



WORLD  
RESOURCES  
INSTITUTE

EXECUTIVE SUMMARY

# ROOTS OF PROSPERITY

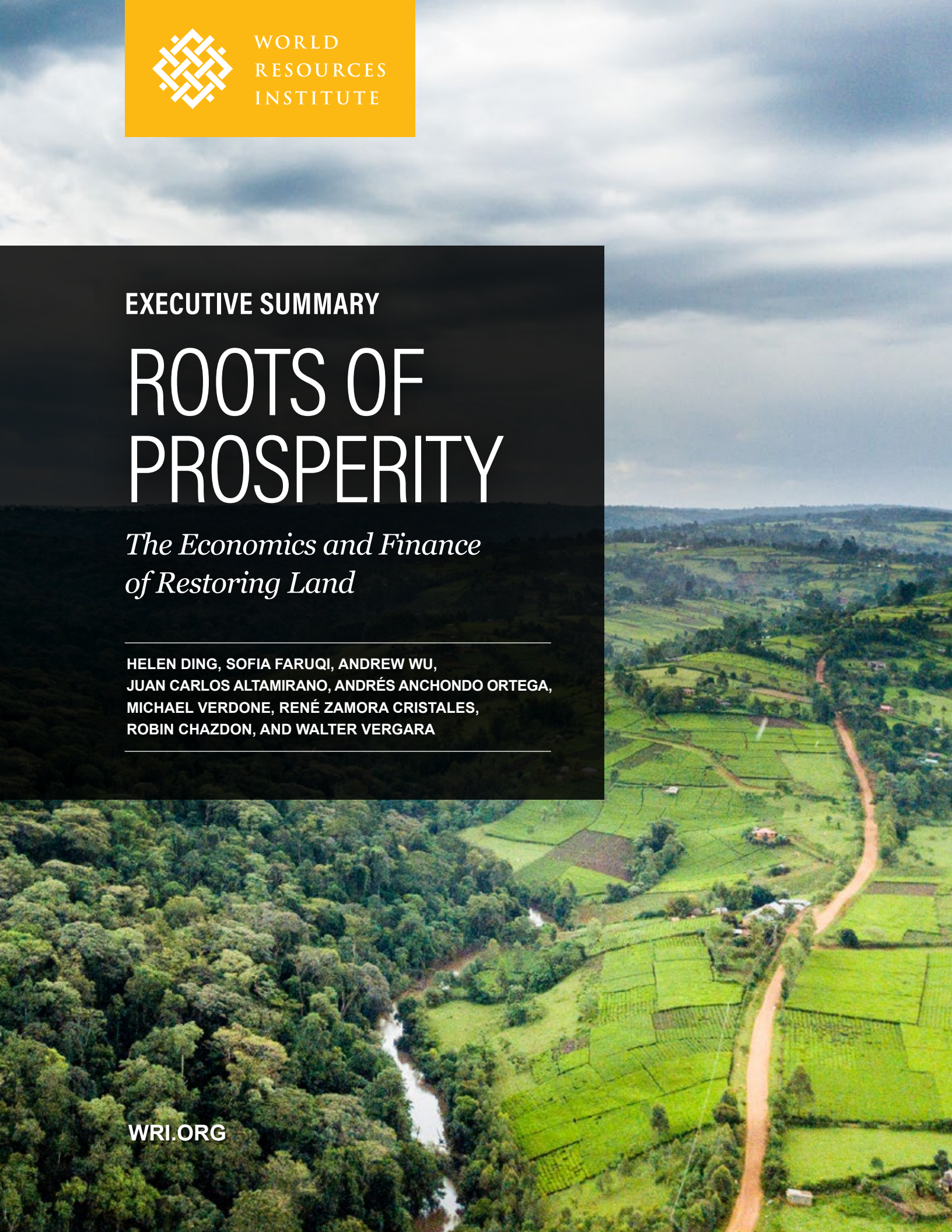
*The Economics and Finance  
of Restoring Land*

---

HELEN DING, SOFIA FARUQI, ANDREW WU,  
JUAN CARLOS ALTAMIRANO, ANDRÉS ANCHONDO ORTEGA,  
MICHAEL VERDONE, RENÉ ZAMORA CRISTALES,  
ROBIN CHAZDON, AND WALTER VERGARA

