UNITED NATIONS ENVIRONMENT PROGRAMME
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ENVIRONMENTAL IMPACTS OF STRUCTURAL ADJUSTMENT PROGRAMMES: SYNTHESIS AND RECOMMENDATIONS

by

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Preface

This document was prepared as a background paper for discussion at the UNEP/World Bank Workshop on Environmental Impacts of Structural Adjustment Programmes (SAPs), held in New York on 20-21 March 1995. SAPs are packages of economic reforms specifically designed to enhance the recovery of economies in crises. A stable, equitable and rational macroeconomic framework is a necessary but not sufficient condition for sustainable developrnent. Economic and structural reforms are urgently needed, therefore, to promote sustainable development. However, concern about environmental impacts of SAPs and other economy-wide policies has grown out of the realization of the interdependence between economy and environment.

A key aim of SAPs and related economic policy reforms is a more efficient allocation of productive resources within the economy, often characterized by increased production of tradable goods. This can have different environmental and distributional implications, depending on the underlying market and policy conditions affecting these sectors.

Efficient management of natural resources is essential for sustainable development and poverty alleviation. However, SAPs and other economy-wide policies that have been designed to address macroeconomic development have largely ignored environmental impacts, particularly the effects of such policies on the incentives and disincentives for efficient resource use and environmental protection. This omission has meant that SAPs and other economy-wide policies may be counter-productive in meeting their stated objectives, and in some cases even exacerbate other market and policy failures.

In most countries, SAPs have had two major effects. First, there has been a strong substitution effect in favour of exports. Second, there has been a strong distributional effect through change in both public expenditures and relative prices. The second effect has exacerbated poverty at least in the short and medium term. Both effects may result in increased environmental damage. This is the case, for example, in low income countries dependent on natural resource exports which lack (a) appropriate property rights in environmental resources and (b) adequate environmental protection measures. The main causes of environmental degradation are to be found in market failures and policy distortions, but the severity of the consequences of these failures can vary depending on the distributional and other effects of SAPs. Every effort must be made to redesign existing adjustment programmes to address social and environmental issues. Future adjustment programmes must seek to integrate social and environmental objectives into their core logic.

This paper explores the extent to which economy-wide policies have revolved or at least, evolved, to realign themselves with the concept of sustainable development through *ex ante* integration with social and environmental policies. The paper surveys the findings of studies that attempted *ex post* assessment of the environmental impacts of structural adjustment programmes and the way in which they have been addressed. It also examines the progress of successive structural adjustment programmes in incorporating environmental concerns and, ultimately, in attempting holistic integration of economic, social, and environmental policies.

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ABBREVIATIONS & ACRONYMS

CGE	- computable general equilibrium (model)
GATT	- General Agreement on Tariffs and Trade
HIID	- Harvard Institute for International Development
IMF	- International Monetary Fund
LDC	- less developed country
LP	- linear programming (model)
MDB	- multilateral development bank
MDC	- more developed country
NGO	- non-governmental organization
OECD	- Organization for Economic Cooperation and Development
PE	- partial equilibrium (model)
PIRG	- Public Interest Research Group
PPP	- polluter pays principle
SAL	- structural adjustment loan
SAM	- social accounting matrix
SAP	- structural adjustment programme
SECAL	- sectoral adjustment loan
WB	- World Bank
WWF	- World Wildlife Fund

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Introduction

Concern about environmental impacts of structural adjustment programmes and other economy-wide policies grew out of the realization of the interdependence between economy and environment. This issue began to gather momentum in the late 1980s and culminated with the 1992 UN Conference in Rio on Environment and Development. Following the Rio Conference, the debate moved one step further, from assessment of the passive impact of development policies on the environment and, of possible mitigation measures, to their dynamic interaction and the need for holistic integration of economy and environment, or what has come to be known as sustainable development.

Since structural adjustment policies predated the concept of sustainable development as the objective of development assistance and policy, it is of considerable interest to explore the extent to which economy-wide policies have revolved or, at least, evolved to realign themselves with the concept of sustainable development through *ex ante* integration with social and environmental policies. This is the objective of the present paper. The inquiry will be carried out on two levels: first, by surveying the findings of studies that attempted *ex post* assessment of the environmental impacts of structural adjustment programmes and the way in which they have been addressed; second, by examining the progress of successive structural adjustment programmes in incorporating environmental concerns and, ultimately, in attempting holistic integration of economic, social, and environmental policies.

1.1 Scope of Study

The field of inquiry that falls under the rubric of "Structural Adjustment and the Environment" is a young and complex one. First, it involves the intersection of both social and natural sciences (i.e., economics, public policy, international development, biology, ecology, etc.), and existing studies often lean heavily on a single perspective at the expense of holistic, interdependent interpretations. Second, less than a decade has passed since a quorum of researchers began focusing their analyses specifically on the environmental effects of structural adjustment in developing countries; thus the coverage of existing studies specific to this area is incomplete, both geographically and in terms of natural resource factors examined. Third, the boundaries between this subject area and other, perhaps more well-researched, areas are fuzzy or broadly overlapping. Examples include debt and environment, trade and environment, poverty and environment, and sustainable development in general. The potential depth and breadth of information *relevant to* structural adjustment and the environment is immense, and the following discourse attempts to narrow the focus to the environmental implications of the economic reforms in structural adjustment and stabilization programmes. Related materials are drawn into the analysis where there appear to be significant gaps in the directly relevant literature.

1.2 Overview of Findings

The major question explored in this paper is: "What are the environmental effects of stabilization and structural adjustment programmes?" Implicit in this question is a desire for policy makers and advisors to provide the appropriate recommendations to ensure a healthy environment and economy for the nation undertaking structural reform. Unfortunately, the only concise answer to the question would be that it depends on a number of factors, thus implying that economic policy makers cannot apply a simple, standardized set of reforms to any given economy and expect predictable, consistent, or even beneficial results.

Consider an analogous question, outside the economics and policy realm: "What are the overall health effects of a diet and exercise programmes?" Assuming a person in average shape, a few pounds overweight, with an adequate but imperfect diet, and with a commitment to the programmes, an attentive counselor can provide the correct nutritional and exercise advice to enhance the subject's health and well-being. But if the subject's condition differs from the assumptions, perhaps because of chronic back problems, chemical abuse, obesity, malnourishment, special dietary needs, or, most importantly, a lack of commitment to wellness, the same nutritional and exercise regimen could fail, yield mixed and unpredictable results, or even kill the subject.

The findings of this study are comparable. Given an economy with more or less efficient (or at least existent and reasonably functioning) markets, infrastructure and institutions; some fiscal difficulties and distortions; a solid, if somewhat degraded, resource base; and the political and social will for reform, a fairly standard recipe of temporary demand reduction, price correction, and trade liberalization should promote sustainable development. However, less developed countries (LDCs) in particular may exhibit conditions contrary to the theoretical assumptions underlying structural reform packages: poor infrastructure and undeveloped institutions; insecure property rights; non-enforcement of contracts; severely degraded natural resources (and hence little margin for error in their use); non-existent or extremely thin and uncompetitive markets; grossly inadequate legal and institutional resources unable to implement even the most basic reforms; or a lack of commitment to economic reform. Thus, macroeconomic reform that is subject to any or all of these complexities may have unpredictable and mixed effects, or may even threaten economic growth and environmental integrity for the future.

2. Structural Adjustment Programmes

2.1 Objectives and Instruments

A combination of long-standing domestic policy distortions and the adverse external conditions of the 1970s (oil shocks, deteriorating terms of trade, debt crisis, and world recession) created severe macroeconomic and structural problems for developing countries ranging from aggregate supply-demand imbalances to high unemployment and rapid inflation to a shortage of foreign exchange and growing budget deficits. In response to this untenable situation, stabilization and structural adjustment programmes were implemented in many developing countries with financial and technical support from international development and financial institutions such as the World Bank and the International Monetary Fund (IMF). The stabilization programmes usually supported by the IMF had short-term, macroeconomic objectives such as reduction in balance of payment deficits, reduction of inflation, and reduction in government budget deficits. The structural adjustment programmes focused primarily on long-term objectives such as the diversification of the production base, improved efficiency and increased competition, a shift towards a market system and rapid economic growth. Over time the distinction between stabilization and structural adjustment has become more blurred as the IMF, World Bank, regional banks, and even bilateral aid agencies collaborated in pursuing a mixture of objectives. While stabilization and sectoral adjustment loans (SALs) have supported economy-wide reforms, a third kind of policy-based lending, sectoral adjustment loans (SECALs), was provided in support of sectoral reform.

The principal instruments of stabilization and adjustment have been currency devaluation, monetary discipline, reduction of public spending, price reforms, trade liberalization, reduction of subsidies, privatization of public enterprises, wage restraints, and institutional reforms, among others.

2.2 Assumptions and Economic Outcomes

There are several implicit assumptions in the design and implementation of structural adjustment programmes. It is assumed that markets exist and would function fairly well when policy-introduced distortions are removed. At a minimum it is assumed that even if markets do not exist for a large set of products, the preconditions and foundations for the emergence of markets do exist. After all, strengthening and more efficient operation of markets is a major objective of the structural reform process. This assumption turned out to be valid in some regions (e.g. Southeast Asia) but seriously flawed in others (e.g. sub-Saharan Africa). Specifically, secure property rights and enforcement of contracts, two fundamental pre-conditions for the emergence and efficient operation of markets, are seriously lagging in much of sub-Saharan Africa. Another key assumption is that the country undergoing crisis and in dire need of reform and adjustment has the political and social will to undertake the austerity measures prescribed and to stick to the reforms, despite short-term social and political costs, in exchange for long-term economic benefits. In a number of countries, especially in Africa, the political, economic, and social horizons have been so short that the costs of adjustment loom too large and immediate, while the benefits seem small and distant.

As a rule, where governments were already planning reforms and structural adjustment, external financial and technical support has found fertile ground and did produce the economic outcomes that were envisaged, albeit with significant social and environmental by-products that were not foreseen. This was clearly the case in countries such as Thailand, Pakistan, and Morocco. On the other hand, in countries where the political will was absent, the institutions weak, and the time horizons short, structural adjustment loans were viewed as sources of the financial resources needed to respond to the fiscal crisis, while the stipulations were resented and the reforms were not consistently followed, resulting in economic outcomes which were neither planned nor envisaged. The poor performance of structural adjustment programmes in much of sub-Saharan Africa is due to the combined effect of implicit assumptions about markets, institutions, and governments that turned out to be contrary to reality.

