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Declining Rural Populations and the Future of Biodiversity: Missing the Forest for the Trees?

TRUMAN P. YOUNG[1]

1. INTRODUCTION

In the 1980s and 1990s, a large influx of funding from development agencies swelled the budgets of traditional conservation groups. In response, international organizations rushed to put conservation into a development context. The projects were labeled with a variety of ever-changing acronyms but were all essentially similar in philosophy.[2] Undergirding all of these efforts were two crucial but largely unsupported assertions. One was that conservation and development need not be antagonistic, and could even be synergistic. The other was that, unless it satisfied local rural economic interests, biodiversity conservation was doomed to failure.

There were some early warnings that this philosophy was poorly conceived and in the last few years this approach to conservation has been subjected to critical reappraisal,[3] both at the conceptual level and in terms

[1] Professor, Department of Plant Sciences and Center for Population Biology, University of California, Davis. E-mail: tpyoung@ucdavis.edu. The author gratefully acknowledges the help of Lynne Isbell, Corinna Riginos, Mikaela Huntzinger, Michelle Gadd, Sandy Harcourt, Dean Lee Hansen, Josh Ginsberg, Carlos Peres, Jim Cramer, and Yon Fernandez de Larrinoa.

[2] Some of them have included Integrated Conservation and Development Projects (ICDPs), Community-based Conservation (CBC), Community-based Natural Resource Management (CBNRM), and Tradition-based Natural Resource Management (TBNRM).

[3] K.E. Brandon & M. Wells, *Planning for people and parks—design dilemmas*, 20 WORLD DEV. 557–570 (1992); John G. Robinson, *The limits to caring: sustainable living and the loss of biodiversity*. 7 CONSERV. BIOL. 20–28 (1993); Truman P. Young, *Development and conservation: more on Caring*. 7 CONSERV. BIOL. 750–751 (1993); THOMAS T. STRUHSAKER, ECOLOGY OF AN AFRICAN RAINFOREST (1997); and especially JOHN F. OATES, MYTH AND REALITY IN THE RAIN FOREST: HOW CONSERVATION STRATEGIES ARE FAILING IN WEST AFRICA (1999).

of various practical problems projects have faced on the ground.[4] A recent special issue of the *Journal* contributed to this reappraisal,[5] highlighting the poor economic performance of conservation/development projects, the insensitivity of such projects to unique local conditions, and shortfalls in developing the skills necessary for greater local involvement in defining and achieving conservation and development objectives.

Many of these recent reassessments of the prevailing paradigm focus on the role integrated conservation and development projects can play as relatively short-term and low-cost strategies for improving conditions. By contrast, the purpose here is to look at conservation and development in the longer term and in the context of structural factors that inevitably constrain the success of projects, no matter how ingeniously they are conceived or how energetically they are advocated. By looking at the larger forest in which project trees are situated, I want to look further down the road and suggest the value of taking a different approach to biodiversity conservation and rural development.

It is not my purpose, here, to offer a comprehensive new recipe for conservation and development. Instead, I outline a series of propositions, supported by data, in the hope that it will encourage a further re-examination of how current policies may affect the long-term futures of rural people, rural economies, and biodiversity conservation.

I think we should begin by acknowledging that low-productivity rural ecosystems cannot produce appreciable wealth for significant numbers of people, even under the most optimistic development scenarios and whether or not these scenarios have a conservation component. Secondly, it seems to me that messages contradicting the first proposition have poisoned popular

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[4] Christopher B. Barrett & Peter Arcese, *Are ICDPs Sustainable? On The Conservation of Large Mammals in Sub-Saharan Africa*, 23 WORLD DEV. 1073–85 (1995); RANDALL KRAMER, CAREL VAN SCHAIK & JULIE JOHNSON, LAST STAND: PROTECTED AREAS AND THE DEFENSE OF TROPICAL BIODIVERSITY (1997); JOHN TERBORGH, REQUIEM FOR NATURE (1999); C.A.M. Attwell & F.P.D. Cotterill, *Postmodernism and African conservation science*, 9 BIODIV. CONSERV. 559–577 (2000); and W.M. Adams & D. Hulme, *If community conservation is the answer in Africa, what is the question?,* 35 ORYX 193–200 (2001); DAVID HULME & MARSHALL MURPHREE, AFRICAN WILDLIFE & LIVELIHOODS (2001); Alexander H. Harcourt, *Conservation in practice,* 9 EVOLUTIONARY ANTHROPOLOGY 258–265 (2000); Thomas T. Struhsaker, Paul J. Struhsaker & Kirstin S. Siex, *Conserving Africa's rain forests: problems in protected areas and possible solutions,* 123 BIOLOG'L CONSERV. 45–54 (2005).

[5] Arielle Levine & Geoffrey Wandesforde-Smith, *Wildlife markets, states, and communities in Africa: looking beyond the invisible hand*, 7 J. INT'L WILDLIFE L. & POL'Y. 135–142 (2004); Parakh N. Hoon, *Impersonal markets and personal communities: Wildlife, conservation, and development in Botswana,* 7 J. INT'L WILDLIFE L. & POL'Y. 143–160 (2004); Robin L. Turner, *Communities, wildlife conservation, and tourism-based development: can community-based nature tourism live up to its promise?,* 7 J. INT'L WILDLIFE L. & POL'Y., 161–182 (2004); Marshall Murphree, *Communal approaches to natural resource conservation in Africa: from whence and to where?,* 7 J. INT'L WILDLIFE L. & POL'Y. 203–216 (2004).

support for biodiversity reserves and diverted substantial conservation funding to ill-conceived projects. Thirdly, in some parts of the developing world rural-urban migration is already underway on such a scale that rural populations are, or soon will be, in numerical decline, even though economic opportunities in most urban areas are limited.

