



**MILLENNIUM
CHALLENGE
CORPORATION**

REDUCING POVERTY THROUGH GROWTH

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**MCC'S FINDINGS IN THE SEARCH FOR A
NATURAL RESOURCES MANAGEMENT INDICATOR**

As part of its search for an indicator that assesses a country's economic policies that promote the sustainable management of natural resources, MCC issued a public "call for ideas" to seek input from a broad range of experts and stakeholders. MCC assembled a group of economists and natural resources management experts to individually evaluate the ideas it received and the two highest-rated proposed indicators were a *Natural Resource Management Index* from Columbia University's Center for International Earth Science Information Network (CIESIN) and the Yale Center for Environmental Law and Policy, and an *Access to Land* indicator from the International Fund for Agricultural Development (IFAD).

These indicators received high rankings from MCC's independent experts on the extent to which they meet the legislative mandate and with respect to MCC's general criteria for an indicator:

- developed by an independent third party;
- utilizes objective and high-quality data;
- is analytically rigorous and publicly available;
- has broad country coverage and is comparable across countries;
- has a clear theoretical or empirical link to economic growth and poverty reduction;
- is policy-linked, i.e. measures factors that governments can influence within a two to three year horizon; and
- has broad consistency in results from year to year.

Scholarly research suggests that performance on these indicators provides a good indication of whether governments are investing limited resources in ways that will increase economic growth, reduce poverty, and improve natural resource management. Improvements in environmental health and protected areas (as measured in the NRM Index; see next page) play an important role in achieving sustainable economic growth and natural resource management. Secure land tenure facilitates long-term investments in land productivity and diminishes the likelihood of short-term decisions with negative environmental impacts such as deforestation and slash-and-burn agriculture.

For questions regarding the consultation process or the indicators themselves, please contact MCC's office of Development Policy at: MCCDevelopmentPolicy@mcc.gov.

NATURAL RESOURCE MANAGEMENT INDEX

What it measures:

Columbia University's Center for International Earth Science Information Network (CIESIN) and the Yale Center for Environmental Law and Policy have created a composite measure of *natural resource management* made up of four indicators:

- **Eco-region Protection:** Developed by CIESIN, this component assesses whether countries are protecting at least 10% of all their biomes (e.g. deserts, tropical rainforests, grasslands, savannas, and tundra). It is designed to capture the comprehensiveness of a government's commitment to habitat preservation and biodiversity protection. The World Wildlife Fund provides the underlying biome data, and the United Nations Environment Program World Conservation Monitoring Center – in partnership with the IUCN World Commission on Protected Areas and the World Database on Protected Areas Consortium – provide the underlying data on protected areas.
- **Access to Improved Water:** Produced by the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF), this component measures the percentage of the population with access to at least 20 liters of water per person per day from an “improved” source (household connections, public standpipes, boreholes, protected dug wells, protected springs, and rainwater collection) within one kilometer of the user's dwelling.
- **Access to Improved Sanitation:** Produced by the WHO and UNICEF, this component measures the percentage of the population with access to facilities that hygienically separate human excreta from human, animal, and insect contact. Such facilities include sewers or septic tanks, pour-flush latrines, and simple pit or ventilated improved pit latrines, provided that they are not public.
- **Child Mortality (Ages 1-4):** Produced by the Population Division of the United Nations Department of Economic and Social Affairs, this indicator measures the probability of a child dying between the ages of 1 and 4. Since the causes of child mortality among 1-4 year olds are predominantly environmental, this indicator is considered to be an excellent proxy for underlying environmental conditions.

The Pilot 2006 Environmental Performance Index (EPI) provides additional information on each of these indicators and is available at www.yale.edu/epi/ and at <http://sedac.ciesin.columbia.edu/es/epi/>.

Why it matters:

Eco-region protection is important because ecosystems provide essential services, such as clean water, fresh air, healthy soils, livable climates, and wild foods that underpin human welfare.ⁱ Protected areas constitute a proven approach to preserving ecosystems.ⁱⁱ In addition, protected areas can generate a significant amount of income by providing opportunities for investments in ecotourism and bio-prospecting, generating debt relief through debt-for-nature swaps and carbon credit arrangements, and attracting international conservation investments. Studies also show that, in the absence of a well-managed protected areas system, the environment both inside and outside of protected areas tends to deteriorate.ⁱⁱⁱ

Lack of access to clean water and sanitation services are two of the most important environmental threats to human health in the developing world. Every year, roughly 1.7 million lives and 54.2 million

“life-years” are lost to unsafe water and inadequate sanitation, and poor people disproportionately bear this burden. The depth of a government’s commitment to sustainable water and waste management is reflected in their effort to improve access to these essential public services.