3. The Evolution of Social and Environmental Concerns in Structural Adjustment

An inquiry into the environmental impacts of structural and sectoral adjustment policies and programmes is a perfectly reasonable exercise in the post-Rio era of recognized economy-environment interdependence and sustainable development ethic. It was not always so. When structural adjustment programmes first began in the late-1970s and early 1980s as a coherent and identifiable set of economic policies or policy and loan packages, the environment was not even an issue. Not only was environmental protection and management a very low priority (if a priority at all), but no intersection, significant linkage, or spillover between the "purely" economic policy world of structural adjustment and the natural world was envisaged. Structural adjustment was macro and economic; the environment was micro and non-economic. Economic policies *were* used to address economic problems; environmental policies *could be* used to address environmental problems, if it was deemed necessary. The idea that certain development projects such as dams and roads may have significant environmental impacts was

beginning to gain credibility among development circles, but the idea that macroeconomic and structural adjustment policies may also have significant and often more pronounced environmental impacts wasn't just novel, it was alien to economic policy makers and development experts. It was in this spirit of a dichotomous world of pure macroeconomic and structural adjustment that the early adjustment programmes were designed and implemented. This was Stage I, the stage of *neglect* (see Table 1).

By the mid-1980s, the social impacts of structural adjustment programmes began to assert themselves as private demand and public expenditure reduction and other austerity measures had more pronounced impact on the poor and other vulnerable socio-economic groups. It was not that the structural adjustment policies were not accomplishing the economic benefits they had promised, but that the distribution of the short-term costs and long-term benefits was such that those with the lowest incomes and highest rates of time preferences were hit the hardest. For those at the margin of survival, a small rise in prices or fall in social services made the difference between survival and starvation, regardless of the necessity and long-term benefits of structural adjustment. Thus, the first wave of criticism came from social groups and development NGOs concerned with the social impacts of adjustment programmes. This is Stage II, the stage of *social consciousness*, during which the social impacts of structural adjustment were explicitly recognized though not yet acted on.

Concern about environmental impacts of adjustment programmes followed on the heels of the social concerns but did not relate to them. It came from domestic and international environmental NGOs which observed that the growth of output and exports stimulated by adjustment policies such as trade liberalization was associated (or at least coincided) with accelerated resource depletion, especially deforestation and increased pollution. Furthermore, the reduction in public environmental expenditures, as part of the deficit-reduction measures, led to reduced enforcement of environmental regulations and a slow-down in reforestation projects, waste treatment facilities, etc.

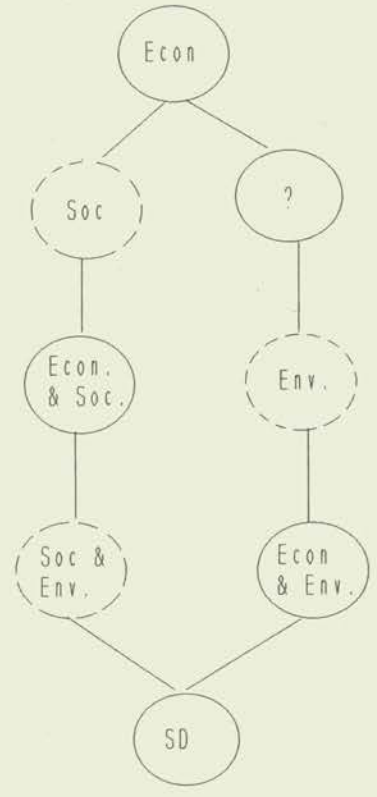
After a brief period of denial, the proponents of structural adjustment programmes admitted the potentially harmful effects of these programmes on the environment but they pointed out: (a) that the objectives of these policies and programmes were not environmental protection or resource management, but rather macroeconomic stabilization and realignment of the fundamentals of the economy with the new realities of the domestic and world markets to promote economic growth; (b) that structural adjustment programmes have several positive environmental impacts (even if not consciously designed to bring them about) through the stability and economic efficiency that they promote (for example, reduction of energy subsidies reduces energy use and environmental pollution); (c) that one cannot pursue several objectives with the same instrument and that structural adjustment is too blunt an instrument for pursuing environmental objectives (which were still seen as micro and largely non-economic); and (d) that any negative environmental impacts can be mitigated concurrently or *ex post* with appropriate environmental policies which are parallel to, not integral or even part of the structural adjustment policies. This third stage is that of *environmental consciousness* during which environmental impacts were recognized but not acted on.

While both governments and multilateral development institutions, respectively, have been incorporating environmental provisions and conditions in new adjustment programmes since the late 1980s, it was not until after the Rio Conference and the worldwide acceptance of the concept of sustainable development that the need for integration of economic and environmental policies was accepted as part of the development orthodoxy. In practice, however, environmental and sustainability concerns remained as add-ons or complementary and

compensatory policies rather than becoming fully integrated into macroeconomic and structural adjustment policies. This is the stage of *complementary policies* (Stage IV) and is as far as the integration of environmental concerns into structural adjustment programmes has evolved.

The fifth and final stage holistic integration of environmental and economic policies in a sustainable development framework still remains an ideal that eludes structural and sectoral adjustment programmes, as it eludes economic and development policies in general. However, at least one positive sign of further progress exists: the recognition of the interrelationship between the social and environmental impacts of structural adjustment programmes: failure to address the short-term social impacts of structural adjustment (poverty, unemployment and inequity) may lead to second-generation environmental problems of forest encroachment and damage to fragile ecosystems.

Table 1. The Evolution of Environmental and Social Concerns in Structural Adjustment Programs: Five Stages on the Road from Neglect to Integration

Stage	Time period	Progress in incorporating social and environmental concerns in structural adjustment	From pure economic objectives to sustainable development
Stage I	Up to early 1980s	Neglect of social and environmental impacts	
Stage II	Mid 1980s	Social consciousness (social impacts recognized)	
Stage III	Late 1980s	Environmental consciousness (environmental impacts recognized; social concerns incorporated)	
Stage IV	Early 1990s	Complementary and compensatory policies incorporated (to mitigate social & environ. impacts)	
Stage V	By the year 2000?	Holistic integration of economic, social and environ. policies in a sustainable development framework	

Broken-lined circles: recognition but no action.
Solid-lined circles: action
SD: sustainable development

4. Linking Structural Adjustment and Environment

The links between structural adjustment and the environment are not immediately obvious but complex, multifaceted, and generally indirect. The intervening variables include economic stability and interest rates, growth and structural shifts, employment and distribution, property rights and resource pricing. Furthermore, to establish the linkage it is necessary to quantify and value environmental changes and to establish causal relationships with economic policy changes that are introduced by structural adjustment programmes.

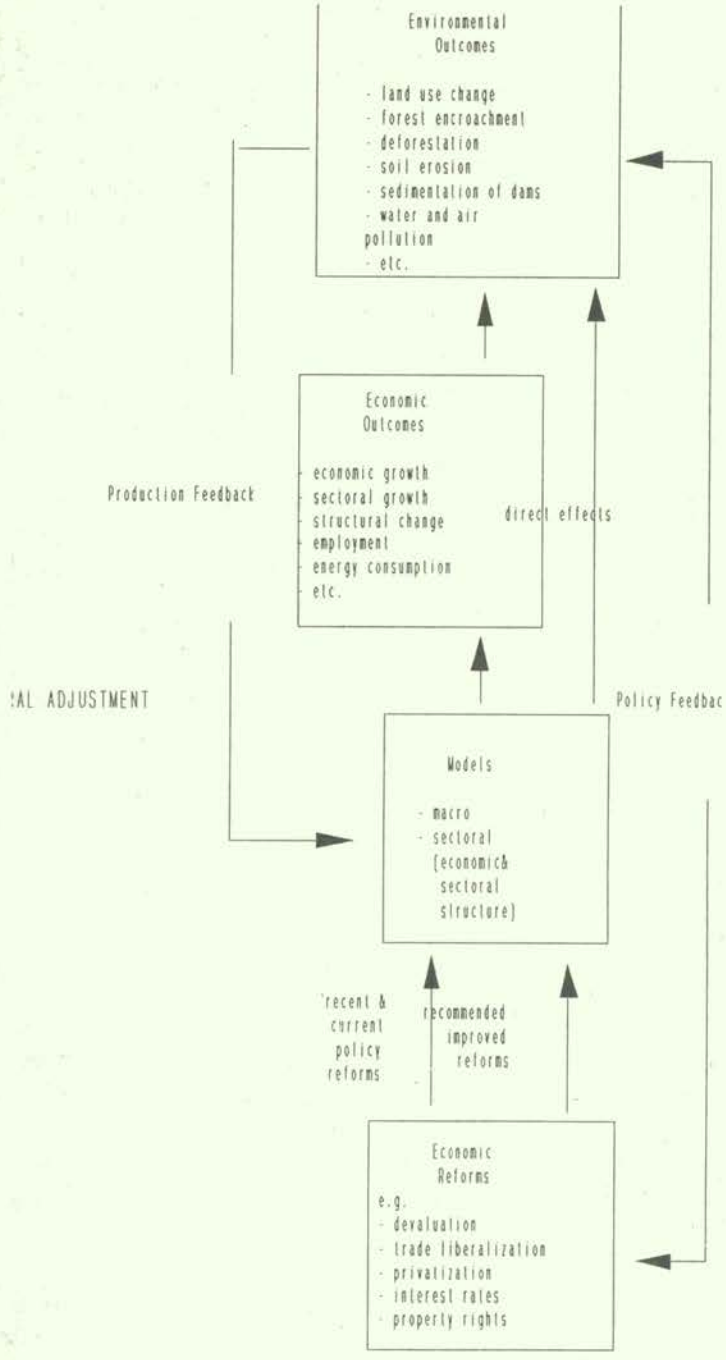
A "with-and-without" rather than a "before-and-after" framework is needed to weed out the effects of unrelated trends, policies, and external shocks that have nothing to do with structural adjustment policies except by temporal coincidence or spurious association. Since the environment is impacted through general economic, ecological, and technological interdependence between activities, through intersectoral spill overs as well as price and income effects, determining the environmental impacts of structural adjustment requires a general equilibrium framework with two-way feedbacks—from economy to environment and vice versa (see Figure 1). This is not an easy task and, barring a few exceptions, one which has not been done. Most studies that sought to establish and quantitatively assess the linkage between structural adjustment policies and the environment have used a partial equilibrium framework without intersectoral linkage, income effects, or two-way feedbacks. While this partial equilibrium approach is made necessary by the lack of data (e.g. environmental accounting matrices are rare), the consequence is that the results of such studies are under- or overestimates and, in some cases, in the reverse direction of what a more general equilibrium analysis would have yielded.

