Environmental Damage and the Mismeasure of Poverty and Inequality: Applications to Indonesia and the Philippines

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Environmental and natural resource accounting has heretofore mostly been conducted in a national income accounting context. Yet income inequality and poverty statistics are often exceedingly optimistic absent an adequate accounting of environmental losses. Following Khan's study on Bangladesh (1997), this paper adjusts for inequality and poverty measures to account for estimated environmental damage, in this case for Indonesia and the Philippines. Unlike Khan, the paper uses actual data on environmental losses published by the World Resources Institute, and tests for different assumptions regarding the within-population distribution of the environmental damage. Results show that both Gini coefficients and poverty rates increase in each country after the adjustments. The study provides further evidence that growth in gross domestic product (GDP) is not always an adequate poverty reduction measure and, more importantly, calls into question the so-called "environment–equity trade-off", implying that pro-environment policies have the potential to produce "win-win" outcomes in less developed countries such as Indonesia and the Philippines.

I. INTRODUCTION

Much recent work on the relationship between economic growth and environmental quality focuses on the economic causes of environmental damage. The environmental Kuznets curve hypothesis (EKC)—which posits an inverted-U relationship between income per capita and environmental degradation or pollution—is perhaps the best example (see, e.g., Grossman and Krueger 1993 1995; Selden and Song 1994; Shafik 1994).[1] While criticisms of the EKC abound, they are also mostly preoccupied with determinants of environmental

[1]The EKC label comes from the original Kuznets curve, based on a seminal article by Kuznets (1955) on the relationship between economic growth and income inequality. The only similarity between the two functions is their appearance: Kuznets, in fact, had little to say about environmental matters.

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damage (e.g., Ekins 1997, Torras and Boyce 1998). Much less attention has heretofore been devoted to the economic consequences of environmental damage.

Beyond the question of whether income growth improves environmental conditions, severe and persistent environmental damage might stifle growth and therefore countervail against eventual improvements in general environmental quality. Moreover, even if the magnitude of GDP growth were not visibly affected by the damage, its "quality" might be, since certain types of environmental damage diminish the ability of growth to combat absolute or relative deprivation in society.[2] A negative feedback loop might subsequently be created since, as argued by Boyce (1994), environmental damage is likely to be greater in cases where society is more polarized.

This observation marks the starting point of this paper. It studies the effect of estimated environmental damage on income inequality and poverty indicators, examining data from Indonesia and the Philippines. Following Khan's study on Bangladesh (1997), inequality and poverty indexes are adjusted based on environmental damage in each country, but unlike Khan, the paper employs published quantitative estimates of environmental damage and conducts a scenario analysis allowing for alternative assumptions regarding the within-population distribution of the social cost associated with the damage.

The environmental estimates are based on different natural resource groups in each country and as such cannot be directly compared. Moreover, the inequality statistics are measured differently for each of the two countries and both the inequality and poverty numbers are available for only a few years. These limitations, nevertheless, do not detract from the paper's general conclusion that measures of deprivation are more severe after one accounts for environmental damage.

While the conclusion might seem axiomatic, the study reveals the significant extent to which environmental damage can limit the effectiveness of GDP growth in reducing deprivation, especially in the case of Indonesia. Insofar as the pervasiveness of poverty or inequality adversely affects environmental outcomes—independent of income—the finding may conflict with earlier optimistic EKC studies. Yet on a brighter note, the results imply that pro-environment policies can improve national well-being not only for the obvious environmental benefits that would be preserved, but also because of the inequality and poverty reduction that is likely to be a consequence of such action. Countries like Indonesia and the Philippines are not, in other words, condemned to suffer continued pernicious environmental effects of economic growth.

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[2]Kakwani and Pernia (2000), for example, distinguish among growth outcomes according to the degree to which they are "pro-poor." Dasgupta and Maler (1990), among others, describe a possible feedback effect in which growth that is *not* pro-poor, i.e., immiserizing, in turn further worsens environmental conditions.

II. ENVIRONMENTAL DAMAGE, INEQUALITY, AND POVERTY

Growing concern among economists over the state of the natural environment has added a dimension to one of the fundamental problems in the field, the timeless controversy over whether economic policy should emphasize growth at the short-run expense of a just income distribution or vice-versa. Environmental damage is widely believed to influence both growth and distributional equity, and some believe that damage beyond a certain threshold is inimical to both objectives.[3] Daly (1992, 1996); Hediger (1999, 2000); and Stewen (1998), among others, refer to a new "triad" of interrelated policy objectives that countries face today, adding "optimal economic scale"—corresponding to the threshold of human impact on the natural environment—to efficiency (growth) and distributional equity.