Access to these clean water and sanitation services affects economic growth and poverty reduction directly through the channels of improved health and higher total factor productivity.^{iv} Lack of access to these basic services affects labor productivity by spreading diseases such as dengue, hepatitis A and E, cholera, dysentery, and diarrheal diseases, encouraging the spread of malaria-infected mosquitoes, and making it difficult for people to retain food and nutrients. Many poor people also spend a significant number of daylight hours fetching water, which further lowers levels of labor productivity.^v Parents, spouses, and older children also often forgo income generating activities to care for family members afflicted by water-borne diseases.

A government’s commitment to reducing child mortality among 1-4 year olds also provides an excellent indication of its broader commitment to natural resource management. CIESIN and the Yale Center for Environmental Law and Policy estimate that roughly 80% of all of the deaths in the 1-4 cohort are attributable to environmental factors – in particular, indoor air pollution and unsafe water and sanitation.^{vi} Indoor air pollution, which is primarily caused by lighting fires indoors for heating and cooking, contributes to roughly 1.6 million premature deaths and 38.5 million lost “life-years” every year.^{vii} Yet, with modest investments, these deaths and illnesses are completely preventable. Studies show that interventions, such as dissemination of improved efficiency household stoves and public awareness campaigns about the importance of proper ventilation, come at a very low cost and save lives.^{viii} The health and economic benefits of water and sanitation initiatives are also well-documented.^{ix}

ACCESS TO LAND INDICATOR

What it measures:

IFAD’s *Access to Land* indicator, a component of its Performance Based Allocation System, assesses the existence of an institutional, legal, and market framework for secure land tenure. Specifically, it measures the extent to which:

- “a range of land access mechanisms is available to rural poor households, including women, indigenous populations and other vulnerable groups, and their land access is generally secure;”
- “the law guarantees secure, equal, and enforceable land rights to poor men and women;”
- “the majority of land holdings are titled and/or registered;”
- “formal land markets [the free buying, selling, and renting of private land] function effectively and are used by the rural poor;” and
- “the government has a policy for the clear and equitable allocation and management of common property resources.”

More on IFAD’s indicator methodology is at: www.ifad.org/gbdocs/gc/27/e/GC-27-L-6.pdf

The 2004 IFAD country scores can be found at: www.ifad.org/gbdocs/gc/28/e/GC-28-L-9.pdf

Why it matters:

Secure land tenure is a critical component of sustainable natural resource management because those who lack clear ownership or use rights to their land are less likely to make long-term investments in land

productivity and more likely to make short-term decisions with negative environmental impacts such as deforestation.^x In Ghana, for example, there is evidence that farmers are significantly more likely to make long-term investments in land by planting trees when their land rights are secure.^{xi}

Conversely, insecure land tenure can contribute to severe land degradation by encouraging the mining of soil fertility and organic matter, slash-and-burn agriculture, and encroachment into ecologically-sensitive areas. Studies show that land tenure insecurity has accelerated deforestation and a range of other unsustainable natural resource management practices in Latin America, Africa, and Asia.^{xii}

In addition to cultivating a longer term perspective on land use, secure land tenure also eases the difficulty of establishing the systems of securitization that are necessary to deliver water and sanitation services: private companies and public utilities generally do not provide access to credit, water, sanitation, telephones or electricity unless the individuals requesting service possess a property title.^{xiii}

Finally, secure land tenure plays a central role in the economic growth process by giving people long-term incentives to invest and save their income, enhancing access to essential public services, allowing for more productive use of time and money than protecting land rights, facilitating use of land as collateral for loans, and contributing to social stability and local governance. Improvements in tenure security also tend to generate “pro-poor” growth because the benefits generally accrue to those who have not possessed such rights in the past.