A further issue concerning the linkage between structural adjustment and the environment has to do with the implementation gap. Since structural adjustment policy prescriptions and conditionalities are rarely observed as agreed upon or intended, it is often not clear whether the identified environmental impacts are due to the prescribed policies or to their incomplete implementation. This is particularly important since structural adjustment policies are designed as a package of complementary, compensatory, and mutually reinforcing policies. A partial, selective, or incomplete implementation may result in greater or smaller environmental impacts than the full package of policies depending upon which parts were dropped or weren't fully implemented. Similarly, failing to follow the prescribed sequence of policy reforms may result in radically different results than those intended or anticipated. For example, if improved security of property rights was intended to take place before trade liberalization, but was postponed because of institutional delays, the affects of trade liberalization on deforestation and natural resource management will be different than those anticipated.

While there are serious difficulties in both anticipating, and *ex post* tracing through and attributing the environmental impacts of structural adjustment policies, the problems with most adjustment programmes (especially the earlier ones) have been (1) the failure to consider such effects at all, and (2) the tendency to make implicit assumptions about their likely significance and mitigation by non-existent or poorly enforced environmental policies. For example, a recent study by HIID/WWF of five countries (El Salvador, Jamaica, Pakistan, Venezuela, and Vietnam) concluded that in none of the countries studied had the environmental impacts of the reform programmes been considered in the design or implementation of the reforms not even when consideration of environmental impacts might have provided additional justification for the reforms (e.g. in the case of reducing fertilizer and pesticide subsidies). SAL I (1991) in El Salvador did not make a single reference to the environment. The first explicit reference occurred in the appraisal report for SAL II in September 1993. In Venezuela and Jamaica the

structural adjustment programmes contained no explicit supposition as to their likely impacts on the environment in contrast to their explicit consideration of the social impacts and the provision for compensatory social programmes. In the case of Pakistan, while the environmental impacts of reforms were equally ignored, World Bank documents related to structural adjustment programmes acknowledged the limited objectives of adjustment programmes and called for compensatory policies in the social and environmental areas (Markandya, Panayotou and Vincent, 1991).

In conclusion, environmental concerns have not played a major role in either domestic economic reforms or official development assistance; the implicit assumption being that environmental impacts are either minimal or can be cushioned by supplementary or parallel environmental policies, even though the latter are only slowly being implemented and even more slowly (or selectively) being enforced. Another very damaging implicit assumption in many structural adjustment programmes relating both to economic and environmental outcomes is that secure property rights over resources are either in place or do not matter. Important exceptions do exist, however, such as the US$30 million side loan provided to Thailand by the World Bank to undertake cadastral surveys and land titling in support of the structural adjustment programmes of the early 1980s.


Environmental
Outcomes
- land use change
- forest encroachment
- deforestation
- soil erosion
- sedimentation of dams
- water and air
pollution
- etc.
Economic
Outcomes
- economic growth
- sectoral growth
- structural change
- employment
- energy consumption
- etc.
Production Feedback
direct effects
!AL ADJUSTMENT
Policy Feedbac
Models
- macro
- sectoral
(economic&
sectoral
structure)
'recent &
current
policy
reforms
recommended
improved
reforms
Economic
Reforms
e.g.
- devaluation
- trade liberalization
- privatization
- interest rates
- property rights

5. The State of Knowledge

Much of the non-economic literature recounts disastrous environmental side-effects from structural adjustment programmes (SAPs), including deforestation, increased pollution, soil erosion and general overexploitation of non-renewable and renewable resources resulting from export expansion, reduction in government spending, and marginilization of certain sections of society. Much economic analysis also recognizes these trends, but avoids such unambiguous attribution.

During the 1992 International NGO Forum on World Bank and IMF Adjustment Lending, three major themes emerged concerning the impact of SAPs on natural resources: (1) Stabilization measures usually exacerbated economic conditions for the poorest segments of society, forcing them to overexploit natural resources that were available to them and to move on to marginal lands. (2) The trade liberalization of structural adjustments and orientation toward the primary commodity export sector has increased rates of deforestation, soil erosion, desertification, and water pollution. (3) Sharp reductions in public expenditure have often entailed a shrinking of the environmental protection apparatus and institutions — including enforcement capacity. Together, these trends imply environmental deterioration within and outside formal markets and a public sector that is handicapped to address the problem.

Many economists argue that, while all the above trends may have been documented, the causality is inconclusive and the generalization unwarranted. In addition, the large body of evidence showing positive environmental impacts from economic reform is entirely ignored. These successes include the removal of perverse subsidies that encourage waste or intensive resource exploitation, the introduction of stability which promotes sound resource management and lower marginal time preference, higher living standards which may entail increased demand for environmental quality, and general efficiency and technology gains.

In order to sort out these divergent viewpoints, it is necessary to review the body of case studies and analyses that focus on the above issues. We have attempted to gather together a fairly representative group of studies for this purpose. They are included in the attached bibliography, along with some background information on adjustment programmes and LDC environmental problems in general. In addition, a matrix of case studies is provided, which attempts to break down the temporal, geographical, methodological, economic, and environmental components of each study. The findings are summarized generally and selectively (conclusions not directly relevant to this inquiry are omitted).

The foci, assumptions, and conclusions of the selected studies are widely divergent and sometimes at odds, but some general relationships (covered in the next section) and commonalities emerge. From the work thus far completed, we have distilled four key observations:

1) Market reforms should increase efficiency of resource use and promote a welfare-enhancing allocation of both productive assets and consumption goods, but this only holds for traded market goods and factors operating within efficient markets. Failure to recognize this simple truth can lead to net economic losses, serious resource degradation, and, most assuredly, unpredictable results from reform.

2) In order for market reform to serve non-market needs, it must account for or internalize the environmental and social externalities of economic activity. This is problematic, since environmental goods and services (and certainly social needs) are not always easily amenable

to quantification and measurement. Where market internalization is possible, for example through securing property rights, shadow pricing, subsidization of positive externalities, Pigouvian taxation of negative externalities, emissions trading, etc., it is the preferable means of correcting market failure. Where certainty of control is desired, non-market command-and-control policies must be coordinated with reforms to achieve the desired economic, social and environmental outcome.

3) None of the above strategies will yield predictable results unless the appropriate institutions exist to communicate incentives, information, control, and enforcement. Structural adjustment without attention to capacity-building and institutional reform amounts to little more than a reform gesture, and may in fact do more harm than good.

4) Similarly, environmental outcomes from economic reforms depend to a large extent on how well economic and environmental policies were integrated prior to the reform process.

5.1 Review of Selected Studies

While the structural adjustment era (mid-1970s to present) initially failed to address environmental issues adequately, it is evolving to integrate the environment more broadly and with more depth, as environment-economy interactions manifest themselves over time and as both North and South develop greater awareness of the productive capacity and inherent value of the environment. A quick overview of studies on the subject underlines just how new and how rapidly growing are the multilateral development banks' (MDBs') concerns over structural adjustment's environmental implications.[1]

Initial inquiries into this field include Hansen's (1988) "Structural adjustment programmes and sustainable development," which chronicles early efforts between the World Bank, IMF and host countries to explicitly address natural resource management in SAPs, making recommendations for broader and more economically integrated natural resource elements. At that time, only a quarter of the Bank's Asian and African SALs even mentioned the environment, and far fewer included relevant policy measures. Sebastian and Alicbusan's (1989) paper, "Sustainable development: issues in adjustment lending," further develops the conceptual framework of economy-environment linkages, explores the expanding environmental elements of SAPs, and includes more coverage of institutional and policy issues. They found that, while environmental issues were increasingly acknowledged in SAPs, specific policy measures to address them were still lacking.

In 1994, Warford *et al.* provided a comprehensive review of "The evolution of environmental concerns in adjustment lending," with three country studies and deeper analysis of environmental-social-economic interplay. At this time, an estimated 60% of adjustment loans addressed environmental issues at least partially, and two stand-alone environmental adjustment loans had been initiated. Complementing this study was the Munasinghe and Cruz (1994) World Bank monograph, *Economywide Policies and the Environment: Emerging Lessons from*

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[1] *It is vital to note that MDB involvement in environmentally relevant projects, capacity-building, and policy extends far beyond the scope of SAPs. While not explicitly tied to SALs, SECALs, and other stabilization or adjustment packages, these endeavors most certainly influence the development vector of host countries. The reader is referred to such publications as WB's The World Bank and the Environment, published annually, among other valuable sources of data on environmental projects and policy in multilateral lending.*

Experience, providing case studies of eleven countries and similarly more sophisticated analysis of linkages and interdependence.

Major findings of these studies are included in Matrix Two and are integrated into the discussion in the next section. One observation that Warford *et al.* (1994) made in reference to Sebastian and Alicbusan (1989) seems to apply to most of the theoretical economic discussions of environment and adjustment: The complementarities and relationships put forth "are merely assumed environmental impacts of adjustment programmes. [...] Long-term impacts are difficult to predict in the best of circumstances, and in the environmental area there are special problems: behavioral and physical linkages are poorly understood; many of the effects are long term; market failure and institutional weaknesses are endemic. [...] Complementary programmes, or supplementary measures within an adjustment lending operation, are typically required to address specific social and environmental consequences of adjustment or to achieve specific objectives." (p. 4)

The above studies all concluded that the net effects of SAPs on the environment are positive, although programmes should be tailored more appropriately to meet environmental needs in the future. Sebastian and Alicbusan (1989) noted that much of the economic and environmental crisis now evident in host countries stems from debilitating external shocks in the late 1970s and 1980s, and that rapid population growth continues to thwart any improvements in standards of living in most LDCs. They stress the need for complementary measures to address the informal sector and the environment, recognizing that market reform alone is not directly attacking all environmental problems. Nonetheless, they do assess net positive environmental impacts and even find "no evidence to connect adjustment policies with significant environmental damage" (p. 28). Much of this assessment is based on assumptions about the future efficiency of markets and institutions within host countries and on the expectation that appropriate internalization measures will be eventually undertaken. For instance, one reason for environmental optimism is that SAPs "enable economies to internalize (and reduce) the social costs of environmental degradation" (p. ii). Enabling, however, does not imply *effecting* internalization, and there is little evidence that LDCs, or MDCs for that matter, are undertaking comprehensive efforts to effectively internalize environmental or social costs.