---

WRI.ORG





## HIGHLIGHTS

---

- Forest and land degradation is estimated to cost the world more than US\$6.3 trillion a year—equivalent to 8.3 percent of global GDP in 2016—and jeopardizes the livelihoods of half a billion people who depend on forests and land resources.
- Restoring degraded forests generates an estimated \$7-30 in economic benefits for every dollar invested. Despite this favorable benefit-cost ratio, funding for landscape restoration falls short by about \$300 billion a year.
- Investment is inadequate for several key reasons. For example, many of the benefits are public goods, which are difficult to monetize; the long-term nature of investments does not match investors' desire for liquidity; and projects are perceived to be risky.
- Policy solutions and financial mechanisms exist to address these factors. Governments can shift incentives from land degradation toward restoration, implement carbon taxes and direct revenues to restoration, adopt an integrated approach across ministries, and support risk-mitigation mechanisms that attract private investment.
- Adopting a standardized economic valuation framework would enable comparison among site- or country-level studies. Collecting analyses in a central repository would help prevent duplication of effort and provide policymakers and practitioners with access to knowledge that could lead to better decision-making.

## EXECUTIVE SUMMARY

**Almost a quarter of the world's land area has been degraded over the past 50 years.** This is the result of soil erosion, salinization, peatland and wetland drainage, and forest degradation. The scale of the resulting damage is staggering: It costs the world an estimated \$6.3 trillion a year (8.3 percent of global GDP in 2016) in lost ecosystem service value, which includes agricultural products, clean air, fresh water, climate regulation, recreational opportunities, and fertile soils (Sutton et al. 2016). Land degradation also jeopardizes the livelihoods of half a billion mostly poor people who depend on forests and agricultural lands. Declining land productivity undermines sustainable development, threatens food and water security, and leads to involuntary human migration and even civil conflict.

**At the global scale, land degradation compromises the integrity of the biosphere.** Biodiversity loss represents a reduction of the world's genetic resources as well as an incalculable diminution in the richness of life on earth. Forests help to regulate the global hydrological cycle, and plant vegetation and soils are a major carbon sink helping to offset human-caused emissions of carbon dioxide. Restoring forests and other landscapes should be an urgent global priority.

**In 2011, the Bonn Challenge was launched in recognition of the importance of land restoration.** The goal is to restore 150 million hectares of the world's deforested and degraded land by 2020 and 350 million hectares by 2030. As of November 2017, 39 countries had made commitments. These governments now need to turn the pledges they made into action on the ground by implementing feasible, affordable solutions that provide multiple benefits to society.

## ABOUT THIS REPORT

The premise of this report is that there is an urgent need to increase financing for restoration, and there are many pathways to make this happen. This publication explains seven key barriers to investment in restoration and highlights policy solutions and financial mechanisms—many of which are already in play—that can be used to overcome these barriers (Figure ES-1).

Through a discussion of the financial and economic issues surrounding restoration, the report encourages governments and practitioners to conduct analyses and enact strategies that support forest and landscape restoration.

Figure ES-1 | **Barriers to Investment in Restoration**



Source: WRI authors.

Economic analysis can encourage investment in restoration by clearly laying out the benefits and costs of restoration projects and their distribution among stakeholders. This report helps policymakers understand the full suite of benefits and costs associated with restoration and outlines the four main analytical tools that can be used to carry out this economic analysis (Figure ES-2).

The report also summarizes existing research on the economic costs and benefits of restoration in Africa and Latin America and makes the case for developing a central database of research findings on restoration.

## KEY FINDINGS

### Restoration can be a good investment.

Studies estimate that every \$1 invested in restoring degraded forests can yield between \$7 and \$30 in economic benefits (Verdone and Seidl 2017). The impact extends well beyond the environmental sphere: Restoring 150 million hectares of degraded agricultural land could generate \$85 billion in net benefits to national and local economies,<sup>1</sup> and provide \$30–40 billion a year in extra income for smallholder farmers and additional food for close to 200 million people (GCEC 2014).