Given these factors, I would argue, fourthly, that the most effective way to reduce or eliminate rural poverty in the long-term is to develop truly productive and sustainable economies that are not based on rural resource extraction, and to prepare the next generation of citizens to be productive contributors to these economies. Current *in situ* rural development schemes can be valuable, but they should be viewed as short-term measures, and their benefits should be weighed against their possible costs with respect to biodiversity conservation. Fifthly, although urban economic development will create its own massive environmental problems, it can nonetheless help alleviate habitat loss, one of the main sources of biodiversity loss, through land abandonment. Even at the vastly lower population densities that would allow for more reasonable per capita incomes, low-productivity rural ecosystems can produce good incomes for only a small fraction of any country's population, and can add only a tiny fraction to national GDP. A sixth proposition, then, is that land use abandonment can have a positive impact, because it contributes to biodiversity conservation and restoration at little national cost.

Stated more succinctly, a fundamental flaw in rural development schemes and in conservation-development projects in particular, is the failure to recognize that the low-productivity lands most in need of poverty alleviation and biodiversity conservation are simply not capable of producing appreciable wealth for large numbers of people on a sustained basis. From a short-term perspective, development projects that double or quadruple some rural personal incomes are impressive, but they are not likely to be deemed sufficient by the next generation of young people in rural parts of the developing world as a basis for their own livelihoods, especially when compared to what urban areas can offer.

Let me briefly try to illustrate these ideas by considering the cases of Brazil and Kenya.

2. BRAZIL

The Amazon Basin is one of the great repositories of biodiversity on the planet. The main threat to this biodiversity is habitat degradation in the form of timber clearing and agriculture (farming and ranching). Traditional efforts to conserve biodiversity in the Amazon, and elsewhere, have been criticized for a lack of sensitivity to the poverty of rural people and to the economic

growth needs of developing nations.[6] The facts suggest, however, that neither rural poverty elimination nor national development in Brazil is likely to rely on extractive uses of resources in the Amazon.

Although rain forest ecosystems are sometimes supported by soils inherently low in nutrients and unsuitable for long-term cultivation, there are sites within the Amazon Basin characterized by richer soils. Clearly, the low-nutrient soils are not a basis for sustainable agriculture. Even higher-nutrient soils can only produce marginal incomes, however, at high rural population densities.

One widely admired example of rural development in Brazil is the Landless Workers' Movement (Movimento dos Trabalhadores Rurais Sem Terra), or MST.[7] Through a combination of social activism, cooperative action, and hard work, large numbers of desperately poor rural farmers have been able to take small parcels of relatively rich non-Amazonian land in southern Brazil and turn them into productive farms. Incomes have grown appreciably, with average annual family incomes perhaps increasing five- or six-fold by virtue of MST initiatives. Even at this elevated level, however, most incomes are well below $1,000 per household, and substantially less per capita.[8] If these farmers were able to double or triple this income in the future, it would still leave most of them with per capita incomes well below $1,000 per year. Since the poorer soils that dominate the Amazon are substantially less productive than those successfully exploited by MST, the effective level of wealth extractable from the Amazon ecosystem by farming is likely to be so low as to be intolerable in the long term for current densities of people with ever-increasing expectations.

Still, at sufficiently low population densities, agriculture can produce substantial incomes for a few individuals. This is already the case for the timber industry and agro-business in Brazil, and in other parts of the developing world. However, the number of people who can be supported at these higher incomes is a tiny fraction of the current rural population.

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[6] As exemplified in this widely-held view: "It is both futile and an insult to the poor to tell them that they must remain in poverty to protect the environment," World Commission on the Environment and Development, 1987, cited in David Hulme & Marshall Murphree, *Community conservation in Africa: an introduction,* HULME & MURPHREE, *supra* note 4, at 1–8.

[7] ANGUS LINDSAY WRIGHT & WENDY WOLFORD, TO INHERIT THE EARTH: THE LANDLESS MOVEMENT AND THE STRUGGLE FOR A NEW BRAZIL (2003).

[8] *Id*. Table 4.2 at 268. Although Wright and Wolford report that one particularly successful farmer's income of ~$1,000 per capita "is a good income in Brazil" (*id*. at 269), this statement reveals more about the desperate state of Brazilian poverty than it does about the long-term future of such agrarian development. It is also not consistent with the fact that Brazil's *per capita* GDP in 2000 was US$6,625. Similarly, in a study of sustainable traditional agriculture in Mexico, far lower incomes than this are said to "contrast favorably with . . . the official minimum wages of Mexico." Victor M. Toledo *et al*., *The multiple use of tropical forests by indigenous peoples in Mexico: a case of adaptive management,* 7 CONSERV. ECOLOGY. 9 (2003). These are both examples where increases in rural standards of living only look good in comparison to a bare minimum existence.

The same sort of analysis applies even more strongly to non-agricultural development. One of the tenets of modern conservation-development projects is that the sustainable use of native biodiversity can enhance rural incomes substantially and therefore increase the attractiveness of biodiversity conservation for local populations. In fact, the returns from small-scale extractive use of biodiversity are even more paltry than those from agriculture or forestry.[9]

A generous estimate is that the extractive use of Brazil nuts, rubber, bush meat, and other natural, non-timber products in the Amazon, for example, may yield as much as one billion dollars per year.[10] But with an estimated eight million people living in the rural Amazon, this is the equivalent of an average increase in per capita income of about $120, at most. In addition, the rates of extraction involved in these calculations appear to be ecologically unsustainable, at least for Brazil nuts.[11] There is, in addition and more generally, little evidence that extraction of wild living resources from terrestrial ecosystems contributes appreciably to national economic development.[12] The destructive Amazonian silviculture and timber trade, for example, contributed an estimated US$1.8 billion to the Brazilian economy in 2002,[13] but this accounted directly for only 0.15 percent of Brazil's GDP, or $10 per capita.