Hansen (1988) also found it "obvious that conventional adjustment programmes [...] hold the potential to provide efficient instruments for the integration of environmental and natural resource concerns in development activities," but stressed that the "challenge is to convince the decision-makers involved that proper adjustment programmes require adequately addressing and reflecting current environmental concerns. This requires the adoption of multi-disciplinary analytical approaches and calls for an active cooperation between the different agents in the development planning system" (p. 22). In addition, Hansen cautioned that MDBs ought to recognize their imposing stature when dealing with poor, vulnerable nations and take special care to elicit from host country negotiators their development goals, avoiding an imposition of their own. These points notwithstanding, Hansen assesses net positive environmental effects and even better potential impacts from structural adjustment and stabilization programmes.

Reference to Matrix Two highlights the many different conclusions drawn as to net environmental effects of adjustment. Most of the literature that leans heavily towards a political or sociological perspective (e.g., the International NGO Forum) tends to focus on negative outcomes, whereas the more economics-oriented analyses (e.g., WWF collaborative studies) find mixed or ambiguous, and occasionally, positive net environmental outcomes (see Markandya, Panayotou, and Vincent 1994).

In Matrix One below, the potential impacts of macro reform are summarized in terms of three sectors: the formal sector (i.e., the monetized market economy), the informal sector (which includes household production, subsistence agriculture, the "non-cash economy," etc.) and the natural sector[2] (which includes all environmental goods and services, non-human production systems, etc.). By attempting to separate out the impacts among the three sectors, it seems evident that the net economic and environmental effects of reform depend on how carefully the informal and natural sectors are considered in adjustment packages.

[2] Natural resources and the environment are often referred to in the literature as "natural capital" or "natural assets," not as the "natural sector". The latter term is chosen here to stress that the natural world and resources underlying both formal and informal sector activities are an integral, dynamic, and productive part of the economy. While goods such as timber or minerals serve as extracted inputs for the other sectors, services such as pollution absorption, flora and fauna production, ecosystem services, and the very root of life energy (solar radiation) are not choices but absolute necessities for the economy to function. "Sector" thus may even be an understatement.

MATRIX ONE: MACROECONOMIC CHANGE AND POTENTIAL ECONOMIC AND ENVIRONMENTAL OUTCOMES

MACROECONOMIC CHANGE	FORMAL SECTOR EFFECTS	INFORMAL SECTOR OUTCOMES	NATURAL SECTOR OUTCOMES
LONG RUN ECONOMIC AND STRUCTURAL CHANGES	Structural adjustment and stabilization (general)	Mixed; depends on recognition of and accounting for informal sector responses	Mixed; depends on adequate internalization of environmental costs and benefits
(Overall package of structural adjustment reforms)	Increase in level of production	Depends on displacement of people and resources	General increase in resource use and waste
	Shift in structure of inputs labor, energy, chemicals, land, natural resources, physical capital, etc.	Labor intensity absorbs labor; chemical or pollution intensity may lower informal sector productivity; land/natural resource intensity may displace resources; capital or energy intensity may displace labor, energy intensity may damage crops through acid deposition	Labor intensity may reduce formal and informal pressure on resources; energy and chemical intensity will degrade resources; land/natural resource intensity may promote better management or more rapid resource depletion; capital intensity in primary sector may cause more rapid degradation,
	Shift in structure of outputs (agricultural, industrial, service, etc.)	[See relevant SECTORAL POLICY.]	[See relevant SECTORAL POLICY.]
	Change in level of consumption	Decreased formal consumption may induce use of informal substitutes; increased consumption may displace informal activities	Consumption generally entails more resource use and environmental impacts
	Shift in structure of consumption (energy, natural resources, durable, non-durable, etc.)	Depends on informal substitutes	Increased energy demands will pollute; resource demands will deplete; durable (especially non-biodegradable) goods will increase waste stream; service demands will have mixed effects
	Increased economic efficiency	Depends on efficiency gains in informal sector	Conservation of scarce resources; less waste

MATRIX ONE: MACROECONOMIC CHANGE AND POTENTIAL ECONOMIC AND ENVIRONMENTAL OUTCOMES

	Increased technical efficiency	Diffusion of technology to informal sector will increase productivity	Less pollution intensity; better resource management
	Change in level of poverty	Less poverty promotes a healthier and perhaps smaller informal sector; converse also true	Less poverty implies less sacrifice of resource integrity for short-term needs and less encroachment on lands
	Change in income distribution	Increased inequality swells the informal sector	Inequality fuels migration, squatting, short time horizons and resource degradation by poor
	Change in discount rate (a decrease implying more investment toward long-term returns); lower market discount rates reduce the difference between private and social discount rates	A lower discount rate may decrease fertility and induce long-term resource management, if felt by the informal sector; lower discount rates may translate into lower informal credit interest rates, hence increasing informal sector investment	Discount rates less than regeneration rates of renewable resources will promote sustainability; may also prolong availability of non-renewables; (low discount rates may also accelerate general development, reducing the above benefits by stimulating capital intensive extractive activities)
PUBLIC EXPENDITURE			
Short-run across-the-board reduction	Demand reduction; increased poverty and unemployment (e.g., due to reduction of public sector employment, public services, subsidies, etc.)	Influx of labor, increased consumption demands for non-marketed goods (e.g., fuelwood)	Decreased pressure on commercial resources, increased pressure on open-access or unpriced resources; reduced pollution abatement in urban sector
Long-run across-the-board reduction	Increased savings and private investment, potential for increased employment	Labor absorption into formal sector -- if formal sector investment is in labor-intensive activity	Depends on nature of activities promoted through investment
Reduction in "low priority" areas (health, education, social and environmental programs)	Demand reduction, lower investment in human and natural capital, and in environmental protection	Less diffusion of information, expertise and technology to help poor manage resources, health, and family planning.	Decline in sustainable resource management, continued population pressure on resources, reduced pollution abatement

MATRIX ONE: MACROECONOMIC CHANGE AND POTENTIAL ECONOMIC AND ENVIRONMENTAL OUTCOMES

Reduction in infrastructure investment other than social or environmental (e.g., roads, dams, etc.)	Reduced public sector employment, slower growth of formal sector (e.g., transport, power, irrigation agriculture)	Reduced displacement of indigenous and low income populations; reduced encroachment and colonization in natural areas	Reduced environmental impacts of large infrastructural projects; reduced destruction of natural areas from encroachment, colonization, commercial development, and other resource exploitation
MONETARY POLICY			
General reduction in credit availability	Generally lower private investment	Influx of labor into informal sector	Increased forest encroachment and other open-access resource exploitation
Specific reduction in soft credit programs	Marked decrease in investment for rural smallholders and small enterprise	Increased informal sector interest rates and reduced investment	Increased forest encroachment and other open-access resource exploitation
Interest rate ceiling removal	Increased smallholder and small enterprise investment	Increased institutional credit availability to informal sector	Reduced farmland mining; increased soil conservation; reduced encroachment

MATRIX ONE: MACROECONOMIC CHANGE AND POTENTIAL ECONOMIC AND ENVIRONMENTAL OUTCOMES

TRADE POLICY			
Currency devaluation	Reduced balance of payments deficit, increased exports and activity in export sector; higher import costs; sectoral shifts depend on relative prices of factors and goods	Increased demand for labor in export activities may pull women out of household production activities; import price increases may hurt poor by increasing prices of domestic substitutes; increased exports and prices of staple foods benefits rural poor with staples surplus and hurts those with deficits or the urban poor SIMILAR TO SECTORAL POLICY EFFECTS [See below.]	Higher cost of imported technology, capital, and pollution control may decrease abatement and production efficiency gains; increased exports of natural resources; ambiguous impacts on forest encroachment SIMILAR TO SECTORAL POLICY EFFECTS [See below.]
Trade barrier reduction (tariff and non-tariff)	Increased imports; resource shift from import substitution to export-oriented industries	Potential reduced prices for import substitutes may help poor, unless there is a loss of scale economies	Improved efficiency of resource use; reduced costs of imported technology (both resource-saving and resource-using)
SECTORAL POLICY	Changes in sectoral practices and shift of resources among sectors		
Agricultural export promotion	Expanded production of export crops (cash crops); reduced production of staple crops; shift in structure of factor demand and in farming practices; potential displacement of forestry and other primary enterprises	Agricultural export cultivation may impinge on subsistence cultivation while simultaneously reducing supply of commercial foodcrops; potential labor demands may absorb excess labor but also may absorb valuable non-market labor (e.g., female household production)	Extensification of commercial agriculture and relocation of informal agriculture may degrade marginal areas; intensification can have positive (more labor, better management) or negative (soil erosion, chemical or nutrient runoff) effects. Dependent on land base, crops promoted, property rights and degree of internalization of offsite effects (e.g., sedimentation of dams due to erosion)

MATRIX ONE: MACROECONOMIC CHANGE AND POTENTIAL ECONOMIC AND ENVIRONMENTAL OUTCOMES

Industrial export promotion	Industrial expansion; change in sectoral shares of small- and large-scale manufacturing; shift in structure of factor demand and output	Labor absorption depends on whether promoted industry is labor or capital intensive; also depends on location of industry (i.e., rural or urban)	Effects ambiguous but generally positive when promoted industry is labor intensive, negative if capital and energy intensive
Services promotion (e.g., tourism)	Shift in structure of factor demand and output; generally favorable structural change	Usually favorable employment and income effects;	Ecotourism has generally positive effects; mass tourism generally negative (haphazard tourist development, beach pollution, damage to forests and coral reefs, increased congestion) unless regulated
SPECIFIC PRICE CHANGES (examples)	Reduced use of higher priced goods and inputs; production and consumption effects from relative price changes	Price increases for basic goods may exacerbate poverty; substitutes may entail degradation of open-access or unpriced resources	Ambiguous effects since price increases lead to conservation when property rights are secure and to depletion when they are not and economy is open to trade; likely increase in exploitation of open access resources
Reduction of subsidies on all commercial energy	Incentive for energy efficiency; potential decline in commercial energy use	Decreased reliance on commercial energy, more reliance on non-commercial substitutes	Energy conservation; reduced pollution (local, regional and global); increased fuelwood gathering and charcoal production (causing deforestation and mangrove destruction)
Reduction of energy subsidies on some commercial energy (e.g., oil)	Some incentive for energy efficiency, but also shift toward substitute sources (e.g., coal)	Shift in household energy use toward traditional fuels	Depends on relative pollution by sources (reduced pollution when relative prices favor low-sulfur, low-carbon fuels like natural gas, or renewable energy); may increase deforestation for fuelwood