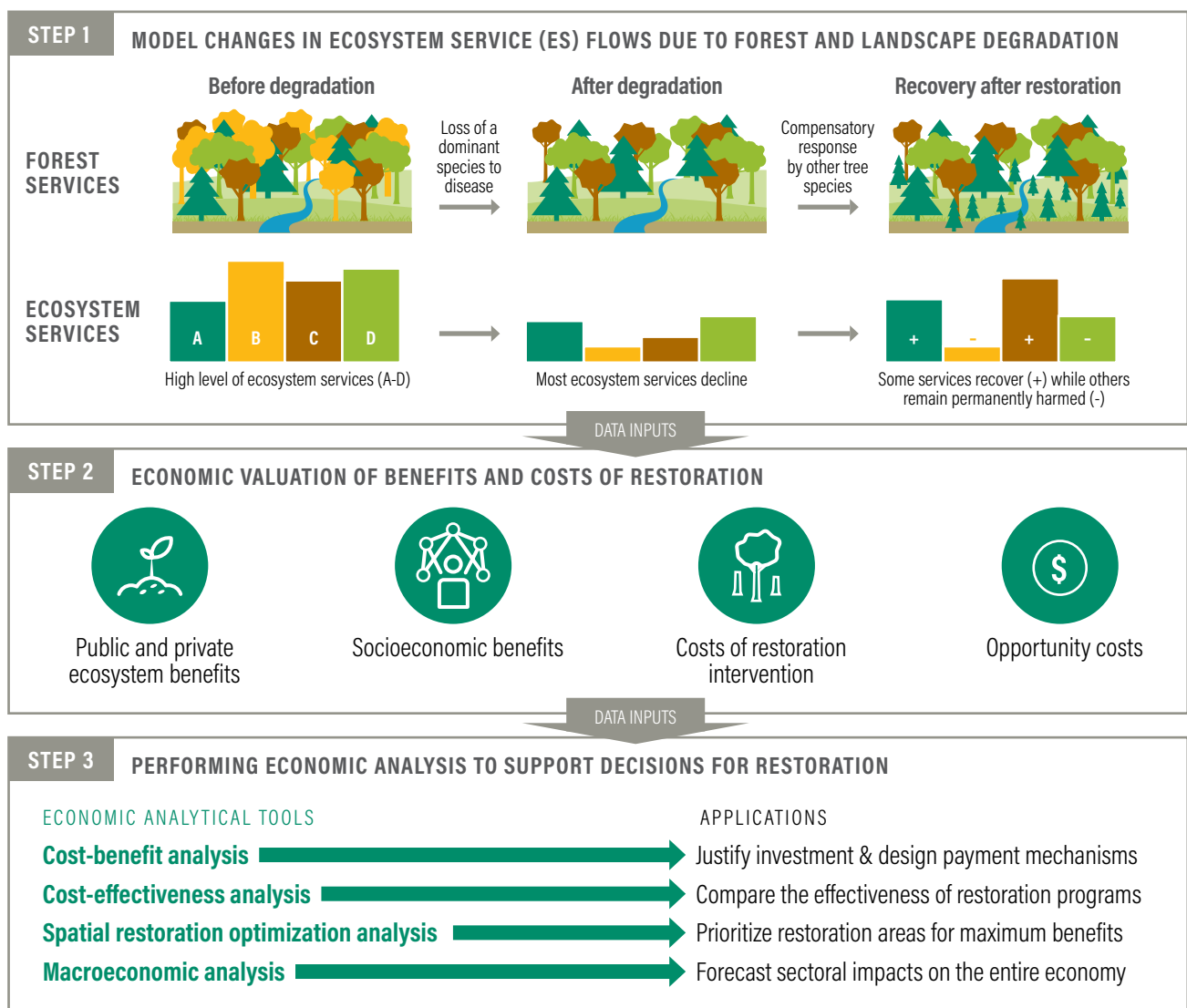
**Although the economic case is clear, financing for restoration activities falls well short of the need.** For example, public climate finance totaled \$128 billion in 2015, of which only \$7 billion (about 5 percent of total climate finance) was used for financing land-use projects (Buchner et al. 2015). Funding for restoration-specific projects was a small fraction of the land-use category. In

contrast, annual funding needs for conservation and restoration are estimated to range from \$300 to \$400 billion per year, indicating a massive financing gap (Figure ES-3) (Credit Suisse et al. 2014).

### Investment is currently falling short for seven main reasons:

- Environmental and social benefits usually have no market value. Evaluated strictly in terms of financial gains, most restoration projects generate returns that are too low to attract private investors.
- Incentives to degrade land outweigh incentives to restore it. Agricultural subsidies and poor enforcement of laws banning illegal logging encourage harmful practices.
- Land restoration is essential to mitigate climate change, yet climate finance is difficult to access. Transaction costs and bureaucracy make it time-consuming and costly for governments and other stakeholders in developing countries to access these funds.
- Funding for restoration is sometimes limited to small environmental budgets. Lack of awareness and coordination among ministries of environment, agriculture, and other sectors means that restoration projects tend to be underfunded.
- Many restoration projects are too small to be attractive to institutional investors. They may require only \$1–10 million in capital, while institutional investors often look for minimum investment sizes of at least \$50–100 million.

