Received: 1 December 2025 | Revised: 18 December 2025 | Accepted: 22 December 2025

DOI: 10.1002/ppp3.70169

Plants People Planet PPF Open Access

OPEN LETTER

Open letter: The need for a site-based biodiversity standard measuring and certifying impacts from nature-based projects

OPEN LETTER TO POLICYMAKERS, BUSINESSES, INVESTORS AND PHILANTHROPISTS FINANCING RESTORATION PROJECTS

The Kunming-Montreal Global Biodiversity Framework (KM-GBF) sets out targets to halt and reverse biodiversity loss, including the ambitious aim to ensure that at least 30% of degraded ecosystems are under effective restoration by 2030. Despite ambitious pledges under the KM-GBF and other multilateral initiatives such as the Bonn Challenge, AFR100 and the Great Green Wall, large-scale restoration continues to be dominated by tree-planting schemes with widespread conflation of reforestation with restoration (Parr et al., 2024). Numerous projects have been poorly designed or have pursued other priorities, leading to unintended harm to native biodiversity from the use of monocultures, non-native and sometimes invasive species (Bond et al., 2019; Holl & Brancalion, 2020; Lewis et al., 2019). This is occurring at a time when 38% of the world's tree species are threatened with extinction (IUCN, 2024). Globally, there is a need to move biodiversity from an afterthought to a key outcome in restoration and other nature-based solutions (Brancalion et al., 2025; Seddon et al., 2021).

Whilst the scale of ambition on ecosystem restoration has grown in recent years, accountability has not kept pace. Many large-scale initiatives have limited monitoring of biodiversity outcomes, creating major uncertainty about their effectiveness in recovering biodiversity and, worse still, their potential to cause collateral damage to biodiversity. Monitoring and reporting have focused heavily on planning or implementation metrics, such as hectares pledged, numbers of trees planted or tree survival rates (Gatica-Saavedra et al., 2017; Key et al., 2022). In fact, 90% of the world's largest corporations involved in restoration fail to report a single ecological outcome (Lamont et al., 2023). This lack of data and transparency leaves policymakers, businesses and investors unable to assess their impact on biodiversity, at risk of causing unintended harm and undermining the confidence that nature-based investments can generate real value. With new frameworks such as the Taskforce on Nature-related Financial Disclosures (TNFD) and the Science Based Targets for Nature (SBTN) driving greater scrutiny of corporate and financial impacts on nature, and with billions of dollars already flowing into carbon credit schemes, the absence of credible biodiversity verification represents both a material risk and a missed opportunity (Nedopil, 2023). Only through credible, site-based monitoring and independent verification of restoration outcomes can financiers avoid greenwashing, rebuild trust and provide assurance that investments are delivering measurable gains for biodiversity.

Conservation and restoration practitioners, policymakers, funders, businesses, NGOs and researchers have already acknowledged the need for stronger safeguards and increased biodiversity outcomes from restoration. The Kew Declaration on reforestation for biodiversity, carbon capture and livelihoods (The Declaration Drafting Committee, 2022) was signed by over 3000 individuals and organisations from 113 countries and explicitly called for biodiversity to be placed at the centre of reforestation pledges. Meanwhile, the UNEA Resolution on Nature-based Solutions formally recognised in 2022 the necessity of biodiversity recovery in Nature-based Solutions. A set of international frameworks exists that outline best practices, including the Society for Ecological Restoration's *International Principles and Standards for the Practice of Ecological Restoration* (Gann et al., 2019), the *UN Decade on Ecosystem Restoration Standards of Practice* (Nelson et al., 2024) and, specifically for forests, the *Ten Golden Rules for Reforestation* (Di Sacco et al., 2021). Together, these best practice frameworks establish a strong foundation to deliver biodiversity outcomes, but until recently, a critical gap remained in translating these principles into credible, site-based verification of biodiversity outcomes.

The Global Biodiversity Standard is a site-based certification scheme whose methodology builds directly on these established frameworks (Bartholomew et al., 2024). Its eight criteria are derived from the *Ten Golden Rules for Reforestation* (Di Sacco et al., 2021), ensuring that projects protect and enhance ecosystem integrity including biodiversity, social benefits and use of adaptive management. Changes in ecosystem integrity are assessed using the Society for Ecological Restoration (SER) Five-star System (Gann et al., 2019), applying the key concepts of project baselines and natural ecosystem reference models to measure progress over time. In addition, it builds on the *UN Decade on Ecosystem Restoration Standards of Practice*

Disclaimer: The New Phytologist Foundation remains neutral with regard to jurisdictional claims in maps and in any institutional affiliations.

(Nelson et al., 2024) to assess monitoring, evaluation, and adaptive management practices.

The Global Biodiversity Standard is a not-for-profit initiative, supported by a coalition of independent ecosystem restoration organisations and experts, founded and overseen by Botanic Gardens Conservation International, SER, CIFOR-ICRAF and other partners. It uses a decentralised model in which experts from biodiversity organisations such as botanical gardens are trained in The Global Biodiversity Standard methodology and deployed in their own regions. By combining the Global Biodiversity Standard's methodology with the knowledge of local biodiversity experts and Certified Ecological Restoration Practitioners (SER, 2025), The Global Biodiversity Standard ensures that site-based verification is both scientifically rigorous and grounded in local ecological and cultural knowledge.

We call on policymakers, businesses, investors and philanthropists financing restoration projects to the following:

- **Require independent certification of biodiversity outcomes** as a condition for financing, ensuring investments deliver genuine ecological and social value.
- **Support and mobilise local expertise**—including certified ecological restoration practitioners, botanical specialists and Indigenous peoples and local communities—to ensure that restoration is both scientifically rigorous and socially just.
- **Shift the definition of success from process to outcomes**, moving beyond hectares pledged or trees planted to measurable gains in ecosystem integrity, species recovery and biodiversity protection.
- **Consider adopting The Global Biodiversity Standard** as the benchmark for credible, site-based verification of ecosystem restoration and nature-based solutions, including projects financed through carbon markets.

