

export crops (including biofuels) and for building new roads, dams, and mines (1, 2). On 6 February, Bolsonaro submitted a bill to Brazil's National Congress that would open Indigenous lands for mining, extraction of oil and gas, and construction of hydroelectric dams, cattle ranches, and mechanized monocultures such as soy (3). Indigenous leaders would be allowed to rent tribal land to non-Indigenous agribusiness entrepreneurs (3). The bill would allow mining in Indigenous lands without authorization from their Indigenous inhabitants (3). This bill, if passed, would violate the rights of Indigenous peoples and threaten the environment.

The Brazilian Society for the Progress of Science (SBPC) organized a public seminar at the National Institute of Amazonian Research (INPA) to discuss the risks the bill poses to Amazonia (4), and the organizers drafted an open letter alerting civil society and decision makers to the bill's violation of Brazilian legislation and ILO Convention 169, which require free, prior, and informed consultation of Indigenous peoples affected by actions such as this (5). The right to consultation has been routinely ignored by large enterprises in the Amazon, putting many traditional peoples at risk (6).

Bolsonaro's desire to open Indigenous lands to agribusiness and mining has often been expressed in his extemporaneous remarks and social media posts. Early in his term of office, a visit by his ministers of agriculture and environment to an illegal soy plantation in an Indigenous land signaled impunity for violations of current legal restrictions (7). The proposed law now makes the threat imminent. The administration's discourse is credited with invasions of Indigenous lands and killings of Indigenous leaders reaching record levels in 2019 (7). The impact of illegal gold miners (garimpeiros)—a constant threat

to Indigenous lands—will now be even greater thanks to the proposed law and to the risk of spreading coronavirus disease 2019 (COVID-19). Bolsonaro has repeatedly expressed support for these invaders (7). On 14 April, his environment minister dismissed one of the directors of the environmental agency as punishment for having ordered the removal of garimpeiros from an Indigenous land (8).

Demarcated Indigenous lands represent 24% of Brazil's Amazon biome, thus protecting more than the 14% that is in federal "conservation units" (protected areas for biodiversity) (9). Indigenous lands act as shields protecting traditional peoples, biodiversity, carbon stocks, and ecosystem services. Destruction of these forested areas poses a risk to the entire planet, as it affects one of the world's largest carbon stocks (10). We urge the president of Brazil's Chamber of Deputies not to put this bill to a vote, and we encourage Brazil's Supreme Court to act quickly to protect the country's Indigenous peoples.

Lucas Ferrante^{1*} and Philip M. Fearnside²

¹Ecology Graduate Program, National Institute of Amazonian Research (INPA), Manaus, Amazonas, Brazil. ²Department of Environmental Dynamics, INPA, Manaus, Amazonas, Brazil.

*Corresponding author.

E-mail: lucasferrante@hotmail.com

REFERENCES AND NOTES

- L. Ferrante, P. M. Fearnside, *Environ. Conserv.* **46**, 261 (2019).
- E. J. A. L. Pereira *et al.*, *Land Use Pol.*, 10.1016/j.landusepol.2020.104491 (2020).
- Senado Notícias, "Chega ao Congresso projeto que permite mineração em terras indígenas" (2020); <https://www12.senado.leg.br/noticias/materias/2020/02/06/chega-ao-congresso-projeto-que-permite-mineracao-em-terras-indigenas> [in Portuguese].
- SBPC, "SBPC-AM promove evento para discutir a Mineração na Amazônia" (2020); <http://portal.sbpnet.org.br/noticias/sbpc-am-promove-evento-para-discutir-a-mineracao-na-amazonia/> [in Portuguese].
- SBPC, INPA, "Nota contra o Projeto de Lei 191/2020 e em defesa da Amazônia" (2020); www.jornaldaciencia.org.br/wp-content/uploads/2020/03/Nota_Oficial_SBPC_INPA.pdf [in Portuguese].
- L. Ferrante, M. Gomes, P. M. Fearnside, *Land Use Pol.*, 10.1016/j.landusepol.2020.104548 (2020).
- Human Rights Watch (HRW), *Rainforest Mafias: How Violence and Impunity Fuel Deforestation in Brazil's Amazon* (HRW, 2019); www.hrw.org/sites/default/files/report_pdf/brazil0919_web.pdf.
- Jornal Nacional, "Ministro do Meio Ambiente exonera o diretor de Proteção Ambiental do Ibama" (2020); <https://g1.globo.com/jornal-nacional/noticia/2020/04/14/ministro-do-meio-ambiente-exonera-o-diretor-de-protecao-ambiental-do-ibama.ghtml> [in Portuguese].
- E. M. Nogueira *et al.*, *Reg. Environ. Chang.* **18**, 261 (2018).
- S. S. Saatchi *et al.*, *Proc. Natl. Acad. Sci. U.S.A.* **108**, 9899 (2011).