MATRIX ONE: MACROECONOMIC CHANGE AND POTENTIAL ECONOMIC AND ENVIRONMENTAL OUTCOMES

Reduction of agricultural subsidies	More efficient farm practices; shift toward other sectors or inputs; reduction of pesticide, fertilizer and irrigation subsidies have short-term negative economic effects on the sector but usually have favorable long-term economic benefits	Informal sector benefits indirectly by the removal of agricultural subsidies that favor the formal sector	Reduced cultivation of fragile and marginal lands; reduced non-point-source water pollution; reduced water-logging and salinization of soils from overirrigation,; reduced damage to natural predators of pests and to biodiversity and wildlife; more sustainable agriculture
Reduction of industrial subsidies	More efficient industrial practices; shift toward other sectors or inputs	Favors artisanal sectors; increased industrial employment (since subsidized industrial sectors such as iron and steel, cement and petrochemicals are capital intensive) reduces surplus labor and raises returns in the informal sector	Reduced encroachment on open-access resources and squatting in public property and slums; reduced solid waste dumping in public places
Increased stumpage fees and timber taxes (and other forms of resource rent capture)	Decreased rates of commercial timber extraction; shift toward less heavily taxed land use activities (unless non-timber values of forests are internalized)	No direct effect on rates of informal forest conversion or extraction, but more forest resources may become available for harvest of non-timber goods; commercial agriculture may displace subsistence farms	Potential decrease in commercial deforestation, may be offset by extensification of commercial agriculture; displaced subsistence farmers may increase pressure on marginal lands
Other "green" taxation (internalizing external costs of various goods and services)	Reduced resource waste; increased efficiency; relative price effects will change patterns of consumption and production; government revenue generated	Price changes may induce more exploitation of open-access or unpriced resources	Generally favorable effects on resource sectors and environment (reduced depletion and pollution); government revenues generated may be used for environment

INSTITUTIONAL REFORM	Promotes more predictable, efficient markets	May "formalize" informal markets	Necessary for resource incentives to work

MATRIX ONE: MACROECONOMIC CHANGE AND POTENTIAL ECONOMIC AND ENVIRONMENTAL OUTCOMES

Land tenure security	Increased market value of land; increased access to credit and increased incentives for long-term investments	Consolidation of commercial lands may displace rural poor; but establishment of rights on their lands will promote sustained production and longer time-horizons	Increased soil conservation; tree planting; long-term management of land resources
Land tenure arrangements	Privatization of open access generates efficiency gains	Privatization deprives poor and landless of last resort source of income and employment; communal management is a preferred arrangement	Requirements that land be cleared to establish tenure promote deforestation; requirements for sustainable management are clearly beneficial
Increased regulatory enforcement	Will ensure regulatory compliance but may increase productions costs in short run	No direct impacts; potential for greater regulation of informal activities (with mixed effects on informal sector production and welfare	Reduced urban and industrial pollution; generally more predictable environmental outcomes from policy
Reduced corruption and collusion	Reduced rent-seeking behavior; some short-term costs and long-run benefits	Unclear connection; potential to remove biases against informal sector production and welfare	Reduced use of natural resources as political resources
Formalized communal property arrangements	Loss of claims to open-access resources	Increased control and empowerment; increased efficiency and reduced poverty	Resource conservation and management; correction of tragedy of the commons

5.2 Synthesis of Findings

Some generalizations on economy-environment linkages are offered above, and most are ultimately ambiguous as to net positive or negative environmental consequences of a given policy action. Where the generalizations have been asserted unambiguously, they are usually based more on economic theory than on empirical evidence. A closer look at the country studies reveals that ambiguity reigns at the aggregate level due to differing, sometimes contradictory, findings among different research projects.

Observing how and why the results may differ from study to study will probably yield more insight into the complex economy-environment linkages than trying to formulate generalizable aggregate relationships. The bulk of the divergences in study findings can be grouped into three contexts:

1) site-specific differences,
2) difference in research assumptions, and
3) differing depths of analysis.

5.2.1 Site-specific Differences

Each nation's development context is different (in terms of culture, politics, resource base, climate, etc.), and analyses of the effects of a similar policy initiative may yield very different results according to this context. For example the promotion of tourism is found to have different implications for the environment in Jamaica, Thailand, Zimbabwe, and Tanzania due to different regulatory regimes, foci of tourist promotion, and levels of ecosystem fragility. Jamaica's tourism promotion concentrated on its comparative advantage of beach leisure activities, but inappropriate coastal zone management and high levels of tourist visitation have led to severe erosion, coral reef and estuary damage, and waste problems (WWF/HIID, 1994). Thailand's promotion of tourism has involved similar problems in beach areas (e.g., mangrove destruction and coastal damage from development), but the growth of tourism has also reduced the level of many harmful agricultural practices indirectly, yielding positive environmental outcomes (Panayotou and Sussangkarn, 1991). In Zimbabwe and Tanzania, on the other hand, tourism has focused more on managed wildlife, providing incentives for conservation of habitat and species. Even in these African countries, where tourism may concentrate on ecosystems arguably less fragile than estuaries and reefs (i.e., semi-arid rangelands), the net ecological damages vary according to the tourist load, the methods of wildlife management (e.g., pristine, culled herds, etc.), and the regulatory framework surrounding tourist services (Muir, Bojö, and Cunliffe, 1994; WWF/ODI, 1994).

5.2.2 Different Conclusions Arising from Research Assumptions

Conclusions on net environmental effects of economic policy will vary even more according to the assumptions, implicit or explicit, underlying the analyses. For example, increased stumpage prices are generally presumed to stem deforestation, since the cost of commercial timber extraction becomes greater. Persson & Munasinghe (1995), using a general equilibrium model that included property rights simulation, found that increasing stumpage prices in Costa Rica may have actually promoted deforestation due to a shift toward agricultural production, entailing forest conversion. This unexpected result may not have been discovered had a partial equilibrium model (implicitly assuming a *ceteris paribus* condition in other sectors) been used. In a similar example, energy price increases may not have a net positive effect on the environment through reduced use and pollution. A change in the relative price of fuels may

make coal more desirable an input than oil, implying higher pollution per unit output. Even across-the-board price increases for all commercial fuels may have net negative impacts if people respond outside the formal market by poaching fuelwood (leading to increased deforestation), or by burning dung, crop residue or peat (leading to reduced soil productivity). The crucial assumptions in the latter case involve secure versus insecure property rights and the existence (and therefore behavioral responses) of a significant informal sector.

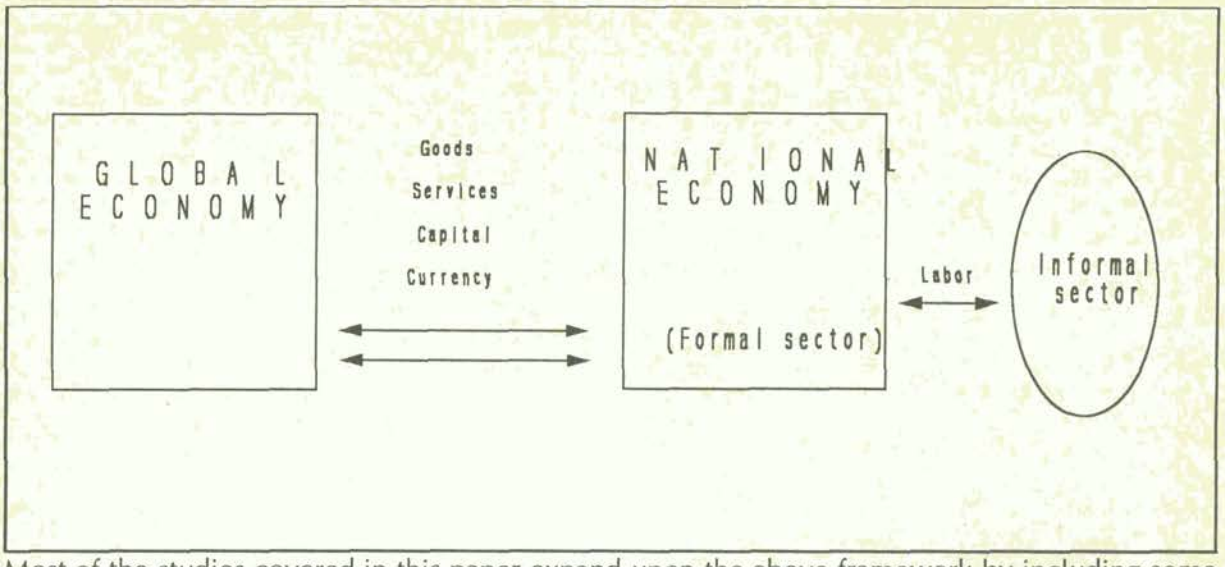
5.2.3 Different Depths and Breadths of Analysis

Conclusions are also highly dependent on the depth and breadth of investigation into environmental consequences. Soil erosion, for example, is often said to increase as a result of increased agricultural exports from trade liberalization (as in the several country summaries from the International NGO Forum, 1992). This conclusion seems to be based on the broad observation that soils were depleted as export agriculture grew. Many of the World Bank studies (e.g., Hansen, 1988) argue that soil erosion may increase or decrease depending on the root structure and common management practices of the type of crop promoted (based on Barbier, 1988). An even deeper analysis of the erosion-trade relationship is provided in Barrett (1992). This study finds that the incentives and preferences of individual farmers toward soil conservation may differ widely, even under similar economic circumstances or crop choices; thus trade reform will have highly variable, and often unpredictable effects on rates of soil erosion (even if preferred crop types are known).

Differences in depth and breadth of analysis introduce biases toward theory, observation, and empirical analysis, as well as the level of aggregation. In the next section, we explore a conceptual framework that may help researchers to sort out these conflicts and may, at least qualitatively, bring the analysis closer to discerning what environmental outcomes are likely to result from economic reforms.