AUTHOR CONTRIBUTIONS

David C. Bartholomew led the initiative and wrote the first draft. Paul P. Smith, George D. Gann, Marcello De Vitis and Amarizni Mosyaftiani reviewed and edited a second version; all 258 authors have read and agreed to the final content of the letter.

ACKNOWLEDGMENTS

This article is supporting by funding from the Darwin Initiative grant DAREX001: Developing a Global Biodiversity Standard certification for tree-planting and restoration.

FUNDING INFORMATION

Darwin Initiative, Grant/Award Number: DAREX001

CONFLICTS OF INTEREST STATEMENT

Hadeel Ali Saeed Abdalqader, Harshavardhini Angappan, Jose A. Aranda-Pineda, Kiran Baldwin, Laura Barbosa Vedovato, Graciela M. Barreiro, David C. Bartholomew, Chris Birkinshaw, Collins Edward Bulafu, Fernanda C. G. Cardoso, Theodora Chin-Tung Chan, Mang Lung Cheuk, Tarun Chhabra, Marcello De Vitis, Dimitri D'Helft, José Manuel Fernández Zeballos, Stephan W. Gale, George D. Gann, Andrew Gichira, Orlik Gomez Garcia, Coskun Guclu, Jonathan Jenkins, David Karanja Wambui, Yogita Karpate, Alona C. Linatoc, José Manuel Mamani, Amarizni Mosyaftiani, Teresiah Mungai, Mutegeki Alislam Said Musa, Tobin Mutiso, Angie Y. S. Ng, Madhura Niphadkar, Randrianarivony Tabita Noromalalaharivelo, Alfonso Orellana-Garcia, Kato Paul, Norma Leticia Piedra Leandro, Thibaud Poulain, Sanjana Radhakrishnan, Ralainaorina Toky Niaina, Ramahefamanana Mbolasoa Narindra, Navalona Ramanambohitra, Kali Ramirez, Eliana Ramos, Michael Roy, Adriana Sandoval Comte, Ayebare Saviour, Monal Singh, Hatem Taifour, Gilles Tilman, Collins Tweheyo, Flor Gabriela Vázquez Corzas, Sebastian Walaita Javan, Wincate Wanja Kagane and Juliana Zuluaga Carrero declare that they are certified assessors of The Global Biodiversity Standard.

DATA AVAILABILITY STATEMENT

Data sharing not applicable to this article as no datasets were generated or analysed during the current study.

David Bartholomew[1]
Paul Smith[1]
Marcello De Vitis[1]
George Gann[2]
Amarizni Mosyaftiani[2]
Hadeel Abdalqader[3]
Lawrence Abel[4]
Lucy Adhimabo[5]
Anita Aerts[6]
Laxmi Aggarwal[1]
Raheela Ahmed[7]
Silvia Alvarez-Clare[8]
Tefy Andriamihajarivo[9]
Annelies Andringa-Davis[1]
Harshavardhini Angappan[10]
Jose Aranda-Pineda[11]
Ibone Arregi[12]
William Baker[13,14]
Kiran Baldwin[15,16]
Ash Baron[17]
Graciela Barreiro[18]
Megan Barstow[1]
Dunia Basciu[19,20]
Sandagdorj Bayarkhuu[21,22]
Nienke Beets[23]
Alejandro Bejerano[24]
Inna Birchenko[13]
Chris Birkinshaw[9]
Irene Bisang[25]
Stephen Blackmore[26]
Aaron Boers[27]
Roderick Bouman[23,28]
Richard Bradley[29]
Pedro Brancalion[30]
Elinor Breman[13]

Elise Buisson[31]
Collins Bulafu[32]
Antonia Burchard-Levine[33]
David Burslem[34]
Rainer Bussmann[35,36]
Anna Calle-Loor[37]
Clare Callow[13]
Cameron Covill[38]
Christian Camara[9]
Vito Emanuele Cambria[39]
Fernanda Cardoso[40]
David Carr[41]
Fabian Carriconde[42]
Naomi Carvey[13]
Theodora Chan[40,43]
Genevieve Chavarot[44]
Mang Cheuk[40]
Tarun Chhabra[45]
Vivek Chopra[46]
Brett Chrystal[47]
Emily Coffey[48]
Rebecca Cole[49,50]
Brian Colleran[51]
Adriana Comte[52]
Matteo Contardo[53]
Carly Cowell[1]
Dimitri D'helft[54]
Anabel da Gama[55]
Sarah Dalrymple[56]
Guilherme de Castro Ramos[57,58]
Andrés De la Rosa Portilla[59]
Sebsebe Demissew[60]
Richard Deverell[13]
Mauricio Diazgranados[61]
Sharif Durzi[38]
Elizabeth Dutra[62]
Thomas Erler[63]
Lauren Eserman[48]
Ilaria Fantozzi[64]
José Fernández Zeballos[65]
Anne-Marie Frankland[1]
Ethan Freid[66,67]
Pierre Gaches[54]
Stephan Gale[40]
Rachael Gallagher[68]
Marta Galloni[64]
Maraeva Gianella[69]
Andrew Gichira[5]
Moses Gichua[70]
Thomas Gichuru[1]
André Giles[71]
Teresa Girao da Cruz[72,73]
Orlik Gomez Garcia[74]
Susan Gould
Barbara Gravendeel[23,28]
Coskun Guclu[40,43]
Stephane Hallaire[54]
Kate Hardwick[13]
Yvette Harvey-Brown[1]
Olivier Hasinger[75]
Billy Hau[43]
Kayri Havens[76]
Mats Havström[77]
James Hearsum[78]
Melanie Heath[79]
Andrew Hector[80]
Viola Heinrich[81,82]
Robert Heinzman[83]
Ryan Hills[1]
Michele Hofmeyr[84]
Karen Holl[85]
Daniel Hribar[86]
Alex Hudson[1]
Stanislav Hybler[87]
Mael Jaonasy[9]
Sebastian Javan[88]
Jonathan Jenkins[5]
Xiaohua Jin[89]
Wincate Kagane[90]
David Karanja Wambui[5]
Yogita Karpate[91]
Olga Kildisheva[92]
Roeland Kindt[93]
Anneleen Kool[94]
Christian Kroll[33]
Yayan Kusuma[95]
Katia Laffusa[96]
Tom LeBreton[97]
Stacey Libra[98]
Alona Linatoc[99]
Cristina Lopez-Gallego[100]
Quentin Luke[101]
Víctor Luna Monterrojo[74]
Gunwant Mahajan[102]
Itambo Malombe[101]
José Mamani[103]
Gustavo Martinelli[104]
Raul Martinez[105]
Beatriz Maruri-Aguilar[106]
María Mata Quirós[1]
Donna McGinnis[107]
Wander Meijer[40]
Simon Milne[26]
Marilou Montemayor[108]
Paul Morris[109]
Micah Muema[110]