Most research into links among these three dimensions has looked into the effects of growth, poverty, and inequality on the environment rather than vice-versa. To the extent that the reverse causal link is considered, it is generally given secondary importance. The literature on the EKC is no exception, since EKC studies seldom consider the reverse link—that is, the feedback effect of environment on economic growth.[4] The paper emphasizes this under-remarked link, but rather than focus on the effects of environmental damage on growth as such, the paper emphasizes its effects on the ability of growth to reduce poverty and inequality.

GDP growth accompanied by reduced welfare for some in the population almost certainly implies worsening inequality, but it is not clear to what extent. More important, it is conceivable that all segments of the population gain in absolute terms—viz, that poverty is reduced despite an increase in inequality.[5] Yet

[3]For consistency the term "environmental damage" is used to stand as well for environmental degradation, ecological damage, even resource depletion and the like, since the differences among these are not particularly pertinent to the present discussion.

[4]Among EKC critics, Arrow et al. (1995) are among the few exceptions. Others do not for the most part broach the subject. In a survey on the EKC, for example, Ekins (1997) finds a number of problems with earlier studies, but most relating to methodological inconsistencies rather than theory. Others focus on other nonincome factors such as literacy, political rights, and income inequality (Torras and Boyce 1998); absence or presence of democracy (Neumayer 2002); and power inequality (Boyce et al. 1999)—again, possible causes of environmental change, not consequences.

[5]The relationship between growth, poverty, and inequality is complex, and has been researched to a considerable extent. Concerned with the manner in which GDP growth sometimes conceals worsening poverty, Ahluwalia and Chenery (1974) were among the first to employ an alternative accounting scheme that places greater weight on the income of poorer groups. Eastwood and Lipton (2000) consider the degree to which existing inequality impacts on the ability of growth to reduce poverty, and Foster and Szekely (2000) note how conclusions on this matter are sensitive to the manner in which well-being—especially well-being for

such an outcome might be less likely if we took into account the effects of environmental damage on individual well-being. Khan (1997) makes this allowance in estimating adjusted measures of inequality and poverty for Bangladesh, concluding that both are considerably understated by the conventional (unadjusted) statistics.

What is novel about Khan's approach is that his environmental adjustments are applied to inequality and poverty statistics instead of to national income accounts. While far from being universally embraced, adjusting income accounts for such damage is a more well established practice. As economists grow increasingly aware about the finiteness of the natural environment, the need to treat natural resource stocks—if not the environment in general—as a form of capital is gradually making its way into the mainstream (e.g., El Serafy and Lutz 1990, World Bank 1994).

Khan justifies the adjustments to the inequality and poverty indexes on grounds that environmental damage increases defensive expenditures individuals face, such as increased health care costs resulting from pollution-induced illness. Despite receiving the same money income, therefore, such individuals experience a lower level of well-being than in the absence of the environmental damage. Additionally, Dasgupta and Maler (1990) note that for people in agrarian economies not far above subsistence, natural resources are often complementary to other goods and services so that depletion of the natural resource base creates destitution even in the face of increasing prosperity at the aggregate (national) level. For both reasons we can expect the inequality and poverty picture to be more stark than suggested by conventional statistics, especially when the country in question suffers substantial environmental damage.

Since the Gini coefficient of inequality is derived from the income shares of different percentile groups in a population, it is not an exceedingly difficult matter to revise the coefficient so that it accounts for a given monetary assessment of environmental damage. Khan notes that assuming there is an income distribution vector α and an estimated environmental damage estimate of x monetary units per person, we can derive a new vector β by subtracting x from each of the individual incomes. For a given individual earning α_i (i = 1,2,3...n), his "real" income becomes $\beta_i = \alpha_i - x$. Gini indexes can be computed for the original vector $\alpha = (\alpha_1, \alpha_2, \alpha_3 \ldots \alpha_n)$ as well as for the "environmentally adjusted" vector $\beta = (\beta_1, \beta_2, \beta_3 \ldots \beta_n)$. Even though according to the framework everyone is presumed to lose equal amounts in absolute terms, the poor lose more relative to their income. It therefore stands to reason that $G(\beta)$ should always exceed $G(\alpha)$—in other words, that accounting for environmental damage should result in

the poor—is defined, concluding that growth in general *is* good for the poor, albeit not as good as for better- off individuals.