3. KENYA

African savannas, bush lands, and woodlands support the world's greatest concentrations of large mammal biodiversity. As is the case with tropical forests, these ecosystems are under threat from land conversion and degradation. There are innovative projects in African savanna ecosystems that are turning the profits of biodiversity back to local people through hunting and non-extractive eco-tourism in an attempt to integrate rural development and conservation. In theory, these biodiversity profits will make alternative land

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[9] Ricardo Godoy *et al., Valuation of consumption and sale of forest goods from a Central American rain forest*, 406 NATURE 62–63 (2000).

[10] The total value of non-timber extractive resources from all Brazilian forests was US$200,000,000 in 2002. Produção da Extração Vegetal e da Silvicultura, Instituto Brasiliero de Geografia e Estatistica (IBGE) (2003), accessed online at: http://www.ibge.gov.br/home/presidencia/noticias/pdf/27112003pevs.pdf. In addition, the bush meat extraction is estimated at 150,000 tonnes/yr. John Fa, Carlos Peres, & Jessica Meeuwig, *Bushmeat exploitation in tropical forests: an intercontinental comparison,* 16 CONSERV. BIOL. 232–237 (2002). Even allowing for a value of non-market consumption that exceeds market value by a factor of two or more, the total value of non-timber extraction from the Amazon can be liberally estimated at no more than US$1 billion/yr. *See* also Carolyn Crook & Roger Alex Clapp, *Is market-oriented forest conservation a contradiction in terms?* 25 ENVTL. CONSERV. 131–145 (1998).

[11] Carlos Peres *et al*., *Demographic threats to the sustainability of Brazil nut exploitation,* 302 SCIENCE 2112–2114 (2003).

[12] Raymond E. Gullison & Elizabeth C. Lossos, *The role of foreign debt in deforestation in Latin America*, 7 CONSERV. BIOL. 140–147 (1993).

[13] IBGE, *supra* note 10.

uses less attractive. One example occurs in the Mara Triangle in southwestern Kenya, an area with rich tourism potential adjacent to Maasai Mara National Reserve. The area supports one of the most lucrative profit-sharing programs in Africa, but also is an area under strong economic pressure to convert wildlife savannas to wheat fields.

Recent economic analyses of this and similar African semi-arid ecosystems have shown that biodiversity development through tourism can substantially increase family incomes, compared to traditional pastoralism (Table 1). Virtually all of these studies report substantial relative increases in rural income from eco-tourism, but also report resultant incomes that are still so low as to be completely insufficient in the context of long-term economic development goals.[14] Game cropping schemes emphasizing the extractive use of wildlife are similarly insufficient.[15]

Even more troubling for biodiversity conservation, the Maasai Mara analysis shows that the incomes available from converting land to wheat production are even more attractive than those available from eco-tourism (Table 1). The decade-long campaign to convince the world that these rural lands "must pay for themselves" has been heard loud and clear by the Maasai.[16] But the consequences of this doctrine for biodiversity have been devastating, as thousands of hectares of prime wildlife habitat have been converted to wheat fields.[17] Moreover, the resulting wheat production can produce per capita annual incomes of only about $250, at current local population densities (Table 1). This represents a substantial increase from traditional incomes, but it is still far below any reasonable target for long term economic development.

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[14] In a book generally laudatory of the profit-sharing benefits of eco-tourism is this blunt reality-check: "In some parts of Africa wildlife-related economic activity could be an element of a poverty-reduction strategy, but it would be disingenuous to pretend that it could form the basis for comprehensive poverty reduction even under the most favourable conditions." David Hulme & Marshall Murphree, *Community conservation as policy: promise & performance*, in HULME & MURPHREE, *supra* note 4, at 289. Other recent data similarly suggest that even aggressive tourism development in the Makuleke area of South Africa would yield only $20–40 per "beneficiary" per year. Turner, *supra* note 5.

[15] T. Holmern *et al*., *Uneconomical game cropping in a community-based conservation project outside the Serengeti National Park, Tanzania*, 36 ORYX 364–372 (2002). Even those employed by the tourist industry in Africa earn less than $1,000 per household per year. Marshall Murphree. *Community, council and client: a case study in ecotourism development from Mahenye, Zimbabwe,* in HULME & MURPHREE, *supra* note 4, at 188.

[16] This widely-held assertion appears, for example, in PETER CAPSTICK, DEATH IN THE DARK CONTINENT (1983) at 18–19: "Once again, the elemental economic rules apply, whether to the garment district of New York City or the wait-a-bit thorn of the Luangwa Valley or the Okavango Swamp: what can justify its existence stays, what can't must go, whether a skirt-manufacturing plant or a herd of impala. Sorry, I don't make the rules." Capstick fails, however, to make the equally obvious observation that Central Park in New York City exists in the middle of some of the most valuable real estate in the world precisely because, collectively, people do value some things more than short-term economic gain.

[17] Katherine Homewood *et al*., *Long-term changes in Serengeti-Mara wildebeest and land cover: Pastoralism, population, or policies?* 98 PROC. NAT'L ACAD. SCI. 12544–12549 (2001).