David Mulwa[110]
Teresiah Mungai[5]
Mutegeki Musa[88]
January Muthoka[1,111]
Tobin Mutiso[5]
James Mwamodenyi[112]
Abdo Nassar[113]
Jennifer Neale[114]
Angie Ng[115]
Veronicah Ngumbau[101]
Madhura Niphadkar[116]
Fadhili Njilima[117]
Randrianarivony Noromalalaharivelo[9]
Ari Novy[118]
Florence O'Sullivan[1]
Alfonso Orellana-Garcia[119,120,121]
Victor Otieno[5,70]
Range Palodang[122]
Ignacio Pascual[123]
Mykhailo Paslavskyi[124]
Kato Paul[125]
Jennifer Peach[13]
Norma Piedra Leandro[126]
Chris Polatin[127]
Zulukumzuk Pongen[128]
Thibaud Poulain[54]
Jessica Prieto[129]
Johny Rabenantoandro[130,131]
Sanjana Radhakrishnan[132]
Jeannie Raharimampionona[9]
Fortunat Rakotoarivony[9]
Brice Rakotozafy[9,133]
Toky Ralainaorina[9]
Narindra Ramahefamanana[9]
Navalona Ramanambohitra[9]
Kali Ramirez[74,134]
Eliana Ramos[135]
Fidisoa Ratovoson[136]
Simplice Razafindranaivo[136]
Lalao Razafitsalama[9,137]
Paul Reed[138]
Leighton Reid[139]
Darren Reidy[140]
Hai Ren[141]
Carole Renner[54]
Jorge Reyes-Betancort[142]
Candace Reynolds[143]
Iñigo Ricalde[144]
Malin Rivers[1]
Ranaivo Roger[145]
Katherine Ross[146]
Lucy Rowland[147]
Jennifer Rowntree[148]
Michael Roy[15]
Jimmy Rui V.[149]
Jan Sala[13]
Narkis Morales San Martín[150]
Emiliano Sánchez Martínez[11]
Duncan Sanders[13]
Ayebare Saviour[151]
Nicola Schoenenberger[152,153]
Udo Schwarzer[154]
Assini Silvia[155]
Eliud Simfukwe[156]
Monal Singh
Toral Shah[157]
Nancy Shaw[92]
George Smith[158]
Linnea Spears-Lebrun[38]
Vanja Stamenkovic[159]
Paul Stuart-Smith[160]
Wawan Sujarwo[122,161]
Brett Summerell[162]
Alex Summers[13]
Michael Szuter[27]
Mariana Tadey[163]
Hatem Taifour[3]
Vikash Tatayah[164]
Evert Thomas[165]
Stewart Thompson[166,167]
Anselme Tilahimena[9,168]
Gilles Tilman[169]
Adriane Tobias[170]
Peter Tomsovic[171]
Michael Toohill
Hanna Tornevall[77]
Nami Traeholt[172]
Mathews Tsirizeni[173]
Michelle Tustin[174]
Collins Tweheyo[175]
Tiziana Ulian[13,69]
Estela Vallejo[176]
Pieter van Midwoud[33]
Flor Vázquez Corzas[177]
Laura Vedovato[30]
Sarina Veldman[178,179]
Yuriy Vergeles[180]
Danilo Viana Lima[181]
Andrew Vovides[59]
Piet Vroeg[182]
James Walsh[183]
Aparna Watve[184]
Leland Werden[185]
Murphy Westwood[8]
Oliver Whaley[13,26,119]
Aru Wiecek[13,186]

Brett Wilson[187]
Dustin Wolkis[188]
Hailu Wondu[189]
Peter Wyse Jackson[190]
Michael Yadrick Jr.[191]
Wei Yan[192]
Pamela Zevit[193]
Juliana Zuluaga Carrero[194,195]