ⁱ On the relationship between ecosystem services (e.g. food, fiber, shelter, water, and genetic diversity) and economic development, see Millennium Ecosystem Assessment. 2005. *Ecosystems and Human Well-Being: General Synthesis*. New York: Island Press; Balmford, A., Balmford A, Bruner A, Cooper P, Costanza R, Farber S, Green RE, Jenkins M, Jefferiss P, Jessamy V, Madden J, Munro K, Myers N, Naeem S, Paavola J, Rayment M, Rosendo S, Roughgarden J, Trumper K, Turner RK. 2002. Economic reasons for conserving wild nature. *Science* 297: 950-953; Kremen C, Niles JO, Dalton MG, Daily GC, Ehrlich PR, Fay JP, Grewal D, and Guillery RP. 2000. Economic incentives for rain forest conservation across scales. *Science* 288: 1828-1832.

ⁱⁱ Millennium Ecosystem Assessment. 2005. *Ecosystems and Human Well-being: Biodiversity Synthesis*. Washington, D.C.: World Resources Institute; Ervin, Jamison. 2003. Protected Area Assessments in Perspective. *Bioscience* 53(9): 819-822; Struhsaker, Thomas T., Paul J. Struhsaker, and Kirstin S. Siex. 2005. Conserving Africa’s rain forests: problems in protected areas and possible solutions. *Biological Conservation* 123 (2005) 45–54.

ⁱⁱⁱ On the impact of protected areas on a range of environmental issues, see K. Brandon, K.H. Redford, and S.E. Sanderson (eds.). 1998. *Parks in Peril: People, politics and protected areas*. Washington D.C.: Island Press; M.F. Kinnaird, E.W. Sanderson, T.G. O’Brien, H.T. Wibisono, and G. Woolmer. 2003. Deforestation trends in a tropical landscape and implications for endangered large mammals. *Conservation Biology* 17 (1): 245–257.

^{iv} A large body of empirical literature demonstrates a strong relationship between unsafe water and sanitation and lower levels of economic growth and poverty reduction. See Prüss-Üstün A, Kay D, Fewtrell L and Bartram J. 2004. “Unsafe water, sanitation and hygiene.” In *Comparative Quantification of Health Risks: Global and Regional Burden of Disease Attributable to Selected Major Risk Factors*, edited by M. Ezzati M, A. Lopez, et al. Geneva: World Health Organization; Markandya, Anil. 2005. “Water Quality Issues in Developing Countries.” In *Essays in Environment and Development*, edited by Joseph Stiglitz. New York: Columbia University Press; Cole, A. and E. Neumayer. forthcoming. The impact of poor health on factor productivity: An empirical investigation.

Journal of Development Studies; Fay, M., D. Leipziger, Q. Wodon, and T. Yepes. 2005. *Achieving Child-Health-Related Millennium Development Goals: The Role of Infrastructure*. *World Development* 33(8): 1267–1284.) On the relationship between ecosystem services (e.g. food, fiber, shelter, water, and genetic diversity) and economic development, see Millennium Ecosystem Assessment. 2005. *Ecosystems and Human Well-Being: General Synthesis*. New York: Island Press; Balmford, A., Balmford A, Bruner A, Cooper P, Costanza R, Farber S, Green RE, Jenkins M, Jefferiss P, Jessamy V, Madden J, Munro K, Myers N, Naeem S, Paavola J, Rayment M, Rosendo S, Roughgarden J, Trumper K, Turner RK. 2002. Economic reasons for conserving wild nature. *Science* 297: 950-953; Kremen C, Niles JO, Dalton MG, Daily GC, Ehrlich PR, Fay JP, Grewal D, and Guillery RP. 2000. Economic incentives for rain forest conservation across scales. *Science* 288: 1828-1832.

^v Cosgrove, W. J., and F. R. Rijsberman. 1998. Creating a Vision for Water, Life and the Environment. *Water Policy* 1(1): 115.

^{vi} Correspondence with Marc Levy (Head of CIESIN’s Science Applications group) on June 8, 2006. CIESIN and the Yale Center for Environmental Law and Policy report in their *2006 Pilot Environmental Performance Index* (pg. 33) that “[m]ortality rates for children between one and four years of age provide a good indicator of the effect of the environment on human health, particularly in the developing world. Poor air quality and an inadequate or unsanitary water supply in a country often manifest themselves in respiratory and intestinal problems and disease. These effects can be seen most often in children, as they are more sensitive to poor environmental quality. By considering only mortality rates for children one to four years of age, we better focus on the impact of environmental conditions as opposed to health care infrastructure.” See Esty, Daniel C., Marc A. Levy, Tanja Srebotnjak, Alexander de Sherbinin, Christine H. Kim, and Bridget Anderson. 2006. *Pilot 2006 Environmental Performance Index*. New Haven: Yale Center for Environmental Law & Policy.