5.3 Methodological Critique

Traditional conceptual models of macro policy effects seem to assume well-defined and functioning formal sector trading goods, services, and capital with the rest of the world. Some recognize an informal sector in the economy which primarily absorbs or supplies labor to the formal sector. [see Figure 2]



Most of the studies covered in this paper expand upon the above framework by including some environmental variables and discussing either formal or informal sector impacts on these variables that arise from changes in macro policy. Most commonly analyzed are soil erosion, deforestation, and different types of pollution. It is important to always recognize, however, that the environment cannot adequately be represented by one or two variables; that formal sector environmental impacts may be offset or overshadowed by informal sector environmental impacts; that the environment itself affects production and consumption patterns in these sectors; and that there is a constant interplay among national and international environment and economy. In short, a more holistic approach is required.

A potential new framework for analyzing the environmental implications of macro policies might account for the formal, informal, and natural sectors, recognizing that net impacts depend on the interplay of these sectors. The three major arenas in which the consequences of reform play out could then be defined as:

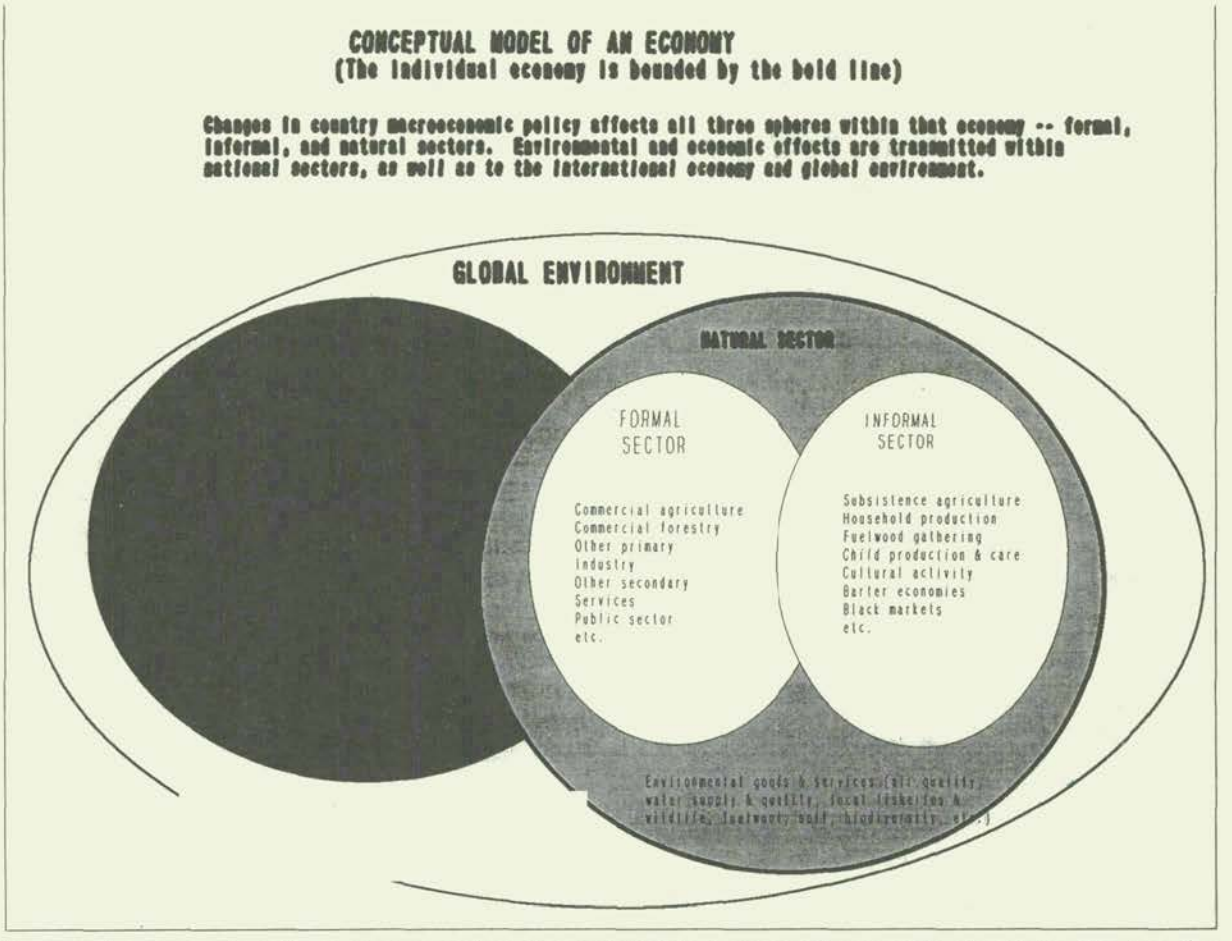
1) Formal sector interactions,
2) Formal-informal sector interactions,
3) Formal-informal-natural sector interactions.

These three sectors are interdependent and also tied to the international economy and the global environment. Conceptually, these relationships are represented in Figure 3.

Viewed from this vantage point, the impacts discussed in Matrix one may be better understood. First, structural shifts will occur within one arena, say the formal sector, and have direct implications on activities in the informal sector. The net impacts flow out to the natural sector, which responds through a change in the structure and level of environmental goods and services for consumption or productive input in both formal and informal economies.

Second, feedback loops occur between the environment and other sectors of the economy. Most of the literature deals specifically with macroeconomic impacts on the environment, not explicitly recognizing that subsequent environmental impacts on the macroeconomy may be just as important to a nation's development and future welfare.

Third, it cannot be understated that efficient markets and effective institutions are vital to achieve the desired outcomes from reform. Markets and institutions are essential to harness the powerful



forces of economic reform, just as a dam is essential to harness the power of a river. To use the analogy of a hydroelectric dam (particularly relevant to MDB project lending), the flow of water can be a source of energy to fuel the development of downstream communities. If the flow were to increase drastically or suddenly, it might break the dam and inundate the communities. If the dam was barely large enough to begin with, any increase in flow cannot be harnessed, and it may cause damage downstream. In addition, more energy might be generated through more efficient generators with or without an increase in water flow.

5.3.1 The "Ideal" Case Study

Given the complexities of the conceptual model, current quantitative methods of inquiry would be stretched to the limit to cover all the bases listed above. How might a country case study best address the issue?

The ideal case study would measure the environmental outcomes of individual reforms against the hypothetical environmental consequences of maintaining pre-adjustment policies. This "with-and-without" approach will grant far more helpful results than a simple "before-and-after" approach, which ignores all intervening factors and trends. For example, most of the literature criticizing adjustment decries continuing or worsening economic disparity and poverty after SAP policy implementation. While these observations are well founded, they should be compared to conditions in those countries which did not undertake adjustment programmes, for which the OECD estimated a twenty per cent decline in income for the poorest of the poor (Stackhouse, 1994).

The ideal study would also account for formal sector and informal sector responses to policy, and it would recognize feedbacks from natural systems.

Before-and-after comparisons, partial equilibrium models, general equilibrium models that fail to fully integrate social and environmental factors, theoretical analyses, and historical narrative accounts, all fail to meet these "ideal" criteria and thus can provide no unequivocal evidence of effects that are solely attributable to structural adjustment policies. As with any other field of research, we are left with ambiguous conclusions or unambiguous conclusions that are biased by the normative assumptions of the researchers.

5.3.2 Methods and Models

In the matrix of studies (Matrix two), the research methods employed are broken down into some basic categories, including: (a) historical (discussion of events, consequences, and intervening factors); (b) analytical (implying that quantitative models or calculations were used, but the method is unspecified); (c) case studies (integration of site-specific research projects); and (d) various models such as partial equilibrium (PE), computable general equilibrium (CGE), linear programming (LP), and social accounting matrices (SAM).

Reliance on one particular quantitative methodology may yield very precise results, thus edifying many theoreticians or policy analysts. But to what extent might this precision be at the expense of accuracy? Accurate determinations may require consideration of all sorts of historical, exogenous, and external factors not formally addressed in a given analysis. In short, they may involve a great deal more uncertainty or suggest a number of "safe" and "preferred" policy choices, rather than a singular optimum. It is for these reasons that not only should models attempt to integrate a large number of significant factors but also findings and recommendations should balance the insights drawn from different models and from "historical" or otherwise qualitative analyses.

Among the quantitative models, multi-sector computable general equilibrium models seem to yield more insight than partial equilibrium models, which is to be expected given that adjustment processes manifest themselves primarily in interactions among sectors. Even the CGE's, however, fail to represent all the productive sectors of the economy (which would include the environment and informal sector). True, rudimentary environmental accounting matrices and non-tradable resource sectors have been integrated into some of the general equilibrium models, but insufficient data and conceptualization difficulties preclude a holistic, representative model.

Girma (1992) presents an almost ideal analytical framework to model structural adjustment's social, environmental, and economic ramifications — integrating macroeconomic dynamics, microeconomic behavior, social variables, and an environmental sector (representing environment as both a productive asset and a consumption good in its own right). To the authors' knowledge, such a holistic quantitative effort is as yet in the theoretical stage and has not been applied to any real-world economy. One reason is that this framework lacks empirical data to support it. Conceptual models of economy-environment linkages all seem to begrudgingly admit this caveat somewhere in their discussion.

Too often, quantitative models yield intriguing results which are internally consistent but do not reflect actual events in the economies they presumed to simulate. Better put, they corroborate the assumptions and underlying coefficients chosen for the model (e.g., assumed inelastic supply functions yield inelastic supply responses in various policy scenarios). Certainly, more empirical analysis on the true function (i.e., not a fixed number) of the various coefficients

is warranted.

Given modeling limitations such as these, the anecdotal evidence, survey data, case studies, and historical analyses served well to complement the model results, fill in gaps, or sometimes challenge the model's conclusions.

5.3.3 Some Methodological "Reality Hurdles": Exogeneity, Stochasticity, and External Distortions

Market, policy, and institutional failures within host countries are not the only "reality hurdles" that models and theory must deal with. Exogenous, stochastic and external factors abound that threaten the sustainability of development strategies promoted by structural adjustment lending.

The quintessential exogenous factor, with particular relevance to agrarian economies, is weather. How well do SAPs protect a nation's development vector in the presence of unforeseen droughts, floods, or other natural disasters? For example, Zimbabwe experienced a serious drought in 1991 - 92, just at the beginning of its Economic Structural Adjustment Programme implementation (Eakin, 1994). Adherence to loan conditionalities, namely the export orientation of food crops such as maize, took precedence over the need to feed citizens starving as a result of the drought. Drought mitigation measures took place only after the loan was secured in February 1992.