[1]*Botanic Gardens Conservation International, Richmond, UK*
[2]*Society for Ecological Restoration, Washington, DC, USA*
[3]*Royal Botanic Garden, Amman, Jordan*
[4]*Green Heart Kilifi, Kilifi, Kenya*
[5]*The Centre for Ecosystem Restoration-Kenya, Brackenhurst Botanic Garden, Limuru, Kenya*
[6]*Trees For Aruba, Ban Lanta y Planta, Noord, Aruba*
[7]*Mount Mulanje Conservation Trust, Mulanje, Malawi*
[8]*Morton Arboretum, Lisle, Illinois, USA*
[9]*Missouri Botanical Garden, Madagascar, Antananarivo, Madagascar*
[10]*Keystone Foundation, Mission Compound, Kotagiri, India*
[11]*Cadereyta Regional Botanical Garden, Science and Technology Council of the State of Querétaro, Camino a Tovares sin número, Cadereyta de Montes, Querétaro, Mexico*
[12]*University of the Basque Country, Universidad del País Vasco/Euskal Herriko Unibertsitatea Barrio Sarriena, Leioa, Bizkaia, Spain*
[13]*Royal Botanic Gardens, Kew, Richmond, UK*
[14]*Department of Biology, Aarhus University, Aarhus, Denmark*
[15]*Auroville Botanical Gardens, Auroville, Tamil Nadu, India*
[16]*Restrata Integral Ecosystem Solutions LLP, Auroville, India*
[17]*Terrastory Environmental Consulting, Rockwood, Ontario, Canada*
[18]*Jardín Botánico de la Ciudad de Buenos Aires "Carlos Thays", CABA, Buenos Aires, Argentina*
[19]*Net Zero Farming, Località Is Paulis, Sardinia, Italy*
[20]*Centre for Conservation of Biodiversity (CCB), University of Cagliari, Cagliari, Italy*
[21]*Biosafety Research Institute, Blosafety Research Institute NGO, Ulaanbaatar, Mongolia*
[22]*Mongolian Ranger Federation, Ulaanbaatar, Mongolia*
[23]*Hortus Botanicus Leiden, Leiden University, Leiden, the Netherlands*
[24]*Universidad de la Habana Jardín Botánico Nacional, Quinta de los Molinos, La Habana, Cuba*
[25]*Swedish Museum of Natural History, Stockholm, Sweden*
[26]*Royal Botanic Garden Edinburgh, Edinburgh, Scotland, UK*
[27]*Resource Environmental Solutions, Bellaire, Texas, USA*
[28]*Faculty of Science, Naturalis Biodiversity Center, Leiden, the Netherlands*
[29]*Department of Evolution, Ecology, and Organismal Biology, The Ohio State University, Columbus, Ohio, USA*
[30]*Forest Sciences, University of São Paulo, Piracicaba, Brazil*
[31]*IMBE, Avignon University, Avignon, France*
[32]*Plant Sciences, Microbiology and Biotechnology, Makerere University Kampala, Kampala, Uganda*
[33]*Ecosia GmbH, Berlin, Germany*
[34]*School of Biological Sciences and Interdisciplinary Institute, University of Aberdeen, Aberdeen, UK*
[35]*Department of Ethnobotany, Ilia State University, Tbilisi, Georgia*
[36]*Department of Botany, State Museum of Natural History Karlsruhe, Karlsruhe, Germany*
[37]*Galapagos Plant Specialist Group, IUCN SSC, Puerto Ayora, Galapagos, Ecuador*
[38]*SWCA Environmental Consultants, Amherst, Massachusetts, USA*
[39]*University of Rome La Sapienza, Rome, Italy*
[40]*Kadoorie Farm and Botanic Garden, Tai Po, New Territories, Hong Kong*
[41]*Stringybark Ecological Pty Ltd, Armidale, NSW, Australia*
[42]*Institut Agronomique Néo-Calédonien, Nouméa, New Caledonia*
[43]*School of Biological Sciences, The University of Hong Kong, Pok Fu Lam, Hong Kong SAR*
[44]*Equator Impact, London, UK*
[45]*Edhkwehlynawd Botanical Refuge (EBR) Centre Trust, Nilgiris, Tamil Nadu, India*
[46]*Hindu College University of Delhi, Sudhir Bose Marg, Hindu College, University Enclave, Delhi, India*
[47]*D/RES Properties, Land and Planning, Donnybrook, Dublin, Ireland*
[48]*Atlanta Botanical Garden, Atlanta, Georgia, USA*
[49]*Tropical Landscape and Climate Program, University of Alaska Fairbanks, Fairbanks, Alaska, USA*
[50]*Organization for Tropical Studies, Durham, North Carolina, USA*
[51]*Ecological Land Management, LLC, Deerfield, Massachusetts, USA*
[52]*Red de Biología y Conservación de Vertebrados, Instituto de Ecología, A. C, Xalapa, Veracruz, Mexico*
[53]*Contardo Consulting Lts, Kilifi, Kenya*
[54]*Reforest'Action, Rueil Malmaison, France*
[55]*Chisel for Impact, Porvorim, Goa, India*
[56]*School of Biological and Environmental Sciences, Liverpool John Moores University, Liverpool, UK*
[57]*Environmental Justice Working Group, Anglican Episcopal Church of Brazil, São Paulo, Brazil*
[58]*Anglican Communion Environmental Network, Universidade Federal do Rio Grande do Sul, Porto Alegre, Brazil*
[59]*Instituto de Ecología, Ambiente y Sustentabilidad, University City, Mexico City, Mexico*
[60]*Plant Biology and Biodiversity Management, Addis Ababa University College of Natural and Computational Sciences, Addis Ababa, Ethiopia*
[61]*Science Division, New York Botanical Garden, New York, New York, USA*
[62]*Institute for Regional Conservation, Delray Beach, Florida, USA*
[63]*King County Noxious Weed Control Program, Seattle, Washington, USA*
[64]*Università di Bologna, Bologna, Italy*
[65]*SUMPA SAC, Engineering, Santiago de Surco, Lima, Peru*
[66]*Leon Levy Native Plant Preserve, Governor's Harbour, The Bahamas*
[67]*Bahamas National Trust, Nassau, Bahamas*
[68]*Hawkesbury Institute for the Environment, Western Sydney University, Penrith, NSW, Australia*