10.1126/science.abb6327

Call for transparency of COVID-19 models

A hallmark of science is the open exchange of knowledge. At this time of crisis, it is more important than ever for scientists around the world to openly share their knowledge, expertise, tools, and technology. Scientific models are critical tools for anticipating, predicting, and responding to complex biological, social, and environmental crises, including pandemics. They are essential for guiding regional and national governments in designing health, social, and economic policies to manage the spread of disease and lessen its impacts. However, presenting modeling results alone is not enough. Scientists must also openly share their model code so that the results can be replicated and evaluated.

Given the necessity for rapid response to the coronavirus pandemic, we need many eyes to review and collectively vet model assumptions, parameterizations, and algorithms to ensure the most accurate modeling possible. Transparency engenders public trust and is the best defense against misunderstanding, misuse, and deliberate misinformation about models and their results. We need to engage as many experts as possible for improving the ability of models to represent epidemiological, social, and economic dynamics so that we can best respond to the crisis and plan effectively to mitigate its wider impacts.

We strongly urge all scientists modeling the coronavirus disease 2019 (COVID-19) pandemic and its consequences for health and society to rapidly and openly publish their code (along with specifying the type of data required, model parameterizations, and any available documentation) so that it is accessible to all scientists around the world. We offer sincere thanks to the many teams that are already sharing their models openly. Proprietary black boxes and code withheld for competitive

NEXTGEN VOICES: SUBMIT NOW

Imagining a post-pandemic world

Add your voice to *Science*! Our new NextGen Voices survey is now open:

What do you hope or fear will be the long-term effects of the coronavirus disease 2019 (COVID-19) pandemic? To answer this question, imagine that you are a science writer in the year 2040. Write a science news story about an event, milestone, or debate taking place in 2040 and how it relates to the COVID-19 pandemic.

To submit, go to www.sciencemag.org/nextgen-voices

Deadline for submissions is 15 May. A selection of the best responses will be published in the 3 July issue of *Science*. Submissions should be 200 words or less.

Anonymous submissions will not be considered.

motivations have no place in the global crisis we face today. As soon as possible, please place your code in a trusted digital repository (1) so that it is findable, accessible, interoperable, and reusable (2).

C. Michael Barton^{1*}, **Marina Alberti**², **Daniel Ames**³, **Jo-An Atkinson**⁴, **Jerad Bales**⁵, **Edmund Burke**⁶, **Min Chen**⁷, **Saikou Y Diallo**⁸, **David J. D. Earn**⁹, **Brian Fath**¹⁰, **Zhilan Feng**⁹, **Christopher Gibbons**¹¹, **Ross Hammond**¹², **Jane Heffernan**⁹, **Heather Houser**¹³, **Peter S. Hovmand**¹⁴, **Birgit Kopainsky**¹⁵, **Patricia L. Mabry**¹⁶, **Christina Mair**¹⁷, **Petra Meier**¹⁸, **Rebecca Niles**¹⁹, **Brian Nosek**²⁰, **Nathaniel Osgood**^{21,22}, **Suzanne Pierce**²³, **J. Gareth Polhill**²⁴, **Lisa Prosser**²⁵, **Erin Robinson**²⁶, **Cynthia Rosenzweig**²⁷, **Shankar Sankaran**²⁸, **Kurt Stange**²⁹, **Gregory Tucker**³⁰

¹Director, Network for Computational Modeling in Social and Ecological Sciences, Tempe, AZ, USA. ²Director, Urban Eco-Evolutionary Research Network, Seattle, WA, USA. ³President, International Environmental Modelling and Software Society, Manno, Ticino, Switzerland. ⁴Managing Director, Computer Simulation and Advanced Research Technologies, Sidney, NSW, Australia. ⁵Executive Director, Consortium of Universities for the Advancement of Hydrologic Science Inc., Cambridge, MA, USA. ⁶President, Operational Research Society, Birmingham, West Midlands, UK. ⁷Director, Open Geographic Modeling and Simulation at Nanjing Normal University, Nanjing, Jiangsu, China. ⁸President, Society for Modeling and Simulation International, Suffolk, VA, USA. ⁹Governing Committee, Mathematical