income being distributed more unequally than in the absence of the modification. As noted, Khan confirms this to be the case for Bangladesh.[6]

Poverty is similarly underestimated if we fail to account for environmental damage. In terms of the headcount index (percentage of the population below the poverty line), it is clear that subtracting some amount x from everyone's income can only increase this percentage since everyone is made poorer. The same is true of the poverty gap measure, which accounts for the severity as well as the incidence of poverty:

$$\text{poverty gap} = \frac{1}{n}\sum_{(i=1)}^{p}\left(G_i / z\right), \tag{1}$$

where:
n = total population
p = number of poor
z = poverty line
G_i = income shortfall of ith individual.

The number of poor (p) increases for the reason given above and G_i increases or at least remains the same for all i if we subtract some constant x from each individual's income. If p increases and G_i is nondecreasing for all i, the poverty gap must increase. Khan examines the FGT index that accounts for caloric (as opposed to income) deprivation. Although the FGT differs slightly from the headcount and poverty gap measures, they are related, and the conclusions to be drawn from the results of the environmental damage adjustments are essentially the same.

I have thus far not elaborated on the assumption that environmental damage is distributed equally across the population (i.e., the claim that everyone suffers the same damage "*x*" in our earlier example). Khan employs this "equality of misfortune" assumption (EMA) on a fortiori grounds. In other words, he sees that the implications of his study would only be strengthened if one adopted the less conservative assumption that the poor on average shoulder more of the environmental damage than the rich not only relative to income, but in absolute terms (call it the "regressive impacts" assumption or RIA).

Yet much recent work in ecological economics and political ecology lends credence to this latter assumption, emphasizing not only income distribution, but

[6]Even the environmentally adjusted Gini may understate inequality. Persky and Tam (1990) note that perceptions of well-being are influenced by local status, i.e., one's place in the income distribution of one's reference group. Their empirical study on the United States shows that a Gini index modified to reflect local status showed much less improvement from 1949 to 1979 than did the standard Gini.

what Martinez-Alier (1995) terms "ecological distribution"—i.e., how the social cost associated with environmental damage is distributed across the population. Torras (2001) demonstrates that regressive ecological distribution often results in well-being decreases for poorer segments of society that would not always be visible absent an independent ecological distribution accounting. Dasgupta (1995) and Martinez-Alier (1993), among others, claim that in many cases the poor suffer disproportionately from environmental damage.[7] It therefore seems remiss to not at least consider the implications of RIA to the present study.

In the analysis to follow, adjusted and nonadjusted Gini and poverty indexes are compared for Indonesia and the Philippines under both EMA and RIA. In applying RIA, following Torras (1999), it is assumed that environmental damage is suffered in inverse proportion to the income share. In other words, if the richest quintile in the population earn fifty percent of national income and the poorest 3 percent, it is assumed that the first groups suffers 3 percent of the environmental damage and the latter group, one-half of it. While distributing the damage in this manner does not connote superiority to other options, at present no data exist to suggest more favorable alternatives.

III. APPLICATION TO INDONESIA AND THE PHILIPPINES

In his paper on Bangladesh, Khan (1997) does not provide actual data on the monetary value of environmental damage in the country, in all likelihood because such data are not available. Undeterred, he conducts a scenario analysis in which he adjusts the country's Gini and poverty indexes for different hypothetical damage levels (relative to GDP) and compares among the outcomes, finding that conventional Gini and poverty indexes consistently understate inequality and poverty. Such hypothetical scenarios are not necessary here, however, since environmental damage estimates already exist for Indonesia and the Philippines.

The relevant data are compiled by researchers from the World Resources Institute (WRI). Repetto et al. (1989) conduct an in-depth natural resource accounting study on Indonesia, and Cruz and Repetto (1992) do similarly for the Philippines. For both studies the monetary estimates are exclusively for resource depletion, and even though for consistency, the paper will continue to refer to these as the "'environmental damage" estimates, they do not account for lost or diminished ecological benefits such as climate regulation, nutrient cycling, etc. The WRI studies only considered squandered economic benefits associated with marketable raw materials. Absent estimates of these other losses, even the adjusted Gini and poverty indexes presented in this paper will underestimate the

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[7]Martinez-Alier is especially careful to emphasize that this is entirely related to the poverty of the affected population rather than any diminished preference for environmental quality on their part.

extent of inequality and poverty. The conclusions of the study therefore apply a fortiori to similar cases where ecological damage value estimates are available.