TABLE 1. Various Estimates of Income from Biodiversity (and Other) Uses of African Savanna Ecosystems. $/ha/yr = US dollars per hectare per year; $/hh/yr = US dollars per household per year; $/cap/yr = US dollars/capita/year

Location	Land use	$/ha/yr	$/hh/yr	$/cap/yr	Reference
Maasai Mara, Kenya	Pastoralism	2	500	~40	Thomson 2002[i]
Maasai Mara, Kenya	Ecotourism (added to above)	2	400	~35	Thomson 2002
Maasai Mara, Kenya	Farming (non-wheat)		Up to 400	Up to 40	Thomson 2002
Maasai Mara, Kenya	Leasing for wheat	10	2500	~200	Thomson 2002
Kenya	Hunting tourism	7			Hurt 2000[ii]
Laikipia, Kenya	Pastoralism	2			Heal 2000[iii]
Laikipia, Kenya	Tourism	5-30[iv]			Heal 2000
Zimbabwe	Tourism (Campfire)		12		Child 1995, Child 2000[v]
South Africa	Ranching	25			Heal 2000
South Africa	Crops	70			Heal 2000
South Africa	Tourism (Conscorp)	200-300[vi]			Heal 2000

[i]Michael Thompson & Katherine Homewood, *Entrepreneurs, elites, and exclusion in Maasailand: trends in wildlife conservation and pastoral development*, HUM. ECOL. 30, 107–138 (2002) for values of $/ha/yr and $/hh/yr. Michael Thompson, pers. comm., citing Savanna Land Use Policy Outcomes Workshop, Arusha (2000) reports household sizes of 9–14. Table 1 reports incomes for the average (non-elite) group range member in Maasai Mara. Income for the few elites in this system are up to ten times greater. This highlights a persistent additional problem with these conservation/development projects: the uneven distribution of wealth generated.

[ii]Robin Hurt and Pauline Raven *Hunting and its benefits: an overview of hunting in Africa with special reference to Tanzania* in WILDLIFE CONSERVATION BY SUSTAINABLE USE. 295–313 (Herbert .H.T Prins, Jeu, G. Grootenhuis & T.T. Dolan, eds, 2000).

[iii]Z$5,582,000 shared among 69,000 households (exchange rate Z$6.94 per US$). Geoffrey Heal, *Markets and sustainability*, in ENVIRONMENTAL LAW, THE ECONOMY AND SUSTAINABLE DEVELOPMENT, 410-437 (Richard Revesv *et al*., eds., 2000).

[iv]Heal cites Rubenstein (ECOL. APPL. 1993) as giving these monetary returns per ha from Laikipia land uses, but that paper has no such numbers.

[v]GRAHAM CHILD, WILDLIFE AND PEOPLE: THE ZIMBABWE SUCCESS (1995); Brian Child, *Making Wildlife Pay: Converting Wildlife's Comparative Advantage into Real Incentives for Having Wildlife in African Savannas. Case Studies from Zimbabwe and Zambia,* in PRINS *supra* note ii at 459-468.

[vi]This value is very high, and not confirmed from any other source.

Even the more productive parts of rural Kenya and of other parts of Africa produce very low per capita farm incomes at current rural densities.[18]

One recent analysis has estimated that with complete conversion to agricultural uses, all of "the parks, reserves and forests of Kenya could support 4.2 million Kenyans, 5.8 million livestock and 0.8 million hectares of cultivation, and generate . . . net returns of $203 m."[19] This amounts to less than $50 per capita per year for the "supported" population, or 0.7 percent of national GDP. Even this devastating hypothetical conversion of biodiversity reserves would utterly fail to meet the legitimate longer term expectations attaching to either local or national development.

Much of Kenya has less rainfall than the Mara, and will produce even less income (Table 1). In some semi-arid ecosystems in Kenya, including places where I have done field research, rural development projects and the pressures of increasing populations have resulted in the subdivision of larger properties into ever-smaller plots over the last 30 years.[20] These small holdings have proven incapable of supporting even a subsistence living, and have become net income sinks for owners who rely on non-farm income, including funds imported from urban settings.[21]

4. CONSERVATION ON A SLIPPERY SLOPE: THE RISKS OF "WILDLIFE MUST PAY ITS WAY"

It is widely held, though rarely demonstrated, that as local stakeholders profit from biodiversity they will appreciably enhance their incomes and be, therefore, more willing and more likely to conserve biodiversity. In fact, relationships between the costs and benefits of using biodiversity need to be considered at several levels of potential economic return.

On one level, the assertion is that even though the income benefits from biodiversity may not be very great they can nevertheless shift the balance of attitudes more in favor of conservation. Ideally, biodiversity income would at least cover the cost of biodiversity management and conservation, with enough left over to make at least moderate payments to local communities,

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[18] *See* Table 5 in T. S. Jayne *et al*., *Smallholder income and land distribution in Africa: implications for poverty reduction strategies*, 28 FOOD POL'Y 253–275 (2003). Charlie M. Shackleton, *Re-examining local and market-oriented use of wild species for the conservation of biodiversity,* 28 ENVTL. CONSERV. 270–278 (2001) suggests that there may be sustainable extraction of non-timber products from African forests and woodlands, but acknowledges that these will provide reasonable incomes only at far lower rural population densities than presently.

[19] Michael Norton-Griffiths & Clive Southey, *The opportunity costs of biodiversity conservation in Kenya*, 12 ECOLOGICAL. ECON. 125–129, (1997). Their estimate that this would amount to 2.8 percent of GDP is apparently due to old or faulty data. My own estimate (*infra,* text accompanying note 25) uses the 2002 GDP figure from the UN.

[20] Jayne *et al*., *supra* note 18.

[21] *Id*.

or to those in a position to influence national conservation strategies. There is the possibility also of some spillover effects to non-local businesses and the national economy in general.