Epidemiology Subgroup of the Society for Mathematical Biology, West Lafayette, IN, USA. ¹⁰Secretary-General, International Society for Ecological Modeling, Severna Park, MD, USA. ¹¹Director, Business Intelligence Team of the City of Sheffield, Sheffield, South Yorkshire, UK. ¹²Director, Center on Social Dynamics and Policy at the Brookings Institution, Washington, DC, USA. ¹³Chair, Planet Texas 2050 Bridging Barriers Program at the University of Texas, Austin, TX, USA. ¹⁴Director, Social System Design Lab of Washington University, St. Louis, MO, USA. ¹⁵Director, System Dynamics Group at the University of Bergen, Bergen, Norway. ¹⁶Research Investigator, HealthPartners Institute, Minneapolis, MN, USA. ¹⁷Director, Center for Social Dynamics and Community Health of the University of Pittsburgh, Pittsburgh, PA, USA. ¹⁸Director, Systems Science in Public Health and Health Economics Research Consortium, Sheffield, South Yorkshire, UK. ¹⁹Executive Director, System Dynamics Society, Albany, NY, USA. ²⁰Director, Center for Open Science, Charlottesville, VA, USA. ²¹Director, Computational Epidemiology and Public Health Informatics at the University of Saskatchewan, Saskatoon, SK, Canada. ²²Founder, System Science in Health, Saskatoon, SK, Canada. ²³Director, Intelligent Systems and Geosciences Research Coordination Network, Austin, TX, USA. ²⁴President, European Social Simulation Association, Zürich, Zürich, Switzerland. ²⁵President, Society for Medical Decision Making, Bridgewater, NJ, USA. ²⁶Executive Director, Earth Science Information Partners, Boulder, CO, USA. ²⁷Co-Leader, Agricultural Model Intercomparison and Improvement Project, New York, NY, USA. ²⁸President, International Society for the Systems Sciences, Ashland, KY, USA. ²⁹Director, Center for

Community Health Integration at Case Western Reserve University, Cleveland, OH, USA. ³⁰Executive Director, Community Surface Dynamics Modeling System, Boulder, CO, USA.

*Corresponding author.

Email: michael.barton@asu.edu

REFERENCES AND NOTES

1. CoMSES Network, Trusted Digital Repositories (www.comses.net/resources/trusted-digital-repositories/).
2. M. D. Wilkinson *et al.*, *Sci. Data* **3**, 160018 (2016).

COMPETING INTERESTS

All authors have signed on behalf of the listed organizations only. J.-A.A. is the head of the Systems Modeling and Simulation, Brain and Mind Centre at the University of Sydney in Australia but does not represent that institution here. B.F. is affiliated with the Advanced Systems Analysis Program at the International Institute for Applied Systems Analysis in Austria but does not represent that organization.

10.1126/science.abb8637

ERRATA

Erratum for the Report "Design of an in vitro biocatalytic cascade for the manufacture of islatravir" by M. A. Huffman *et al.*, *Science* **368**, eabc1954 (2020). Published online 17 April 2020; 10.1126/science.abc1954

Erratum for the Report "Mutual control of coherent spin waves and magnetic domain walls in a magnonic device" by J. Han *et al.*, *Science* **368**, eabc1767 (2020). Published online 17 April 2020; 10.1126/science.abc1767



Science Webinars help you keep pace with emerging scientific fields!

Stay informed about scientific breakthroughs and discoveries.

Gain insights into current research from top scientists.

Take the opportunity to ask questions during live broadcasts.

 Get alerts about upcoming free webinars.

Sign up at: webinar.sciencemag.org/stayinformed

Call for transparency of COVID-19 models

C. Michael Barton, Marina Alberti, Daniel Ames, Jo-An Atkinson, Jerad Bales, Edmund Burke, Min Chen, Saikou Y Diallo, David J. D. Earn, Brian Fath, Zhilan Feng, Christopher Gibbons, Ross Hammond, Jane Heffernan, Heather Houser, Peter S. Hovmand, Birgit Kopainsky, Patricia L. Mabry, Christina Mair, Petra Meier, Rebecca Niles, Brian Nosek, Nathaniel Osgood, Suzanne Pierce, J. Gareth Polhill, Lisa Prosser, Erin Robinson, Cynthia Rosenzweig, Shankar Sankaran, Kurt Stange and Gregory Tucker

Science **368** (6490), 482-483.
DOI: 10.1126/science.abb8637

ARTICLE TOOLS

<http://science.sciencemag.org/content/368/6490/482.2>

RELATED CONTENT

<http://stm.sciencemag.org/content/scitransmed/12/541/eabb5883.full>
<http://stm.sciencemag.org/content/scitransmed/12/534/eabb1469.full>
<http://stm.sciencemag.org/content/scitransmed/11/499/eaat0360.full>
<http://stm.sciencemag.org/content/scitransmed/9/396/eaal3653.full>

REFERENCES

This article cites 1 articles, 0 of which you can access for free
<http://science.sciencemag.org/content/368/6490/482.2#BIBL>

PERMISSIONS

<http://www.sciencemag.org/help/reprints-and-permissions>

Use of this article is subject to the [Terms of Service](#)

Science (print ISSN 0036-8075; online ISSN 1095-9203) is published by the American Association for the Advancement of Science, 1200 New York Avenue NW, Washington, DC 20005. The title *Science* is a registered trademark of AAAS.

Copyright © 2020 The Authors, some rights reserved; exclusive licensee American Association for the Advancement of Science. No claim to original U.S. Government Works