The WRI studies in each case report estimated losses in the three dominant natural resource sectors, and adjust GDP accordingly. Tables 1 and 2 present estimates of these losses for Indonesia and the Philippines, along with the total loss in relation to GDP for that year. The relative losses for both countries for the most part far exceed any of the damage-GDP ratios considered by Khan in his Bangladesh study—0.5, 1, and 2 percent—though, in fairness to the author, he did note in his study that his assumptions were "fairly conservative." Relative to GDP, damages are much higher in Indonesia than in the Philippines, save a few years (1971 and 1974) in which significant petroleum deposits were discovered, resulting in a sizable "negative damage."

We should at this point note three more caveats. First, it might come as a surprise that environmental damage relative to GDP comes out much higher for Indonesia than for the Philippines. Yet in most cases the majority of the environmental damage is not "damage" in the ecological sense, rather foregone income associated with petroleum extraction as estimated by Repetto et al. (1989). Since petroleum did not figure into the Philippine study, it may be misleading to compare the two countries. Related to this, it is not obvious that natural resource depletion always reduces well-being—especially that of the poor—in the same way that some types of ecological damage might. To the extent that exhaustion of a country's petroleum reserves hurts the poor, it is likely to be from the ensuing ecological damage, rather than from squandered future oil revenues. Finally, the method employed by Repetto et al. (1989) of counting discoveries as income or "negative damage" is contestable to say the least, but space limitations prevent a further discussion of this issue.

Table 1: **Monetary Assessment of Resource Depletion in Indonesia**
(billion rupiah, 1973 prices)

Year	GDP	Petroleum Sector Loss	Forestry Sector Loss	Soil Sector Loss	Total Loss	As Percent of GDP
1971	5,545	-1,527	312	89	-1,126	-20.3
1972	6,607	-337	354	83	100	1.6
1973	6,753	-407	591	95	279	4.1
1974	7,296	-3,228	533	90	-2,605	-35.7
1975	7,631	787	249	85	1,121	14.7
1976	8,156	187	423	74	684	8.4
1977	8,882	1,225	405	81	1,711	19.3
1978	9,567	1,117	401	89	1,607	16.8
1979	10,165	1,200	946	73	2,219	21.8
1980	11,169	1,633	965	65	2,663	23.8
1981	12,055	1,552	595	68	2,215	18.4
1982	12,325	1,158	551	55	1,764	14.3
1983	12,842	1,825	974	71	2,870	22.3
1984	13,520	1,765	493	76	2,334	17.3

Source: Repetto et al. (1989).

Table 2: **Monetary Assessment of Resource Depletion in the Philippines**
(million Philippine pesos, 1990 prices)

Year	GDP	Forestry Sector Loss	Soil Sector Loss	Fisheries Sector Loss	Total Loss	As Percent of GDP
1970	51,014	2,508	139	234	2,881	5.6
1971	53,672	2,476	151	234	2,861	5.3
1972	56,464	2,119	163	234	2,516	4.5
1973	60,202	2,577	176	234	2,987	5.0
1974	64,187	2,858	188	234	3,280	5.1
1975	68,437	2,599	200	234	3,033	4.4
1976	73,922	2,435	212	234	2,881	3.9
1977	78,467	2,824	224	234	3,282	4.2
1978	82,784	2,628	236	234	3,098	3.7
1979	87,962	3,341	249	234	3,824	4.3
1980	92,568	4,217	261	234	4,712	5.1
1981	96,207	3,427	273	234	3,934	4.1
1982	98,999	2,502	285	234	3,021	3.1
1983	99,921	2,596	297	234	3,127	3.1
1984	93,927	2,296	309	234	2,839	3.0
1985	89,904	2,422	322	0	2,744	3.1
1986	91,287	2,369	334	0	2,703	3.0
1987	95,948	2,649	346	0	2,995	3.1

Source: Cruz and Repetto (1992).

Indonesia experienced consistent and strong growth over the years covered in the WRI study. The annual GDP growth rate was 8.2 percent for 1971-1977, 6.2 percent for 1977-1984, and 7.1 percent for 1971-1984. Even per capita income growth was impressive, with the respective rates being 5.6, 4.1, and 4.8 percent. For the Philippines the story is more varied, with strong growth during the 1970s followed by weak growth (and contraction in per capita terms) during the 1980s. Divided into subperiods, GDP growth was 6.1 percent (3.5 percent per capita) from 1970-1980 but only 0.5 percent (-2.0 percent per capita) from 1980-1987. Nevertheless, growth for 1970-1987 was not trivial at 3.8 percent (1.2 percent per capita).