[69]University of Turin, Torino, Italy
[70]Jomo Kenyatta University of Agriculture and Technology, Nairobi, Kenya
[71]Departamento de Fitotecnia, Federal University of Santa Catarina, Florianópolis, Brazil
[72]University of Coimbra Botanic Garden, Coimbra, Portugal
[73]Department of Life Sciences, University of Coimbra, Coimbra, Portugal
[74]Jardin Botanico Francisco Javier Clavijero, Veracruz, México
[75]Fondation Franklinia, Geneva, Switzerland
[76]Chicago Botanic Garden, Glencoe, Illinois, USA
[77]Gothenburg Botanical Garden, Gothenburg, Sweden
[78]Massachusetts Horticultural Society, Wellesley, Massachusetts, USA
[79]TRAFFIC International, David Attenborough Building, Cambridge, UK
[80]Department of Biology and Leverhulme Centre for Nature Recovery, University of Oxford, Oxford, UK
[81]GFZ Helmholtz Centre for Geosciences, Telegrafenberg, Potsdam, Germany
[82]School of Geographical Sciences, University of Bristol, Bristol, UK
[83]Leadership and Business Coaching, Lee, Massachusetts, USA
[84]NEOM, Land Conservation NEOM Nature Reserve, Neom, Kingdom of Saudi Arabia
[85]University of California Santa Cruz, Santa Cruz, California, USA
[86]MAD Scientist Associates, LLC, Westerville, Ohio, USA
[87]Czech Technical University, Prague, Czechia
[88]Tooro Botanical Gardens, Tooro Botanical Gardens, Central Division, Fort Portal, Uganda
[89]Chinese Academy of Sciences, Institute of Botany, Beijing, China
[90]The Little Environmental Action Foundation - Kenya, Kilifi, Kenya
[91]14 Trees Foundation, Vishwakalyan, Pune, India
[92]The International Network for Seed-based Restoration, Washington, DC, USA
[93]CIFOR-ICRAF, ICRAF, UN Avenue, Gigiri, Nairobi, Kenya
[94]Natural History Museum, University of Oslo, Oslo, Norway
[95]Research Center for Ecology and Ethnobiology, Yayasan Botani Tropika, Bogor, Indonesia
[96]LUMSA, Rome, Italy
[97]School of BEES, University of New South Wales, UNSW, Sydney, NSW, Australia
[98]Indigo Ecological Design, Algonquin, Illinois, USA
[99]Department of Forest Biological Sciences, College of Forestry and Natural Resources, University of the Philippines Los Banos, UPLB College, Los Baños, Laguna, Philippines
[100]University of Antioquia, Medellín, Colombia
[101]National Museums of Kenya, Nairobi, Kenya
[102]Applied Environmental Research Foundation, Kirshnarjun, Madhavbaug Co-op. HSG, Shivtirthnagar, Pune, India
[103]Universidad Nacional San Antonio Abad de Cusco, Cusco, Peru
[104]Brazilian National Center for Plant Conservation – CNCFlora, Rio de Janeiro Botanic Garden Research Institute, Rio de Janeiro, Brazil
[105]Desert Botanical Garden, Phoenix, Arizona, USA
[106]Consejo de Ciencia y Tecnologia del Estado de Queretaro, Jardín Botánico Regional de Cadereyta, Camino Antigua Hacienda de Tovares S/N Ejido, Las Fuentes, Cadereyta de Montes, QRO, Mexico
[107]Naples Botanical Garden, Naples, Florida, USA
[108]Marilou Montemayor, Regina, SK, Canada
[109]Planet Healers, London, ON, Canada
[110]Base Titanium—Kenya, Ukunda, Kenya
[111]IUCN ESARO, Nairobi City, Kenya
[112]Kenya Forest Service, Nairobi, Kenya
[113]Environment and Solid Waste Management, Libanconsult AGM, Sioufi, Beirut, Lebanon
[114]Denver Botanic Gardens, Denver, Colorado, USA
[115]The Conservancy Association, Kowloon, Hong Kong
[116]Wildlife Conservation Trust, Fort Mumbai, India
[117]IUCN, New Bagamoyo Road, Victoria House, Dar es Salaam, Tanzania
[118]San Diego Botanical Garden, Encinitas, California, USA
[119]Huarango Nature, La Salcedo—Los Aquijes, Ica, Ica, Peru
[120]Museum of Natural History, National University of San Marcos, Ciudad Universitaria, Lima, Peru
[121]Faculty of Biological Sciences, San Luis Gonzaga National University of Ica, Ciudad Universitaria, Ica, Peru
[122]Ethnobiological Society of Indonesia, Tabanan, Bali, Indonesia
[123]Ketrawe Foundation, Santa Cruz de la Sierra, Bolivia
[124]Department of Computer science, Ukrainian National Forestry University, Lviv City, Ukraine
[125]Joint Effort to Save the Environment, Fort Portal City, Uganda
[126]Jardín Etnobiológico Estatal de Durango, Durango, Durango, Mexico
[127]Land Stewardship, Mountain Road Gill, Massachusetts, USA
[128]Nagaland State Biodiversity Board, Nagaland, India
[129]Urbanativa LLC, San Juan, Puerto Rico
[130]Madagasikara Ekôlôjia, Antananarivo, Madagascar
[131]JR Consulting, Antananarivo, Madagascar
[132]Ananas, 001, Margosa Court Apartment, Malleswaram, Bangalore, India
[133]CR Alatsinainy Ibity, Ibity Protected Area, Antsirabe, Madagascar
[134]Universidad Autónoma Chapingo, Texcoco, Mexico
[135]IICA, Brasília, Federal District, Brazil
[136]MAMPITA, Antananarivo, Madagascar
[137]Association TSIMOKA, Antananarivo, Madagascar
[138]Institute for Applied Ecology, Corvallis, Oregon, USA
[139]School of Plant and Environmental Sciences, Virginia Tech, Blacksburg, Virginia, USA
[140]National Botanic Gardens of Ireland, Office of Public Works, Glasnevin, Dublin, Ireland
[141]Department of Ecology, South China Botanical Garden, Guangzhou, China
[142]Jardín de Aclimatación de la Orotava, Instituto Canario de Investigaciones Agrarias, Santa Cruz de Tenerife, Canary Islands, Spain
[143]HANA Resources, Inc., Lake Forest, California, USA
[144]Insular, Los Lagos, Región de Los Ríos, Chile
[145]Madagascar Action Development, 64 TER C FM Morondava Antehiroka, Antananarivo, Madagascar
[146]Blue Beach Farm, San Carlos, Falkland Islands
[147]Department of Geography, University of Exeter, Exeter, UK
[148]School of Biological and Marine Sciences, University of Plymouth, Plymouth, UK