Figure ES-2 | How economic analysis can inform decisions about restoration



Source: WRI authors, adapted from Boyd et al. 2013.

- Many restoration projects have very long investment horizons of 10 to 20 years because restoration is a multi year process. This long time frame significantly limits investor interest.
- Restoration is considered risky as there is no investment track record, and countries where restoration is needed most may have governance and land tenure issues.

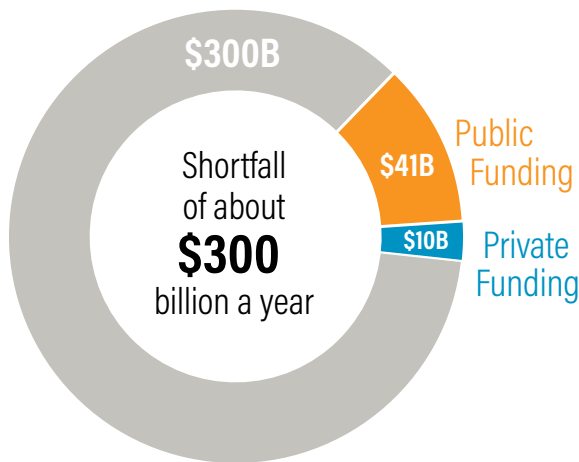
**Estimating the full benefits and costs of restoration can help to prioritize projects.** Economic analysis can document successes, help prioritize projects based on specific objectives, and estimate the effects of restoration on job creation, GDP growth, poverty alleviation, food security, and

greenhouse gas emissions. Analyses should cover not only restored sites but also their surrounding areas, so that conclusions can be drawn about the impacts at the landscape level. The results can be used to engage a wide range of stakeholders, such as water utilities and municipal governments, that might benefit from restoration efforts coordinated at a landscape scale.

**Economic analysis can identify who benefits from restoration and who pays the costs.**

Benefit and cost estimates should be disaggregated across stakeholders to better understand who gains and who pays. Furthermore, costs and benefits can be entered into various economic tools and analytical models—such as cost-benefit analysis, cost-effec-

Figure ES-3 | **Estimates of Global Funding for Restoration and Conservation**



Source: Adapted from Parker et al. 2012; Credit Suisse et al. 2014.

tiveness analysis, spatial restoration optimization analysis, and macroeconomic analysis—that can be used to support policy and financing decisions.

**Quantifying the multiple public benefits of restoration can provide the basis for blending different sources of capital.**

Quantification can help to allocate capital by identifying who bears the upfront costs and tailoring the structure of an investment to provide incentives for landowners. Quantification can also help to scale investment in landscape restoration by blending different sources of capital, including climate, conservation, and development finance.

**RECOMMENDATIONS**

**To increase investment in forest and land restoration, governments need to take the following actions, among others:**

- Remove perverse incentives—such as agricultural subsidies—that make it profitable to degrade land and introduce new mechanisms that incentivize restoration.
- Explore the extent to which climate and development finance and revenues from carbon taxes can be directed toward restoration. This will unlock billions in funding from existing sources.
- Integrate restoration actions into many government bodies—such as ministries of agriculture, finance, energy, and the treasury—because land generates benefits for many areas of the

economy and should not be treated as a purely environmental concern.

- Work with multilateral banks, philanthropic organizations, and civil society to develop financial mechanisms to leverage public and philanthropic capital and attract private investment. Mechanisms that reduce risk—including insurance guarantees, tax credits, and first-loss capital structures—can help to bring in new investors.

**An improved information base and a standardized evaluation framework would enhance restoration planning and implementation:**

- Creating a standardized valuation framework that assesses restoration benefits and costs at both the national and community levels would enhance the robustness and comparability of economic estimates and identify where large investments in restoration could pay dividends for current and future generations.

A high-level panel of social scientists—similar to the NOAA Blue Ribbon Panel created to evaluate the robustness of nonmarket valuation methods—could be established to provide guidance in the context of landscape restoration (Arrow et al. 1993).

- A database that includes information on the estimated costs and benefits of restoration would allow practitioners and decision-makers to share and develop knowledge. Such a repository would reduce duplication of effort, direct scarce resources to activities where more research is needed, and allow practitioners and decision-makers to quickly access the information they need. The database would be particularly useful for parties that cannot afford to conduct their own research.