Inequality statistics, in the form of Gini coefficients, were obtained from the respective country statistical yearbooks for a variety of years. Since Gini coefficients are generally not estimated with any regularity, they were only available for a few of the years covered in the WRI reports: five for Indonesia and only three for the Philippines, so only these were considered in the analysis. Data on poverty (World Bank 1999) were even more scant, with national statistics for the two countries being available only for two years, 1975 and 1985. Fortunately, the years roughly correspond to the beginning and ending years in the WRI studies, enabling the drawing of reasonable conclusions about the respective periods.

Perhaps not surprisingly, GDP growth for the most part led to inequality and poverty reductions for both countries if conclusions are based on conventional indicators. Yet as expected, the conventional statistics overstate the magnitude of the reductions. As shown below (Table 3), the Gini index remains quite high for each country after accounting for the environmental damage, especially in the RIA case. The Gini increases observed after accounting for the environmental damage are caused by the fact that the poor lose more than the rich in relative terms, even under EMA. Inequality is even more severe under RIA, since here the poor lose more consequent to the damage adjustment not only relatively but absolutely.

Table 3: **Income Inequality, Conventional and Adjusted**

(A) Indonesia

Year	Gini Coefficient	Change	Equality of Misfortune Adjustment	Change	Regressive Impact Adjustment	Change
1976	.346	—	.378	—	.409	—
1978	.386	.040	.464	.086	.542	.133
1980	.356	-.030	.468	.004	.579	.037
1981	.337	-.019	.413	-.055	.489	-.090
1984	.324	-.013	.392	-.021	.459	-.030

(B) Philippines

Year	Gini Coefficient	Change	Equality of Misfortune Adjustment	Change	Regressive Impact Adjustment	Change
1971	.494	—	.522	—	.550	—
1985	.461	-.033	.475	.047	.490	-.060
1987	.457	-.004	.472	.003	.487	-.003

Sources: Indonesian and Philippines *Statistical Yearbooks*, various years.

Even though Indonesia's Gini coefficient increased from 1976 to 1978 (until 1980 for environmentally adjusted Gini), in more recent years the trend was an unambiguously inequality-reducing one. The magnitude of reduction in the Gini coefficient was actually greater when environmentally adjusted, and greatest in the RIA case. Still, compared with the conventional Gini index, the EMA-adjusted and RIA-adjusted Ginis remained substantially higher throughout, even exceeding 0.5 in a few of the RIA cases. The Philippine Gini coefficient shows only decreases over the three years for which the data are available. As with Indonesia, the magnitude of the drop is magnified upon adjusting for environmental damage—and again most so in the RIA case—but only from 1971 through 1985. Otherwise it makes little difference. Gini for the Philippines also remained at an exceedingly high level, although unlike in the Indonesian case this held even without environmental damage adjustments.

Yet as in the case of the environmental damage estimates, one should exercise caution in comparing the Indonesian and Philippine Gini coefficients. While Indonesia bases its Gini on inequality of expenditures, the Philippines's Gini reflects income inequality, which is invariably higher than consumption inequality. One could always "adjust" the consumption-based measure (multiplying it by a factor of, say, 2), but this was avoided, for two reasons. First is that whatever factor chosen would necessarily be somewhat arbitrary. Second and more important, this study is not meant to compare cross-country outcomes (since it would anyhow require remarkable consistency in the data) but attempts to compare, for each country, conventional measures of deprivation with environmentally adjusted ones.

Again judging from the conventional statistics, Indonesia's rapid growth contributed significantly to poverty reduction, halving the poverty rate from 1975 to 1985 and reducing the poverty gap by almost two thirds (Table 4a). Growth in the Philippines, in contrast, reduced poverty far more modestly, only achieving approximately ten percent reductions in both indexes (Table 4b). Yet, after factoring in environmental damage, poverty is shown to be higher in both years, for both countries, and under either distribution assumption.

The headcount index for Indonesia is higher under EMA than RIA in both 1975 and 1985. What makes this unusual outcome possible is the fact that only the poorest income quintile loses more in absolute terms under RIA than EMA, since this group suffers the lion's share of the damage under the "inverse income weights" scheme discussed earlier. Consequently, some individuals near the median of the income scale who were "made poor" with the EMA environmental damage adjustment were not under the RIA scenario. The outcome contradicts Khan's (1997) a fortiori assertion that more regressive environmental impacts necessarily result in conventional statistics understating the respective problems to a greater degree than under EMA.