In some respects this represents a healthy approach to conservation. The locally run Narok County Council, for example, has been getting substantial income from Maasai Mara National Reserve for decades and, although it has been plagued by some mismanagement and skewed income distribution,[22] it is potentially a good illustration of wildlife paying its way. The same thing could conceivably happen elsewhere. Even in these sorts of circumstances, however, the limited returns from sustainable extractive use can lead down a slippery slope where strong pressures are created to pursue uses that are more financially rewarding but unsustainable, or are inconsistent with biodiversity conservation.[23]

On another level, the notion that biodiversity must pay its way means that it has to grapple with opportunity costs. To be successful, in other words, biodiversity conservation has to return more income than alternative economic uses of the land. And on this score the evidence is far from compelling, as suggested by the analysis in the previous section and the data in Table 1. One difficulty here is the encouragement provided to treat the economic value of biodiversity as the ultimate measure of the value of land, ecosystems, and species. As is evident from the example of wheat production in the Mara triangle, people are getting this message, and the results are not good for biodiversity. Similarly, for many forest areas around the world the greatest economic return is clear-cutting, followed by judicious investment of the proceeds. When the indigenous Kayapo and Lanacondones peoples of the Amazon, for example, were given control over their land, they put it to profitable use, selling off the logging rights to destructive timber concessions.[24] In addition, the message that biodiversity "must pay its way" often assumes indigenous people are incapable of valuing things for anything other than their economic return; a view that is both patronizing and demonstrably untrue.[25]

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[22] Chris Southgate 1998, quoted in Hulme & Murphree, *supra* note 4, at 289.

[23] Holmern, *supra* note 15, and Carolyn Crook & Roger Alex Clapp, *Ecosystem structure, economic cycles and market-oriented conservation*, 28 ENVTL. CONSERV. 194–198 (2001).

[24] Kramer, van Schaik & Johnson, *supra* note 4. For a similar example with Native Americans, see Kirk Dombrowski, *The praxis of indigenism and Alaska native timber politics*, 104 AM. ANTHROPOL. 1062–1073 (2002).

[25] Young, *supra* note 3, and in *Biodiversity Issues*, 265 SCIENCE 1151 (1994); William Newmark, *et al*. *Conservation attitudes of local people living adjacent to five protected areas in Tanzania*, 63 BIOLOG'L CONSERV. 177–183 (1993); Brian Czech, P.R. Krausman, & R. Borkhataria, *Social construction, political power, and the allocation of benefits to endangered species,* 12 CONSERV. BIOL. 213–235 (1998); H. Bauer, *Local perceptions of Waza National Park, northern Cameroon,* 30 ENVTL. CONSERV. 175–181 (2003); Ranjith Bandara & Clem Tisdell, *Comparison of rural and urban attitudes to the conservation of Asian elephants in Sri Lanka: empirical evidence*. 110 BIOLOG'L CONSERV. 327–342 (2003).

And at still a third level, biodiversity uses would have to be sufficiently successful to be a productive part of substantial and sustainable rural development. This means that the yields from using biodiversity have to be large enough not just to increase some local incomes but also to help nations lift their rural populations out of poverty. This outcome is highly unlikely. Further, conservation-development projects have made unrealistic promises of wealth from biodiversity. When these expectations are not met, as they cannot be, the slippery slope leads local populations to feel cheated and to distrust conservation in all its forms, perhaps even more than they did before "enlightened" conservation and development policies were put in place. Certainly, I have seen this effect in Kenya, and I suspect that comparable disillusionment is more widespread. This unfortunate outcome is particularly ironic. One of the reasons development agencies got involved with conservation in the first place was that traditional conservation education programs had successfully elevated biodiversity awareness and sympathy worldwide, without resorting to ill-conceived notions of short-term economic gain.

5. DEMOGRAPHIC AND LAND-USE ABANDONMENT OF LOW-PRODUCTIVITY RURAL LANDSCAPES

Quite apart from my own assessment of the future of rural economies, the rural populations of developing countries are already voting with their feet. Throughout the developing world, urban populations are growing faster than rural populations, despite the greater birth rates of the latter. In a 2000 report from the United Nations Population Division,[26] not one country had a rural population growing as fast as its urban population. This is due to massive rural-urban migration,[27] and it has reached such rates in some countries that their rural populations are declining in absolute terms.

The UN has also made projections of future rural and urban population growth. In Brazil, home of most of the Amazon rain forest, over 80 percent of the population is urban. The national population growth rate is 1.2 percent per year, but the rural population is *declining* at 1.4 percent per year (Figure 1). This decline began more than 30 years ago,[28] and is occurring despite higher birth rates in the rural population. Every year, a number of people equivalent to all those rural births, plus an additional half million, leave the

[26] UNITED NATIONS, WORLD URBANIZATION PROSPECTS: THE 2001 REVISION (2002), accessed online at http://www.un.org/esa/population/publications/wup2001/wup2001dh.pdf

[27] M. O'Meara, *Exploring a new vision for cities*, in STATE OF THE WORLD 1999, 133–150 (L. Starke, ed., 1999).

[28] But *see* Table 2 in Cynthia S. Simmons *et al.*, *The changing dynamics of land conflict in the Brazilian Amazon: The rural-urban complex and its environmental implications,* 6 URBAN ECOSYSTEMS 99–121 (2002).

countryside for Brazilian cities. On the face of it, this ought to be encouraging news for the rain forest, and perhaps we should be finding ways to make it even more attractive. A conservation policy that spends millions of dollars to make extractive rural lifestyles marginally more attractive in financial terms may do little more than delay this migration and the conservation gains that could follow in its train.