Two strategies may mitigate these potential crises. First, quantitative models that venture to determine the appropriate allocation of resources for human and economic development may be subjected to stochasticity. Thus, for example, the appropriate shares of grain production for export or local consumption would depend upon the overall production that year, which would depend in part on a stochastic precipitation variable. In fact, the integration of climate forecasts and other environmental data may reduce the level of uncertainty.

Second, and perhaps more important, any adjustment programme should contain provisions for unforeseen events. In the drought example, it might allow for temporary subsidization of grain distribution locally or temporary re-orientation of grain marketing to favor local consumption. If food shortages are likely to occur with regularity, a small level of food security protection might be justified.

Third, external market distortions should be considered. For instance, does the liberalization promoted in SAPs rely on hypothetically free global markets or on the actual conditions of the global market place? Of particular relevance to this question are the terms of trade between North and South. Nigeria, for example, expressed concern to the 1991 GATT council that five years of SAPs had failed to adequately diversify Nigerian exports, owing primarily to the import restrictions of developed countries (Iheduru, 1992). Essentially, the unilateral liberalization on Nigeria's part mostly boosted oil exports to the North. The extent to which adjustment capitalizes on Nigeria's comparative advantage in a global market is clearly dependent on the North's revealed commitment to free markets.

Other exogenous factors that will negatively distort a country's adjustment and development (particularly with regard to the environment) are global commons issues (e.g., extra-jurisdictional fisheries, global warming, transboundary pollution), migration patterns, balances of power (e.g., North-South, inter-LDC), and, perhaps most significant, war. Admittedly,

no model could adequately factor in, much less predict, all these phenomena, but some methodological advances could be endeavored. More importantly, these factors should be considered qualitatively and conceptually when SAP agreements are formulated.

In summary, even if host-country failures of market, policy and institutions are accounted for, structural adjustment requirements based on assumptions of a predictable world and non-distorted world markets will not necessarily promote sustainable development in LDCs. For example, the whims of Nature or the existing policies of the North could have worse consequences for human welfare or natural resource use if inappropriate adjustment policies are adhered to. For these reasons, SAP agreements and the analyses thereof should:

1) Contain provisions for potential stochastic shocks,
2) Account for external market distortions (i.e., not assume a level playing field), and
3) Where possible, include external and stochastic parameters in their models.

Failure to qualify agreements or adjust calculations in this manner may overshadow or even nullify the welfare and development gains promised (and predicted) by structural adjustment.

5.4 Needs for Further Research

Dynamic models need to be developed that represent a true general equilibrium, including comprehensive social and environmental accounting. Feedback is crucial, as natural resource systems affect development as much as development policy affects them.

Empirical research should be undertaken to determine true, variable elasticities and coefficients. (Fixed, assumed coefficients appear to do little more than corroborate the research assumptions made in setting them — typical "begging the question" reasoning of poor economic analysis.)

Efforts should be made to determine realistic assumptions about the global marketplace, the uncertainty of political and natural dynamics, and other exogenous and external factors affecting development.

Above all, data are required on environmental phenomena and the intervening social/demographic, and biological variables. (Where quantitative measures of important variables are unavailable, normative goals must be set. Lack of amenability to quantification does not imply lack of importance.) Development of environmental accounting matrices that can be combined with social accounting matrices to build truly general and dynamic equilibrium models with two-way feedback between the economy and environment are both necessary and feasible at this stage of development of the interface between structural adjustment and the environment.

6. Conclusions and Policy Implications: Integrating Environment and Sustainable Development

Environmental improvement has not been an aim of structural adjustment policies in the past and therefore it is not fair to use an environmental measuring rod to judge such policies, especially with the benefit of hindsight. However, to the extent that such policies lead to natural resource depletion or environmental damage beyond the economic optimum, they are defective in economic terms, i.e., they fail their very own objectives. Furthermore, with the growing realization that the environment cannot be divorced from economic development, future structural adjustment policies need to not only be explicit about their environmental implications, but also to treat the natural resource base and the environment as economic assets in the same way that man-made capital is treated. For only then would stabilization and structural adjustment policies take their rightful position, not only as preconditions but also as agents of sustainable development. It is in the context of designing and implementing improved structural adjustment programmes in the future that the assessment of the environmental performance of past programmes has been undertaken.

A number of conclusions and policy implications emerged from the survey and attempted syntheses of the findings of the studies on the interface between structural adjustment and the environment. Some apply to the studies themselves and others to the design and implementation of future structural adjustment programmes. Box 1 below proposes some further guidelines towards improved structural adjustment programmes.

6.1 Implications for Studies

(1) When assessing the overall impact of structural adjustment and related economy-wide reforms on the environment, it is necessary to go beyond the first round of impacts and analyze the responses of people and natural systems to these impacts and indeed, to trace the path of adjustment.

(2) The relevant comparison when assessing the environmental (and social) impacts of macroeconomic and structural reforms (as indeed with any policies and projects) is not between the situation before and after the reforms or programmes but with and without them, and this necessitates the controlling of many other factors and policies that contribute to the apparent outcomes. This in turn requires the collection of benchmark environmental conditions at the time of the first introduction of these programmes and the reconstruction of the "without" scenario, against which the "with" scenario can be compared.

3. The environmental impacts of structural adjustment programmes and related economic reforms need to be valued in economic terms (using the valuation methods for both market and non-market goods and services) and be fed back into the economic system in order to fully capture the general equilibrium effects in a dynamic context. In a dynamic CGE formulation, the feedback mechanisms are imbedded (with a lag) in the production and utility functions to affect economic output and social welfare by changing the productivity of inputs and the utility of outputs. However, by definition any environmental impacts that are worth averting or mitigating cause excessive damage (i.e., reduce economic output and welfare by

more than the cost of potential remedy) and therefore, unless they are explicitly modeled, it is not possible to determine the optimal level of intervention that will maximize economic output or social welfare (by equating the relevant marginal costs and benefits).

(4) Studies of the interface between structural adjustment and the environment should not be limited to the linkage between the formal sector and the environment but they must explicitly model the informal sector and it's two-way linkages with both the formal sector and the "natural sector" or the environment in its broadest sense. This is not only because the informal sector, which operates largely outside the market economy, has pronounced impacts on the environment. It is also, and perhaps more importantly, because many of the impacts of structural adjustment programmes that operate largely in the realm of formal sectors and markets are often magnified and transmitted to the environment via the informal sector whose activities, though not market-oriented, are indirectly but profoundly affected by economic and market reforms.

(5) There is a need to develop and link environmental accounting matrices with SAPs, to improve quantification of environmental effects of economy-wide policies, to develop performance indicators, and to capture general and dynamic equilibrium effects.

6.2 Implications for Structural Adjustment Programmes

(1) The question is not whether or not to undertake structural adjustment but what kind of structural adjustment, at what pace and with what reform sequence. Tailoring and fitting structural reforms to the specific condition of the host country is something that was done poorly, especially as it concerns sub-Saharan Africa where there was only limited recognition of the fundamental differences from, say, Southeast Asia, especially with regard to the role and efficacy of embryonic markets.

(2) Structural adjustment programmes must pay as much attention to market and institutional failures as they pay to policy failures. Otherwise, the gains from correcting one failure may be lost by exacerbating the other. Recognizing their second-best nature structural adjustment programmes must provide for a carefully thought out and designed sequence of consistent and mutually reinforcing reforms that can bring the economy closer to the optimum on all fronts, not just in a narrow set of objectives (e.g. openness of the economy, competition, privatization), which are not social goals in themselves, only the means to higher ends (improved social welfare).

(3) Deregulation and liberalization associated with SAPs should be preceded or at least be accompanied by the introduction and application of economic instruments (environmental taxes and charges, bonds, deposit-refund systems, etc.) and stricter enforcement of necessary environmental regulations. Particular emphasis should be placed on win-win policies that have combined economic, environmental and social gains.

(4) Using environmental and social policies as add-ons or supplementary and compensatory or parallel policies, to mitigate or cushion the environmental and social impacts of structural adjustment, is second best to the full integration of these policies with the economic reforms in the context of a sustainable development strategy.

(5) Structural adjustment programmes can best ensure sustainability by providing for reinvestment of rents derived from the depletion of natural resources in natural, environmental, man-made and human capital to maintain and expand the productive capacity of the economy and the quality of life. In the absence of secure property rights over natural resources and the lack of internalization mechanisms for externalities, structural adjustment policies such as currency devaluation, trade liberalization and privatization may lead to net disinvestment of natural and environmental capital without commensurate formation of other forms of capital, a necessary (though not a sufficient) condition for ensuring sustainability. Where the first-best policy of establishing secure property rights and internalizing externalities can not be accomplished, imposition of the extended Hartwick-rule of sustainability (reinvestment of resource rents) can prevent disinvestment during the adjustment process (Hartwick, 1977).

(6) Partial reforms or incomplete implementation of reforms may do more harm than good if they are selectively applied to benefit certain constituencies without due regard to their social and environmental impacts. The selective implementation of structural adjustment programmes reduces their economic effectiveness without necessarily reducing their social and environmental impacts. Again, holistic integration of economic, social and environmental policies in the design of structural adjustment programmes is the best insurance against piecemeal and selective implementation.

In conclusion, international development assistance institutions, such as the World Bank and the IMF, have a critical role to play in promoting sustainable development by insisting on and assisting in the holistic integration of economic, social and environmental policies in their stabilization and structural and sectoral adjustment programmes and other development assistance they provide. The missed opportunities of the past should serve as valuable lessons for the future. Dwelling on the assignment of blame for past failure (with a great deal of hindsight) has high opportunity costs in terms of the foregone consensus for the design of better programmes and policies in the future, in the interest of sustainable development to which both the development and environmental communities subscribe.

Box 1. Towards Structural Adjustment Programme Guidelines

Based on the findings of the studies we have reviewed and our own analysis, we would propose the following guidelines for adjustment programme planning and implementation:

Structural adjustment programmes (or autonomous reform decisions) should be based on knowledge, not only of the dynamics of the formal economic sectors, but of the informal sectors of the economy, such as subsistence agriculture, barter economies, indigenous peoples' social and resource practices, and household non-market production. Elements of these informal sectors which are destructive (e.g., swidden agriculture, open-access exploitation, inefficient energy use) may be targeted for reform, whereas neutral or beneficial elements (i.e., sustainable or socially beneficial practices) should be shielded from adverse adjustment effects.