Table 4: **Comparison of Conventional and Depletion-Adjusted Poverty Measures**

(A) Indonesia

	Year	Number of Poor (millions)	Headcount Index*	Poverty Gap**
Conventional	1975	87.2	64.3	23.7
	1985	52.8	32.2	8.5
Percent reduction			49.9	64.1
Equality of Misfortune	1975	96.0	70.8	34.9
	1985	87.6	53.4	22.8
Percent reduction			24.6	34.7
Regressive Impact	1975	93.3	68.8	45.5
	1985	83.5	50.9	34.3
Percent reduction			26.0	24.6

(B) Philippines

	Year	Number of Poor (millions)	Headcount Index*	Poverty Gap**
Conventional	1975	15.4	35.7	10.6
	1985	17.7	32.4	9.2
Percent reduction			9.2	13.2
Equality of Misfortune	1975	17.0	39.3	14.5
	1985	19.3	35.3	11.8
Percent reduction			10.2	18.6
Regressive Impact	1975	18.3	42.4	21.1
	1985	22.3	40.8	16.4
Percent reduction			3.8	22.3

*Percentage of the population that is poor.
**Mean shortfall divided by poverty line.

For Indonesia the percentage reductions for both indexes are much lower after factoring in environmental damage. Instead of the headcount index declining by 50 percent from 1975 to 1985, it drops by only about a quarter under either type of adjustment assumption. In the case of the poverty gap, the declines are only about one third under EMA and one fourth under RIA, compared to two thirds without adjustments. The Philippine case offers a stark contrast. While the conventional, EMA, and RIA headcount index reductions are not too dissimilar in percentage terms, reductions in the poverty gap are larger in both environmentally adjusted cases: 18.6 and 22.3 percent for EMA and RIA, respectively, compared with only 13.2 percent for conventional. This is explained by a significantly lower rate of resource depletion relative to GDP over the latter half of the 1970-1987 period, causing the difference between the conventional and adjusted figures to shrink from 1975 to 1985. The environmentally adjusted poverty gap remains higher under either assumption, however.

IV. DISCUSSION AND POLICY IMPLICATIONS

Environmental damage assessments have an important place in economic measurement, not only in the national income accounts, but also in the inequality and poverty statistics. As shown, and consistent with Khan's earlier conclusions, conventional statistics may understate the degree of deprivation in society, often substantially. Contrary to earlier accounts, GDP growth in Indonesia and the Philippines has generated at best modest reductions in inequality and poverty. The regressive impacts assumption (RIA) in most cases increases the degree to which the statistics are understated although, contrary to Khan's claim, assuming a regressive distribution of environmental damage does not necessarily worsen the poverty picture.

Whether the damage-induced exacerbation of inequality and poverty in turn implies further environmental damage is still very much an open question. The same can be said for its implications on continued GDP growth. Both questions deserve continued attention and further research.

Procurement of more reliable data is also important. The limited reliability of and frequent intercountry incompatibility among Gini coefficients is well known. Yet data limitations do not lessen the paper's conclusion in any way, since the principal argument relates to comparisons of alternative measurement approaches, not intercountry comparisons. Indeed, refinements in data collection techniques are unlikely to alter the findings in any appreciable manner. Environmental damage estimates values are also often inconsistent, and in any case very subjective. Fortunately there is already an enormous literature on the subject attempting to devise more objective estimation criteria. Estimates of the lost ecosystem benefits—as opposed to marketable raw materials—are especially important. Their omission from this study implies that in all likelihood, even the adjusted figures underestimate deprivation in Indonesia and the Philippines.

Since present as well as future generations are hurt by unrestrained degradation of the natural environment, the most important policy implication to be drawn from this study is that greater environmental protection should be pursued not only for its own sake but also to avoid a worsening of inequality and poverty in society. Rather than there existing an "equity–environment trade-off", the reverse appears to hold. Also, contrary to the first stage in the environmental Kuznets curve hypothesis, continued environmental deterioration is not inevitable in LDCs such as Indonesia or the Philippines if a “pro-environment” policy is implemented. To the extent that less poverty and more equality themselves contribute to less environmental damage and more rapid and sustainable growth, more aggressive environmental protection today has the potential to generate a “win-win” outcome for society and future generations.

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