In Indonesia, the numbers are comparable to those for Brazil, with the rural population declining by an estimated 800,000 a year (Figure 1). Even in Africa, where rural-urban migration is slower than on other continents, over half the nations have rural population growth rates of less than one percent per year, with many of these projected to have declining rural populations within the next decade. South Africa already has a declining rural population, projected to decline by a further 40 percent over the next 30 years (Figure 1).[29] All of this is happening in a world undergoing rapid population stabilization.[30] Indeed, if we were to build aggressively on the falling birth rates of the last 15 years, we could begin to imagine a world with a substantially reduced total population. Many see substantial decreases in global population as our only long-term hope.

The data I highlight here represent demographic land abandonment, a process that also involves consolidation of holdings on more productive lands, initially with little change in land use. The most productive lands will likely stay in agriculture for the foreseeable future. On the low-productivity land, however, demographic land abandonment can lead to abandonment of extractive land uses, with concomitant opportunities for ecological restoration and biodiversity conservation.

In semi-arid Laikipia, Kenya, there are signs that long-term trends of land subdivision and agricultural conversion are beginning to reverse. In Costa Rica, large-scale land abandonment has been essential to the progress of a major tropical forest restoration project.[31] And in Puerto Rico, abandonment of rural land has increased forest cover from less than ten to more than 40 percent of surface area in the last six decades.[32] In the Amazon, one prominent

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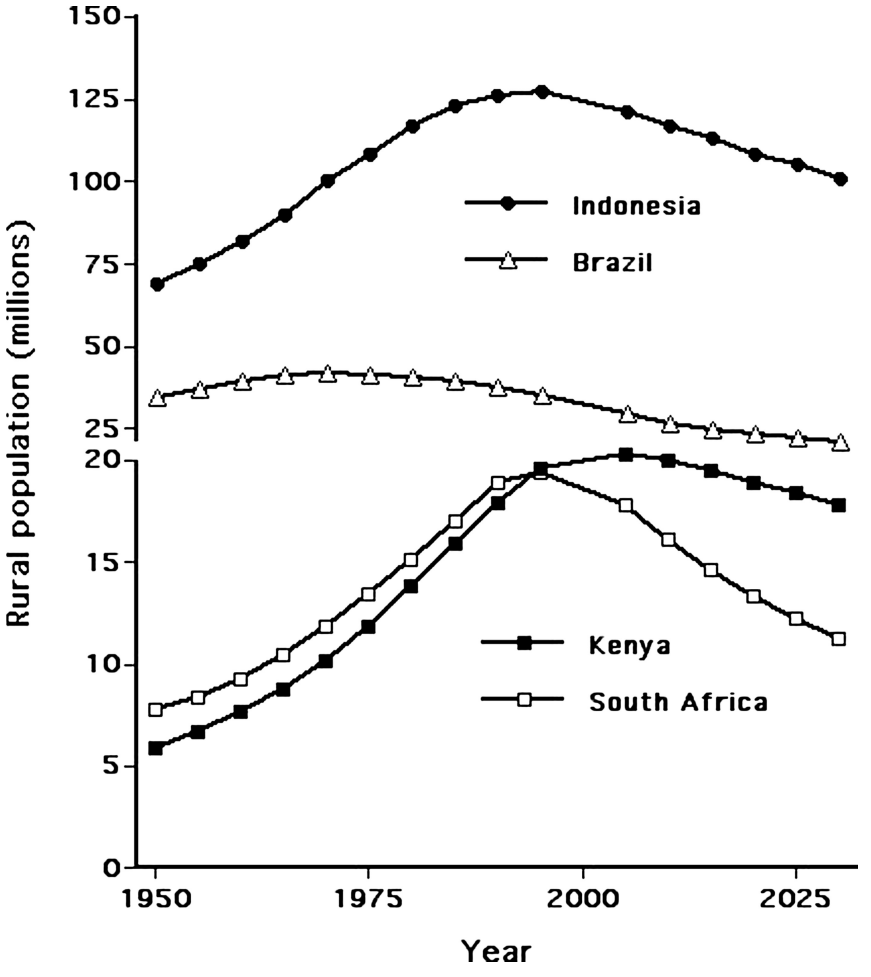
[29] This decline will be partly due to HIV/AIDS, but even without the epidemic the rural population of South Africa would decline substantially.

[30] The latest figures from the UN (*supra* note 26) suggest that world population will peak in the middle of the coming century at 9–10 billion people, and then begin to gradually decline.

[31] "The Rincon Rainforest project could never have been done 20–25 years ago, when it was covered with colonists, now all gone." Dan Janzen, *pers. comm.*, October 2004. *See* also http://janzen.sas.upenn.edu/RR/rincon_rainforest.htm. This land is not part of the Payment for Environmental Services program (PES), which pays land owners not to cut trees. Instead, it is land sold for conservation uses by landowners no longer willing to scratch out a living in these marginal ecosystems. Most of them had abandoned the land months or years earlier. Dan Janzen, *pers. comm.,* September 2005.

[32] H. Ricardo Grau, *The ecological consequences of socioeconomic and land-use changes in postagricultural Puerto Rico*, 53 BIOSCIENCE 1159–1168 (2003).

