included climate
773 or biodiversity measures in their packages, and a number have introduced measures that would have negative
774 impacts (such as reducing environmental taxes or regulatory enforcement). Data on current recovery proposals for
775 selected countries can be found in Supplementary Materials.

776


Canada
$1.7b bailouts for oil and gas industry
Canada
Large corporate recipients of bailout must register carbon disclosures
UK
£2.5b for cycling infrastructure
Germany
€50b for climate change infrastructure (EVs, etc)
China
Stimulus investment in high speed rail, EVs and power lines
China
Investment in new coal power plants
European Union
€40b for member state climate neutrality; corporate loans must align with climate goals; €15b for meeting biodiversity 2030 plan
United States
Increased subsidies for fossil fuel production; Waivers of environmental law enforcement
Vietnam
Reducing environmental taxes by 30%
Pakistan
Tree planting incentives, green jobs for youth
Brazil
$800m to support indigenous communities
Uganda
Stimulus $ for green jobs
New Zealand
$1.1b for nature-based jobs
Positive biodiversity stimulus measures
Positive climate stimulus measures
Positive climate and biodiversity stimulus measures
Negative biodiversity or climate measures

777 **Figure 3**. Actions to reform the global economy to reduce impacts on nature

778 Both short and long-term actions across multiple sectors and actors are needed to address global economic

779 impacts on biodiversity.

780

## Short term actions

**Government monetary & fiscal policies**

- Eliminate harmful subsidies and shift to positive ones
- Increase environmental taxation & reform tax havens
- Public procurement of green goods
- Central bank sustainable finance guidelines

**Private sector**

- Stimulus relief funds criteria
- Standards for greener private investment
- Shorter & sustainable supply chains
- Acknowledge risks of stranded assets
- Biodiversity bonds
- Disclosure standards, reporting & liability

**Employment policies**

- Green work programs
- Universal Basic Income

## Longer term measures

**Government monetary & fiscal policies**

- Central bank risk measures
- Ecological fiscal transfers
- Reduce inequality

**Private sector**

- Rethink corporate paradigms
- Resilient supply chains
- Reduce verticalization
- Improve circular economies

**Consumers**

- Rethink consumption

**Trade and aid**

- Fairer trade rules
- Ensure international funding

**Metrics**

- Natural capital accounting
- Alternative measures of social welfare