[149]Act America Carbon Trading, Development, Bogotá, Colombia
[150]Bioeconomy Science Institute, Lincoln, New Zealand
[151]WWF Uganda, Rubirizi District, Uganda
[152]Jardin Botanique de Genève, Geneva, Switzerland
[153]Swiss Botanical Society, Geneva, Switzerland
[154]Bio Piscinas, Aljezur, Portugal
[155]Department of Earth and Environmental Sciences, University of Pavia, Pavia, Italy
[156]Uwanda Ecosystem Restoration Tanzania, Karume Road Opposite SANGU High School Mbeya, Mbeya, Tanzania
[157]Plan Vivo Foundation, 4 Gayfield Pl Ln, Edinburgh, UK
[158]Blackthorn Ecology, Moate, Co. Westmeath, Ireland
[159]Faculty of Science, University of Zagreb Botanical Garden, Zagreb, Croatia
[160]JS Global Advisory, Rose Square, London, UK
[161]Research Center for Ecology, National Research and Innovation Agency Republic of Indonesia, Jakarta Pusat, Indonesia
[162]Botanic Gardens of Sydney, Sydney, New South Wales, Australia
[163]INIBIOMA, Bariloche, Argentina
[164]Mauritian Wildlife Foundation, Vacoas, Mauritius
[165]Bioversity International, Lima, Peru
[166]Change a Life Bwindi, Kabale, Mpungu sub-county, Kanungu District, Uganda
[167]Department of Biological and Medical Sciences, Oxford Brookes University, Oxford, UK
[168]Association Tsinjoala, Réserve Spéciale Analalava, Foulpointe, Madagascar
[169]Sylva Nova, Blegny, Belgium
[170]Department of Biology, Ateneo de Manila University, Quezon City, Metro Manila, Philippines
[171]HELIX Environmental Planning, Inc., La Mesa, California, USA
[172]Aichmi Group, Kuala Lumpur, Malaysia
[173]WeForest, Mulanje Golf Club, Mulanje, Malawi
[174]Crosby Hanna, Saskatoon, SK, Canada
[175]Triple F Agroecology Demonstration and Research Center, Fort Portal, Uganda
[176]Ecology Program, Universidad CES, Medellín, Antioquia, Colombia
[177]Programa Bosques y Selvas, Pronatura Veracruz A.C., Veracruz, Mexico
[178]Hortus Botanicus Amsterdam, Amsterdam, the Netherlands
[179]Pinetum Blijdenstein Hilversum, Hilversum, the Netherlands
[180]Department of Urban Environmental Engineering & Management, O M Beketov National University of Urban Economy, Kharkiv, Ukraine
[181]Agripalm Ambiental, Rua Professor Horácio Berlink, São Paulo, SP, Brazil
[182]Vroeg Holding BV, Leiden, the Netherlands
[183]Tetra Tech Inc, Lander, Wyoming, USA
[184]Western Ghats Plant Specialist Group, IUCN SSC, Keystone Foundation, Kotagiri, India
[185]ETH Zürich, Universitätstrasse, Zurich, Switzerland
[186]University of Durham, Durham, UK
[187]Wild Tulip Specialist Group, IUCN Species Survival Commission, Gland, Switzerland
[188]National Tropical Botanical Garden, Kalaheo, Hawaii, USA
[189]Department of Forest and Rangeland Plant Biodiversity, Ethiopia Biodiversity Institute, Addis Ababa, Ethiopia
[190]Missouri Botanical Garden, St. Louis, Missouri, USA
[191]City of Tacoma Open Space Program, Tacoma, Washington, USA
[192]Shanghai Botanical Garden, Xuhui District Shanghai City, Shanghai, China
[193]Adamah Consultants, Surrey, Canada
[194]Jardín Botánico de Bogotá, Bogotá, Colombia
[195]Universidad Nacional de Colombia, Universidad Nacional de Colombia, Bogotá, Colombia

Correspondence
David Bartholomew, Botanic Gardens Conservation International, Descanso House, 199 Kew Road, Richmond, TW9 3BW, UK.
Email: david.bartholomew@bgci.org

ORCID

David Bartholomew https://orcid.org/0000-0002-8123-1817
Paul Smith https://orcid.org/0000-0003-1015-054X
Marcello De Vitis https://orcid.org/0000-0002-2156-8186
George Gann https://orcid.org/0009-0001-6532-1361
Amarizni Mosyaftiani https://orcid.org/0000-0003-0441-2013
Laxmi Aggarwal https://orcid.org/0000-0003-0790-2560
Silvia Alvarez-Clare https://orcid.org/0000-0002-7792-387X
Jose Aranda-Pineda https://orcid.org/0000-0001-9082-4772
William Baker https://orcid.org/0000-0001-6727-1831
Megan Barstow https://orcid.org/0000-0001-9835-2933
Sandagdorj Bayarkhuu https://orcid.org/0000-0002-5043-4056
Nienke Beets https://orcid.org/0009-0006-7842-3347
Alejandro Bejerano https://orcid.org/0000-0001-7089-2946
Irene Bisang https://orcid.org/0000-0002-0403-6196
Stephen Blackmore https://orcid.org/0000-0002-8168-4226
Roderick Bouman https://orcid.org/0000-0002-2949-3318
Pedro Brancalion https://orcid.org/0000-0001-8245-4062
Elinor Breman https://orcid.org/0000-0001-9834-5186
Elise Buisson https://orcid.org/0000-0002-3640-8134
David Burslem https://orcid.org/0000-0001-6033-0990
Rainer Bussmann https://orcid.org/0000-0002-3524-5273
Anna Calle-Loor https://orcid.org/0000-0003-0617-8734
Clare Callow https://orcid.org/0009-0007-0944-7617
Vito Emanuele Cambria https://orcid.org/0000-0003-0481-6368
Fernanda Cardoso https://orcid.org/0000-0002-5217-5107
Fabian Carriconde https://orcid.org/0000-0003-3987-7662
Naomi Carvey https://orcid.org/0000-0002-4335-842X
Theodora Chan https://orcid.org/0000-0003-1315-2292
Mang Cheuk https://orcid.org/0000-0003-3218-6703
Vivek Chopra https://orcid.org/0000-0002-5216-5064
Emily Coffey https://orcid.org/0000-0002-9199-2943