To do this, a global initiative that is similar to The Economics of Ecosystems and Biodiversity (TEEB), could be developed to gather evidence of restoration interventions in different regions and to make the benefits of restoration visible to the world.

Given the strong political impetus for restoration, now is the time to accelerate action on the ground. We hope this report will help to develop the foundation of a thriving restoration economy.

## REFERENCES

- Arrow, K., R. Solow, P.R. Portney, E. E. Leamer, R. Radner, and H. Schuman. 1993. "Report of the NOAA Panel on Contingent Valuation." *Federal Register* 58: 4601–4614.
- Boyd, I.L., P.H. Freer-Smith, C.A. Gilligan, and H.C.J. Godfray. 2013. "The Consequence of Tree Pests and Diseases for Ecosystem Services." *Science* 342: 1235773, doi: 10.1126/science.1235773.
- Buchner, B., C. Trabacchi, F. Mazza, D. Abramskiehn, and D. Wang. 2015. "Global Landscape of Climate Finance 2015. Climate Policy Initiative." <https://climatepolicyinitiative.org/wp-content/uploads/2015/11/Global-Landscape-of-Climate-Finance-2015.pdf>.
- Credit Suisse, WWF (World Wildlife Fund), and McKinsey and Company. 2014. "Conservation Finance: Moving Beyond Donor Funding toward an Investor-Driven Approach." <https://www.cbd.int/financial/privatesector/g-private-wwf.pdf>.
- GCEC (Global Commission on the Economy and Climate). 2014. "Land Use." In *Better Growth, Better Climate*, edited by M. Davis and G. Wynn. Washington, DC: World Resources Institute. <http://newclimateeconomyreport/2014/land-use/>.
- Parker, C., M. Cranford, N. Oakes, and M. Leggett. 2012. *The Little Biodiversity Finance Book*. 3rd ed. Oxford, UK: Global Canopy Programme. [https://www.cbd.int/financial/hlp/doc/literature/LittleBiodiversityFinanceBook\\_3rd%20edition.pdf](https://www.cbd.int/financial/hlp/doc/literature/LittleBiodiversityFinanceBook_3rd%20edition.pdf).
- Sutton, P.C., S. Anderson, R. Costanza, and I. Kubiszewski. 2016. "The Ecological Economics of Land Degradation: Impacts on Ecosystem Service Values." *Ecological Economics* 129: 182–192.
- Verdone, M.A., and A. Seidl. 2017. "Time, Space, Place and the Bonn Challenge Global Forest Restoration Target." *Restoration Ecology*, 25: 903–911. doi:10.1111/rec.12512.

## ENDNOTES

1. Information on the Bonn Challenge can be found at <http://www.bonnchallenge.org/content/challenge>.

## ACKNOWLEDGMENTS

This report benefited greatly from spirited discussions with all participants at the Expert Workshop on the Economics and Financing of Restoration Opportunities, organized by World Resources Institute in Washington, DC, on March 31, 2017.

The authors are grateful for the comments and suggestions on an early report outline provided by Amy W. Ando (University of Illinois and Resources for the Future), Christopher Delgado (World Bank and Johns Hopkins School of Advanced International Studies), Barbara Wagner (Montana Dept. of Labor and Industry), Edward Barbier (Colorado State University), and Stefanie Tye (WRI).

The authors also wish to express their particular thanks to the following individuals for their valuable guidance, critical reviews, and research support: Ana Ríos (Inter-America Development Bank), Anil Markandya (BC3), Caroline van Leenders (Dutch Ministry of Foreign Affairs), David Mayer (UNDP BIOFIN), Dolf de Groot (Wageningen University), Edward Davey (the Prince of Wales's Charitable Foundation), John Herbohn (University of the Sunshine Coast), Jon Strand (University of Oslo), Robert Beach (RTI International), Sara Scherr (Ecoagriculture), and Todd Bendor (UNC).

Many World Resources Institute colleagues provided comments on drafts of this report, including Fred Stolle, James Mulligan, Katie Reyntar, Maria Franco Chuaire, Helen Mountford, Sean DeWitt, Laura Malaguzzi Valeri, Daryl Ditz, and Michelle Manion. The authors would also like to acknowledge those involved with graphic design, editing, and layout as well as communications and outreach: Carni Klirs, Julie Moretti, Emily Matthews, Barbara Karni, Caroline Gagne, James Anderson, Natasha Ferrari, John-Rob Pool, Deborah Zabarenko, Lauren Zelin and Ally Friedman.