^{vii} Smith, Kirk R, Sumi Mehta, and Mirjam Maeusezahl-Feuz. 2004. “Indoor air pollution from household use of solid fuels.” In *Comparative Quantification of Health Risks: Global and Regional Burden of Disease Attributable to Selected Major Risk Factors*, edited by M. Ezzati M, A. Lopez, et al. Geneva: World Health Organization. Bloom, David A., Anita K.M. Zaidi, and Ethan Yeh. 2005. The demographic impact of biomass fuel use. *Energy for Sustainable Development* 9(3): 40-48. Ezzati, Majid and Kammen, Daniel M. 2002. The Health Impacts of Exposure to Indoor Air Pollution from Solid Fuels in Developing Countries: Knowledge, Gaps, and Data Needs. *Environmental Health Perspectives* 110 (11): 1057-1068.

^{viii} See Ezzati, Majid and Daniel M. Kammen. 2001. Indoor air pollution from biomass combustion and acute respiratory infections in Kenya: an exposure-response study. *The Lancet* 358: 619-24; Ezzati, Majid and Daniel M. Kammen. 2001. Evaluating the health benefits of transitions in household energy technologies in Kenya. *Energy Policy* 30: 815 – 826. Smith, K. R., Samet, J. M., Romieu, I., Bruce. N. 2000. Indoor Air Pollution in Developing Countries and Acute Lower Respiratory Infections in Children. *Thorax* 55: 518 - 532

^{ix} On the effectiveness of access to water and sanitation initiatives, see Center for Global Development. 2006. *Measuring Commitment to Health*. Washington D.C.; Esrey, S.A. 1996. Water, waste, and well-being: a multicountry study. *American Journal of Epidemiology* 143(6):608-623.; Esrey SA, Potash JB, Roberts L, Shiff C. 1991. Effects of improved water supply and sanitation on ascariasis, diarrhoea, dracunculiasis, hookworm infection, schistosomiasis, and trachoma. *Bulletin of the World Health Organization* 69(5): 609-621. Galiani, Sebastian, Paul Gertler, and Ernesto Schargrofsky. 2005. Water for Life: The Impact of the Privatization of Water Services on Child Mortality. *Journal of Political Economy* 113(1): 83-119. Jalan, J. and M. Ravallion. 2003. Does Piped Water Reduce Diarrhea for Children in Rural India? *Journal of Econometrics* 112: 153-173.

^x The empirical literature on secure land tenure suggests a strong link to sustainable natural resource management. See A. Cattaneo, A. 2001. Deforestation in the Brazilian Amazon: Comparing the Impacts of Macroeconomic Shocks, Land Tenure, and Technological Change. *Land Economics* 77(2): 219–40. World Bank. 2003. *Land Policies for Growth and Poverty Reduction*. Washington D.C.: World Bank.) Cross-national empirical studies

also demonstrate a strong relationship between rule of law – a close correlate of secure land tenure – and environmental protection. See Daniel Esty and Michael Porter. 2005. National environmental performance: an empirical analysis of policy results and determinants. *Environment and Development Economics* 10: 391–434; Robert T. Deacon. 1994. Deforestation and the Rule of Law in a Cross-Section of Countries. *Land Economics* 70: 414–430.

^{xi} Timothy Besley. Property Rights and Investment Incentives: Theory and Evidence from Ghana. *Journal of Political Economy* 103(5): 905–93.

^{xii} K. Otsuka, K. 2001. *Land Tenure and Natural Resource Management: A Comparative Study of Agrarian Communities in Asia and Africa*. Baltimore and London: The Johns Hopkins University Press. Nelson, G. C., V. Harris, and S. W. Stone. 2001. Deforestation, Land Use, and Property Rights: Empirical Evidence from Darien, Panama. *Land Economics* 77(2): 187–205. A. Cattaneo, A. 2001. Deforestation in the Brazilian Amazon: Comparing the Impacts of Macroeconomic Shocks, Land Tenure, and Technological Change. *Land Economics* 77(2): 219–40.

^{xiii} De Soto, Hernando. 2000. *The Mystery of Capital: Why Capitalism Triumphs in the West and Fails Everywhere Else*. New York: Basic Books. De Soto, Hernando. 1989. *The Other Path: The Invisible Revolution in the Third World*. New York: Harpercollins.