Rebecca Cole https://orcid.org/0000-0001-9217-796X
Brian Colleran https://orcid.org/0000-0003-1066-5156
Carly Cowell https://orcid.org/0000-0002-7964-6220
Sarah Dalrymple https://orcid.org/0000-0002-6806-855X
Guilherme de Castro Ramos https://orcid.org/0000-0002-4551-1512
Andrés De la Rosa Portilla https://orcid.org/0000-0002-7680-4561
Sebsebe Demissew https://orcid.org/0000-0002-0123-9596
Mauricio Diazgranados https://orcid.org/0000-0003-0448-5706
Thomas Erler https://orcid.org/0009-0004-3957-456X
Lauren Eserman https://orcid.org/0000-0002-0208-6632
José Fernández Zeballos https://orcid.org/0000-0003-1660-8865
Ethan Freid https://orcid.org/0000-0003-3890-7022
Stephan Gale https://orcid.org/0000-0002-2161-6694
Rachael Gallagher https://orcid.org/0000-0002-4680-8115
Marta Galloni https://orcid.org/0000-0001-5304-7820
Andrew Gichira https://orcid.org/0000-0002-0530-7605
Teresa Girao da Cruz https://orcid.org/0000-0003-2625-2567
Orlik Gomez Garcia https://orcid.org/0000-0001-6507-9256
Susan Gould https://orcid.org/0000-0002-3722-867X
Barbara Gravendeel https://orcid.org/0000-0002-6508-0895
Coskun Guclu https://orcid.org/0000-0003-1263-5452
Kate Hardwick https://orcid.org/0000-0001-7864-8008
Billy Hau https://orcid.org/0000-0003-1147-6314
Kayri Havens https://orcid.org/0000-0002-3528-1856
Mats Havström https://orcid.org/0000-0003-4541-2618
Andrew Hector https://orcid.org/0000-0002-1309-7716
Viola Heinrich https://orcid.org/0000-0003-0501-0032
Ryan Hills https://orcid.org/0000-0002-7192-7941
Karen Holl https://orcid.org/0000-0003-2893-6161
Alex Hudson https://orcid.org/0000-0001-6034-3978
David Karanja Wambui https://orcid.org/0009-0003-3431-3689
Yogita Karpate https://orcid.org/0000-0003-2545-9371
Olga Kildisheva https://orcid.org/0009-0001-9441-1649
Roeland Kindt https://orcid.org/0000-0002-7672-0712
Anneleen Kool https://orcid.org/0000-0002-5961-4168
Tom LeBreton https://orcid.org/0000-0001-9353-0067
Alona Linatoc https://orcid.org/0000-0002-3130-781X
Cristina Lopez-Gallego https://orcid.org/0000-0002-5872-6053
Víctor Luna Monterrojo https://orcid.org/0000-0003-1862-5001
Gunwant Mahajan https://orcid.org/0009-0006-7887-990X
Itambo Malombe https://orcid.org/0000-0002-8168-7013
Gustavo Martinelli https://orcid.org/0000-0002-8560-2363
Raul Martinez https://orcid.org/0000-0002-5870-0312
Beatriz Maruri-Aguilar https://orcid.org/0000-0002-1594-6101
Marilou Montemayor https://orcid.org/0009-0006-9868-4157
Jennifer Neale https://orcid.org/0000-0002-3539-0083
Veronicah Ngumbau https://orcid.org/0000-0002-2545-8494
Madhura Niphadkar https://orcid.org/0000-0003-2279-7121
Ari Novy https://orcid.org/0000-0002-0873-9948
Alfonso Orellana-Garcia https://orcid.org/0000-0003-4021-695X
Victor Otieno https://orcid.org/0000-0002-7342-5312
Mykhailo Paslavskyi https://orcid.org/0000-0003-1635-4340
Norma Piedra Leandro https://orcid.org/0000-0003-1374-4810
Jessica Prieto https://orcid.org/0000-0002-6688-3112
Eliana Ramos https://orcid.org/0000-0003-1492-2076
Fidisoa Ratovoson https://orcid.org/0009-0003-1589-4190
Paul Reed https://orcid.org/0000-0001-7143-7515
Darren Reidy https://orcid.org/0000-0002-2005-7587
Hai Ren https://orcid.org/0000-0002-3744-8007
Jorge Reyes-Betancort https://orcid.org/0000-0003-0732-3219
Malin Rivers https://orcid.org/0000-0001-9690-1353
Lucy Rowland https://orcid.org/0000-0002-0774-3216
Jennifer Rowntree https://orcid.org/0000-0001-8249-8057
Jan Sala https://orcid.org/0000-0002-8896-1265
Narkis Morales San Martín https://orcid.org/0000-0002-3942-1916
Udo Schwarzer https://orcid.org/0000-0003-2910-0606
Assini Silvia https://orcid.org/0000-0002-6480-6543
Nancy Shaw https://orcid.org/0009-0004-9414-5370
George Smith https://orcid.org/0000-0002-9863-3425
Wawan Sujarwo https://orcid.org/0000-0001-8858-9769
Brett Summerell https://orcid.org/0000-0002-6666-5756
Michael Szuter https://orcid.org/0009-0008-6420-6784
Mariana Tadey https://orcid.org/0000-0001-9788-0419
Vikash Tatayah https://orcid.org/0000-0003-0759-254X
Evert Thomas https://orcid.org/0000-0002-7838-6228
Stewart Thompson https://orcid.org/0009-0001-8236-8129
Estela Vallejo https://orcid.org/0000-0002-5222-4837
Flor Vázquez Corzas https://orcid.org/0000-0002-5341-3920
Yuriy Vergeles https://orcid.org/0000-0002-4915-1489
Andrew Vovides https://orcid.org/0000-0002-3779-1374
Aparna Watve https://orcid.org/0000-0001-6186-8960
Leland Werden https://orcid.org/0000-0002-3579-4352
Murphy Westwood https://orcid.org/0000-0002-4828-954X
Oliver Whaley https://orcid.org/0000-0002-7761-3169
Dustin Wolkis https://orcid.org/0000-0002-8683-5855
Hailu Wondu https://orcid.org/0000-0003-2926-8185
Juliana Zuluaga Carrero https://orcid.org/0000-0002-9208-5958