We are pleased to acknowledge our institutional strategic partners, who provide core funding to WRI: Netherlands Ministry of Foreign Affairs, Royal Danish Ministry of Foreign Affairs, and Swedish International Development Cooperation Agency.

## PHOTO CREDITS

Cover photo by Patrick Shepherd/CIFOR



## ABOUT THE AUTHORS

**Helen Ding** is a Senior Environmental Economist with the Economics Center at WRI.

Contact: [helen.ding@wri.org](mailto:helen.ding@wri.org)

**Sofia Faruqi** is Manager of the New Restoration Economy in the Forests Program at WRI.

Contact: [sofia.faruqi@wri.org](mailto:sofia.faruqi@wri.org)

**Andrew Wu** is a Research Analyst in the New Restoration Economy in the Forests Program at WRI.

Contact: [andrewwu@wri.org](mailto:andrewwu@wri.org)

**Juan Carlos Altamirano** is a Senior Economist with the Economics Center and the Open Climate Network at WRI.

Contact: [jcaltamirano@wri.org](mailto:jcaltamirano@wri.org)

**Andrés Anchondo Ortega** is a Research Assistant in the New Restoration Economy in the Forests Program at WRI.

Contact: [andres.anchondo@wri.org](mailto:andres.anchondo@wri.org)

**Michael Verdone** is a Senior Associate at BBC Research & Consulting.

Contact: [MVerdone@bbcresearch.com](mailto:MVerdone@bbcresearch.com)

**René Zamora Cristales** is an Associate II with the Global Restoration Initiative in the Forests Program at WRI.

Contact: [Rene.Zamora@wri.org](mailto:Rene.Zamora@wri.org)

**Robin Chazdon** is a Senior Fellow in the Forests program at WRI, Professor Emerita in the Ecology and Evolutionary Biology Department at the University of Connecticut, and a Research Professor at the University of the Sunshine Coast, Queensland, Australia.

Contact: [Robin.Chazdon.5@wri.org](mailto:Robin.Chazdon.5@wri.org)

**Walter Vergara** is a Senior Fellow with the Global Restoration Initiative in the Forests Program and coordinator of Initiative 20x20 at WRI.

Contact: [Wvergara@wri.org](mailto:Wvergara@wri.org)

## ABOUT WRI

World Resources Institute is a global research organization that turns big ideas into action at the nexus of environment, economic opportunity, and human well-being.

### Our Challenge

Natural resources are at the foundation of economic opportunity and human well-being. But today, we are depleting Earth's resources at rates that are not sustainable, endangering economies and people's lives. People depend on clean water, fertile land, healthy forests, and a stable climate. Livable cities and clean energy are essential for a sustainable planet. We must address these urgent, global challenges this decade.

### Our Vision

We envision an equitable and prosperous planet driven by the wise management of natural resources. We aspire to create a world where the actions of government, business, and communities combine to eliminate poverty and sustain the natural environment for all people.

### Our Approach

#### COUNT IT

We start with data. We conduct independent research and draw on the latest technology to develop new insights and recommendations. Our rigorous analysis identifies risks, unveils opportunities, and informs smart strategies. We focus our efforts on influential and emerging economies where the future of sustainability will be determined.

#### CHANGE IT

We use our research to influence government policies, business strategies, and civil society action. We test projects with communities, companies, and government agencies to build a strong evidence base. Then, we work with partners to deliver change on the ground that alleviates poverty and strengthens society. We hold ourselves accountable to ensure our outcomes will be bold and enduring.

#### SCALE IT

We don't think small. Once tested, we work with partners to adopt and expand our efforts regionally and globally. We engage with decision-makers to carry out our ideas and elevate our impact. We measure success through government and business actions that improve people's lives and sustain a healthy environment.

Each World Resources Institute report represents a timely, scholarly treatment of a subject of public concern. WRI takes responsibility for choosing the study topics and guaranteeing its authors and researchers freedom of inquiry. It also solicits and responds to the guidance of advisory panels and expert reviewers. Unless otherwise stated, however, all the interpretation and findings set forth in WRI publications are those of the authors.





WORLD  
RESOURCES  
INSTITUTE

10 G STREET NE  
SUITE 800  
WASHINGTON, DC 20002, USA  
+1 (202) 729-7600  
[WWW.WRI.ORG](http://WWW.WRI.ORG)

ISBN 978-1-56973-926-6