FIGURE 1. Past and Projected Rural Populations of Some Developing Countries with Important Biodiversity Areas. Note the two different scales of the Y-axis. These four countries are projected to have rural populations that decline by 13–42% over the next generation. Data were generated from the United Nations Population Information Network webpage: http://esa.un.org/unpp/



biodiversity project looking at the effects of the isolation of forest fragments has seen the agricultural land between the experimental fragments revert to secondary forest on a large scale.[33] This is part of a worldwide trend in which the abandonment of tropical lands previously converted from forest to agriculture is occurring on a spatial scale similar to and even exceeding

[33] Rob. O. Bierregaard, Jr. & C. Gascon. *The Biological Dynamics of Forest Fragments Project: Overview and history of a long-term conservation project,* in LESSONS FROM AMAZONIA: THE ECOLOGY AND CONSERVATION OF A FRAGMENTED FOREST 5–12 (R. O. Bierregaard, *et al*., eds., 2002).

the extent of deforestation.[34] The fact that this reversion to secondary forest is happening while catastrophic net losses of primary tropical forest habitat continue underscores just how wasteful our uses of tropical forest resources are, overall.[35]

Rural land abandonment seems to me to be exciting news for conservation, although it has received scant attention in the relevant professional literature.[36] Agricultural land abandonment has also been a significant process in Europe and North America. But in the developing world, including some of the world's most important biodiversity areas, it is just beginning in earnest. The ecosystems regenerating on these abandoned lands will not, of course, replace the ecosystems that were lost, at least not for many, many years. And it would be far better not to lose the original habitats at all. Nonetheless, abandoned land represents a substantial and significant, albeit so far underappreciated, opportunity for restoration and conservation.[37]

6. IMPLICATIONS FOR CONSERVATION/DEVELOPMENT POLICY

To the extent that the preceding analysis has value, it points to a change in the way we think about rural poverty alleviation and biodiversity conservation. At the very least, it suggests that current rural development programs, even when economically effective in the short-term, need to be put in the context of the larger and longer term structural forces that are reshaping the rural parts of the developing world. Since current conservation and development policies can make things worse rather than better, and unnecessarily so, I propose we consider developing conservation and development policies for the coming century along the following lines.

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[34] R. A. Houghton, *The worldwide extent of land-use change,* 44 BIOSCIENCE 305–315 (1994); David Lamb, *et al*. *Rejoining habitat fragments: restoring degraded rainforest lands,* in TROPICAL FOREST REMNANTS: ECOLOGY, MANAGEMENT, AND CONSERVATION OF FRAGMENTED COMMUNITIES (W. F. Laurance & R. O. Bierregaard, eds., 1997). However, lower rates of tropical land abandonment are reported by Eric F. Lambin *et al*. *Dynamics of land-use and land-cover change in tropical regions,* 28 ANN. REV. ENV'T RESOURCES 205–241 (2003).

[35] William F. Laurance, *A crisis in the making: responses of Amazonian forests to land use and climate change*, 13 TRENDS ECOLOGY & EVOLUTION 411–416 (1998); Laurance & Bierregaard, *supra* note 34.

[36] For examples, *see* D. Klooster, *Forest transitions in Mexico: institutions and forests in a globalized countryside*, 55 PROF. GEOGRAPHER 227–237 (2003); T. K. Rudel *et al., A tropical forest transition? Agricultural change, out-migration, and secondary forests in the Ecuadorian Amazon*, 92 ANNALS ASS'N AM. GEOGRAPHERS 87–102 (2002), and references cited therein. For an argument much like that presented here, *see* Gaoming Jiang *et al., Potential for restoration of degraded steppe in the Xilingol Biosphere Reserve through urbanization,* 30 ENVTL. CONSERV. 304–310 (2003).

[37] Truman Young, *Restoration ecology and conservation biology*, 92 BIOLOG'L CONSERV. 73–83 (2000); Andrew Dobson *et al., Hopes for the future: restoration ecology and conservation biology*, 277 SCIENCE 515–522 (1997); Suzanne Milton *et al*., *Economic incentives for restoring natural capital in southern African rangelands*, 1 FRONTIERS ECOLOGY ENV'T 247–254 (2003).

A useful first assumption would be that urban development, no matter how difficult, is an essential part of rural poverty alleviation. There is simply not enough potential income from extractive rural economies to support the levels of per capita income that are sufficient and appropriate for significant long-term development in much of the developing world. Secondly, preparing young people in rural areas for urban jobs, and improving education generally, may be the most effective *in situ* strategy for alleviating rural poverty,[38] for reducing tropical habitat loss,[39] and for the all-important goal of reducing birth rates.[40]

Thirdly, we ought to recognize that while rural subsidies and assistance may partially alleviate rural poverty, they also encourage people to stay on low-productivity lands, or move there, when they might otherwise leave. In the Great Plains of the U. S., such policies have retarded habitat restoration and discouraged emigration to places with better jobs.[41] If, as has been suggested, immigration encouraged by biodiversity and development projects in the tropics is bad for conservation,[42] there seems at least a possibility that encouraging emigration would be good.[43] I am not advocating "forcing people off the land." Many of them are already anxious to leave. I do ask, however, that we pay much more careful attention to the unintended consequences of the rural conservation and development policies we now pursue. And fourthly, once extractive resource degradation is understood as a strategy that can only be temporary and yield minimal economic returns, it will be easier to justify biodiversity conservation through more traditional means, such as education and enforcement.

7. CAVEATS AND CONCLUSION

This analysis is circumscribed by several caveats. First, there are clearly instances in which the sustainable extractive or non-extractive use of biodiversity

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[38] "Education, which played an important role in Asia by allowing households to exit agriculture into more lucrative off-farm jobs, is relatively low in most areas of rural Africa by world standards. Investments in rural education and communications are likely to become increasingly important to facilitate structural transformation." Jayne, *supra* note 18, at 272.

[39] Ricardo Godoy, *A comparative study of education and tropical deforestation among lowland Bolivian Amerindians: forest values, environmental externality, and school subsidies*, 49 ECON. DEV. CULTURAL CHANGE 555–574 (2001).