REFERENCES

Bartholomew, D. C., Mosyaftiani, A., Morgan, B., Shah, T., Shaw, K., Stillman, C., Baldwin, K., Baqueiro, L. H. R., Birkinshaw, C., Breman, E., & GD FM. (2024). *The global biodiversity standard: Manual for assessment and best practices*. Botanic Gardens Conservation International & Society for Ecological Restoration.

Bond, W. J., Stevens, N., Midgley, G. F., & Lehmann, C. E. R. (2019). The trouble with trees: Afforestation plans for Africa. *Trends in Ecology & Evolution*, *34*, 963–965. https://doi.org/10.1016/j.tree.2019.08.003

Brancalion, P. H. S., Hua, F., Joyce, F. H., Antonelli, A., & Holl, K. D. (2025). Moving biodiversity from an afterthought to a key outcome of forest restoration. *Nature Reviews Biodiversity*, *1*, 248–261. https://doi.org/10.1038/s44358-025-00032-1

Di Sacco, A., Hardwick, K. A., Blakesley, D., Brancalion, P. H. S., Breman, E., Cecilio Rebola, L., Chomba, S., Dixon, K., Elliott, S., Ruyonga, G., Shaw, K., Smith, P., Smith, R. J., & Antonelli, A. (2021). Ten golden rules for reforestation to optimize carbon sequestration, biodiversity

recovery and livelihood benefits. *Global Change Biology*, *27*, 1328–1348. https://doi.org/10.1111/gcb.15498

Gann, G. D., McDonald, T., Walder, B., Aronson, J., Nelson, C. R., Jonson, J., Hallett, J. G., Eisenberg, C., Guariguata, M. R., Liu, J., Hua, F., Echeverría, C., Gonzales, E., Shaw, N., Decleer, K., & Dixon, K. W. (2019). International principles and standards for the practice of ecological restoration. Second edition. *Restoration Ecology*, *27*, S1–S46.

Gatica-Saavedra, P., Echeverría, C., & Nelson, C. R. (2017). Ecological indicators for assessing ecological success of forest restoration: A world review. *Restoration Ecology*, *25*, 850–857. https://doi.org/10.1111/rec.12586

Holl, K. D., & Brancalion, P. H. S. (2020). Tree planting is not a simple solution. *Science*, *368*, 580–581. https://doi.org/10.1126/science.aba8232

IUCN. (2024). "Global Tree Assessment: More than one in three tree species worldwide faces extinction—IUCN Red List." Retrieved Accessed: January 6, 2026, from https://iucn.org/press-release/202410/more-one-three-tree-species-worldwide-faces-extinction-iucn-red-list

Key, I. B., Smith, A. C., Turner, B., Chausson, A., Girardin, C. A. J., Macgillivray, M., & Seddon, N. (2022). Biodiversity outcomes of nature-based solutions for climate change adaptation: Characterising the evidence base. *Frontiers in Environmental Science*, *10*, 905767. https://doi.org/10.3389/fenvs.2022.905767

Lamont, T. A. C., Barlow, J., Bebbington, J., Cuckston, T., Djohani, R., Garrett, R., Jones, H. P., Razak, T. B., & Graham, N. A. J. (2023). Hold big business to task on ecosystem restoration. *Science*, *381*, 1053–1055. https://doi.org/10.1126/science.adh2610

Lewis, S. L., Wheeler, C. E., Mitchard, E. T. A., & Koch, A. (2019). Restoring natural forests is the best way to remove atmospheric carbon. *Nature*, *568*, 25–28. https://doi.org/10.1038/d41586-019-01026-8

Nedopil, C. (2023). Integrating biodiversity into financial decision-making: Challenges and four principles. *Business Strategy and the Environment*, *32*, 1619–1633. https://doi.org/10.1002/bse.3208

Nelson, C. R., Hallett, J. G., Romero Montoya, A. E., Andrade, A., Besacier, C., Boerger, V., Bouazza, K., Chazdon, R., Cohen-Shacham, E., Danano, D., Diederichsen, A., Fernandez, Y., Gann, G. D., Gonzales, E. K., Gruca, M., Guariguata, M. R., Gutierrez, V., Hancock, B., Innecken, P., … Weidlich, E. W. A. (2024). *Standards of practice to guide ecosystem restoration—A contribution to the United Nations decade on ecosystem restoration 2021–2030*. FAO, Rome.

Parr, C. L., Te Beest, M., & Stevens, N. (2024). Conflation of reforestation with restoration is widespread. *Science*, *383*, 698–701. https://doi.org/10.1126/science.adj0899

Seddon, N., Smith, A., Smith, P., Key, I., Chausson, A., Girardin, C., House, J., Srivastava, S., & Turner, B. (2021). Getting the message right on nature-based solutions to climate change. *Global Change Biology*, *27*, 1518–1546. https://doi.org/10.1111/gcb.15513

SER. (2025). "Certified Ecological Restoration Practitioner (CERP) Program." Retrieved January 6, 2026, from https://www.ser.org/page/CERPProgram

The Declaration Drafting Committee. (2022). Kew declaration on reforestation for biodiversity, carbon capture and livelihoods. *Plants, People, Planet*, *4*, 108–109.