[40] Mamba Murthi, *Fertility change in Asia and Africa,* 30 WORLD DEV. 1769–1778 (2002).

[41] DANIEL S. LICHT, ECOLOGY AND ECONOMICS OF THE GREAT PLAINS (1997); D. Popper & F. Popper, *The Great Plains: checkered past, hopeful future*, 9 FORUM APPLIED RES. PUB. POL'Y 89–100 (1994).

[42] P. Scholte, *Immigration: A potential time bomb under the integration of conservation and development*, 32 AMBIO 58–64 (2003)

[43] A key difference between discouraging immigration and encouraging emigration is that the former is more likely to maintain local ethnic and cultural identity and traditions. Clearly, one of the issues in a rapidly urbanizing world is the fate of such traditions and identities. Moradewun A. Adejunmobi, *pers. comm*. 2004.

can be made substantially profitable, compared to other economic options for land and for people. And, if some of the more rosy projections in Table 1 are realistic, then the locally successful economic pathway to biodiversity conservation can also be a part of a larger national development strategy. It seems most unlikely, however, that this type of profitability can be extended over extensive areas of low-productivity land, or bring large numbers of people into a middle class.

Second, rural population declines are not uniform, and their effects not fully apparent in the short term. The UN projects that overall rural population growth in the developing world will be relatively flat over the next 20 years, with declines in some countries countered by increases in others.[44] In addition, it is possible that much of the rural-urban migration is occurring from the more productive rural lands, where small-holders have access to the educational and health resources that allow their children to have greater urban employment prospects, and that the marginally productive lands are experiencing relatively less of this rural population decline. In any case, policies that encourage urban economic development and rural-urban migration, and even greater consequent declines in birth rates, are likely to increase projected rates of rural population decline worldwide.[45] And some of this change could occur in a local context where rural ecosystems are relegated, at least partly, to biodiversity restoration and conservation.

Third, industrial and post-industrial economic growth in the developing world has proven more difficult to achieve than many had imagined, and there is no guarantee that urban economies will provide substantially greater per capita incomes for the working poor than rural economies, although past trends suggest that they will. Current inequalities in income, social injustice, and sluggish economic growth all hamper the alleviation of poverty in the developing world.

Lastly, large-scale economic growth in urban economies produces environmental costs, many of which will replace rural habitat degradation as leading causes of biodiversity loss. Already, increased urban demands for charcoal, bush meat, and timber are threatening species and ecosystems far from cities.[46] Local urbanization in the rural matrix may even increase land

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[44] Interactive data are available online at the *United Nations Population Information Network,* accessible at http://www.un.org/popin/

[45] Licht, *supra* note 41, has made the same point for the Great Plains ecosystem in the United States, where there is a similar resistance on the part of the aging resident farmers, and the public in general, to the idea that these ecosystems are better off being abandoned. But just as is beginning to happen in the developing world, the younger generations on the Great Plains are already making their decision to abandon the farming lifestyle and often the land itself.

[46] "A question still being debated is whether urban land use is more efficient than rural land use, and therefore whether urbanization saves land for nature." Lambin *et al*., *supra* note 34, at 213. *See* also S. N. Talhouk, R. Zurayk, & S. Khuri, *Conservation of the coniferous forests of Lebanon: past, present and future prospects,* 35 ORYX 206–215 (2001).

conflicts.[47] Air and water pollution, excess environmental nitrogen, and global warming will also number among the consequences of such development.[48] But these urban economies will grow, and grow massively, over the coming decades, and we will have to deal with their environmental impacts in any case, or, catastrophically, fail to do so. No amount of romanticizing about the low environmental impact of simple, usually meaning desperately poor, agrarian economies will change these facts. The bottom line is that, although urban development represents an opportunity to ameliorate some of the major causes of biodiversity loss, and specifically rural habitat conversion, it is not a panacea for either poverty or biodiversity loss.

I am definitely *not* suggesting that rural populations be forcibly removed to urban settings. Rural-urban migration is already underway, is likely to increase, and can be made more beneficial for both the emigrants and biodiversity if we plan appropriately. I am also not suggesting that all human presence is bad for biodiversity. I do think, however, that a sustainable human presence in many rural parts of the developing world is only attainable at far lower rural population densities than currently exist there, especially if our ambition is that these populations should attain substantially higher standards of living than they now enjoy. The world cannot sustainably support ten billion people living as consumptively as Americans. We need to find innovative ways to satisfy pent-up demand for higher standards of living that leave far shallower footprints in the sand than wealthy nations currently do.[49]

Most importantly, I am not suggesting that a utopia of bright clean cities will rise in the developing world. Initially, the urbanization of rural populations, which is already well under way, will be crowded, dirty, destructive, unjust, and even murderous. The scale of these problems may even be causing some governments actively to discourage urban migration, at least in the short run.[50] It will be one of the monumental tasks of the coming century to guide this process to a sustainable and desirable endpoint, and we will not succeed if we continue to miss the forest for the trees.

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[47] Simmons *et al*., *supra* note 28.

[48] Michael L. McKinney, *Urbanization, biodiversity, and conservation,* 52 BIOSCIENCE 883–890 (2002); Peter M. Vitousek, *Beyond global warming: ecology and global change*, 75 ECOLOGY 1861–1876 (1994).

[49] I thank Lynne Isbell for this. I also recognize that rural lifestyles have many non-monetary values and that many urban dwellers would seek to return to rural settings, if they could afford to. In the modern world, there are increasing opportunities for non-extractive incomes that do not require urban living, and can be realized in rural settings.

[50] Jim Cramer, *pers. comm*. 2004.