In addition, the natural sector of an economy must be recognized, such as plant and animal communities or ecological services — none of which really "respond" to policies directly but rather are impacted indirectly. Normative decisions must be made as to which elements are to be preserved and to what extent. These decisions must be made in advance of macro policy decisions that impact the resources; otherwise policy effects may be unnecessarily expensive (e.g., pollution cleanup) or irreversible (e.g., species loss). Uncertainty as to the potential benefits of the resources and costs of their loss should introduce a bias toward conservation.

After the above determinations have been made as to the informal and natural sectors, adjustment policies should be sequenced as follows:

1) "Stabilize" welfare of poorer segments of society. Rather than setting goals of per-capita income levels (which imply nothing in terms of equity), set goals of actual incomes for poor families in the formal sector and of actual welfare proxies (health, nutrition, rights) of poor families in the informal sector. Examples might include promoting labor-intensive agriculture, artisanal activity, services, and labor-intensive manufacturing. Account fully for the environmental and social consequences of economic activities favored by the reforms.

2) Reform laws and institutions that facilitate efficient markets. Set environmental and social goals alongside economic goals, and ensure that the capacity and infrastructure are present to maintain these goals in the presence of free market forces. For instance, provide that: land tenure can be secured for smallholders or poor families, resource rents can be effectively monitored, taxed, and reinvested and effluent limits can be enforced.

3) Investigate what potential or fledging economic activities would have a "comparative advantage" in international trade. Develop and expose these activities gradually but steadily to greater international and domestic market discipline. Simply opening the floodgates of trade may never lead a nation to exploit its comparative advantage, if its initial access to capital, technology and expertise lags far behind that of its competitors. This may explain the often inefficient and unsustainable exploitation of LDC primary resources that has resulted from too rapid transition to free trade.

4) Gradually adjust energy and resource prices to reflect non-market costs. The trade-off between economic activity and external costs (where these can not be valued and internalized) will be determined in large part by normative decisions on allowable losses in the natural sector.

5) When vicious cycles of poverty and environmental degradation are being addressed, institutions and capacity are being strengthened, and comparative advantage sectors are rooting, *then* liberalization, privatization, and stabilization measures (similar to current SAP reforms) can be accelerated. Adjustment loans should explicitly provide for training and technology transfer (perhaps substituting some direct financial capital) appropriate to the resource management and sectoral promotion goals of the borrowing nation.

MATRIX TWO. SELECTIVE OVERVIEW OF STUDIES

COUNTRY & TIME SPAN[1]	AUTHORS (STUDY DATE)	METHODS OF STUDY[2,3]	MACRO ECONOMIC AND POLICY FACTORS[4]	ENVIRON-MENTAL FACTORS [5]	SUMMARY OF *SELECTED* FINDINGS, RESULTS, AND RECOMMENDATIONS[6]

[1] Most studies have provided a historical overview of development experience. The TIME SPAN element refers to the period during which structural adjustment programs were being implemented. If a specific period is not given in the study, the appropriate decades are listed (e.g., 1980s, or 70s-80s)

[2] Any number of methods may have been utilized for the individual studies. **Only selected methods**, that granted the most insight into adjustment-environment linkages, are given here (most often as Historical, Analytical, Case Studies, or various quantitative models). Virtually all studies have relied upon secondary research, so it is not mentioned unless that was the specific intent of the study (e.g., Meta-analysis). "Analytical" implies that some quantitative data analysis appears to have been utilized, and "Historical" implies a primarily narrative coverage of events.

[3]The common abbreviations here are: -PE (partial equilibrium), CGE (computable general equilibrium), LP (linear programming), and SAM (social accounting matrix).

[4] There is great variability among the studies in the taxonomy of adjustment, and this is reflected in the notation of "factors" in this column. Where specific reforms such as devaluation or ag. subsidy cuts are tied to a specific environmental outcome, those specific reforms are noted. Where, as is more generally the case, categories of reform are covered, the notation is more general (e.g., trade liberalization, price reform). Some taxonomic consistency is sacrificed in the name of contextually accurate representation.

[5] As with macroeconomic and policy factors, environmental factors may be specific or general, depending on the perspective of each study.

[6] These categories are listed separately within the column. The notes are drawn selectively from the studies according to their relevance to structural adjustment and the environment, and are **not intended to be a comprehensive summary of the studies**. FINDINGS include documented trends and observations from analysis. RESULTS refers to relevant insights from any quantitative models that may have been used. RECOMMENDATIONS include relevant policy recommendations and, where explicitly noted, recommended areas for further research. Where it may not be obvious, generally negative environmental impacts are noted by (-), positive effects by (+), and mixed effects by (+/-).

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Cameroon 1985-1994	WWF/ODI (1994)	-Historical -Analytical -Case studies	-Ag. price and marketing reform -Credit availability -Currency devaluation -Public expenditure	-Ag. practices -Forest conversion -Poverty conditions	FINDINGS -Price reform for cash crops (reducing producer price) led to less maintenance (-) and less output (+) from plantations, and relative prices then favored more soil-erosive food crops (-). -Devaluation encouraged extensification of ag. exports (-) and restoration of some plantations (+/-). Some soil-erosive food crops have been disfavored by ag. export growth (+). -Cuts in extension services discouraged intensification, diversification, conservation, and agro-forestry (+), and rural credit reductions also disfavor intensification (+).
					-Cuts in Forestry Service exacerbate unsustainable logging, and new Forestry Code, the only environmental provision in the SAP, is inadequate to promote sustainability (-). -Fuel price increases encourage use of substitute woodfuel, thus causing deforestation (-). -Decreased social spending, especially for education, health, and women's empowerment, have exacerbated poverty and unsustainable practices (-). RECOMMENDATIONS -Resource planning and legislation should be expanded and reformed, including forest and wildlife legislation, comprehensive env. laws, and a nationwide land use plan. -Institutional reform and strengthening are prerequisites. -Rural credit should be expanded and guaranteed. -Adjustment programs should protect env. funding and the poor. -Reforms need to be sequenced, balanced and gradual to avoid excessive shocks, internal contradictions, and disproportionate hardship.

MATRIX TWO. SELECTIVE OVERVIEW OF STUDIES

Chile 1983-1992	International NGO Forum (1992)	-Historical (cursory)	-Trade liberalization	-Deforestation -Ag. practices -Fisheries	FINDINGS -Promotion of non-traditional exports, specifically certain wood products, has caused deforestation. -Timber exports promoted deforestation. Replanting of non-native trees has caused soil erosion, and pesticide/agrochemical problems. -Export fishmeal industry has displaced subsistence fishing and led to overharvesting and species decline. (Toxic effluent also responsible.) -Fruit exports have encouraged damaging chemical intensification.
China	Tao & Warford (in Munasinghe & Cruz, 1994)	-Survey data -Partial equilibrium models	-Reducing ag. subsidies -Increased opp. cost of ag. labor from industrial growth -Lifting ag. import quotas	-Ag. practices -Pesticide use -Fertilizer use -Energy use	RESULTS -Lifting ag. input subsidies generally decreases overuse of pesticide & fertilizer, but relative price changes make the relationship uncertain. -Increasing prices for commercial energy reduce use, but biomass energy will increase, entailing higher demand for chemical fertilizer and effects from biomass burning. RECOMMENDATIONS -Policy reform must accompany market reform to get predictable and environmentally beneficial results. -Intervention will be necessary to correct market failure.
Costa Rica 1982-1991	Cruz et al. (1992)	-Historical -Analytical	-General adjustment policies	-Deforestation -	FINDINGS -Reforms increased poverty and unemployment, exacerbating frontier migration, forest conversion, and land degradation. -Failure to account for informal sector response, population trends, and common property resources exacerbated env. degradation.

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Costa Rica 1980-1993	Hansen-Kuhn (1993)	-Historical -Analytical	-General adjustment policies	-General -Poverty	FINDINGS -Focus on ag. exports, particularly non-traditionals, has promoted deforestation, chemical intensity, instability, and health problems. -Reforms have exacerbated income disparity, with negative env. implications from migration, poverty, and decreased public investment. -Major institutional factors (e.g., land tenure) have not been addressed.
Costa Rica 1985-1992	International NGO Forum (1992)	-Historical (cursory)	-Trade liberalization -Export promotion	-Agrochemicals -Deforestation -Human health	FINDINGS -Chemical intensification in booming ag. exports caused severe env. degradation and health problems. -Increased poverty from a regressive tax structure, and chemically degraded land, have prompted conversion of marginal uplands. -Concentration of land among wealthy and foreign investors has generally exacerbated above trends.
Costa Rica	Persson & Munasinghe (in Munasinghe& Cruz, 1994)	-CGE model (includes property rights simulation)	-Property rights -Discount rate (or interest rate) -Increased wage rate	-Deforestation -Soil erosion	RESULTS -Higher interest rates encourage deforestation, while lower ones increase conservation. -Increased stumpage prices, while reducing logging, promote deforestation indirectly through increasing ag. forest conversion. -Similarly, increased wages for unskilled labor reduce logging (formal sector) but they shift resources to informal agriculture and forest conversion.

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Côte d'Ivoire	CIRES (in Reed, 1992)	-Optimal control model (forest sector only) -Econometric analysis -Historical -Analytical	-Public expenditure reduction -Currency devaluation (hypothetical) -Tenure and institutional reform -Trade liberalization -Sectoral policies	-Land tenure -Deforestation -Soil degradation -Pollution	FINDINGS -Land degradation is primarily due to insecure land tenure. -Pollution problems result from poor regulation, perverse subsidies, and failure to account for negative env. externalities. -Devaluation, now impossible, would decrease domestic demand. -Lack of urban labor absorption may exacerbate rural degradation in the informal sector in the presence of demand reduction. RESULTS -Optimal forest stock is far greater than actual forest stock, using either previous yield coefficient estimates or econometrically revised ones. -Tenure insecurity and institutional failures, represented by a high discount rate, accelerate forest conversion and degradation. -Increases in ag. output prices, relative to forest products, increase deforestation, but decreased domestic demand may decrease conversion. -If externalities were included in the analysis, both env. damages and benefits from sustainable policies and practices would be greater.
El Salvador 1985-1993	WWF/HIID (1994)	-Historical -Analytical	-Public expenditure -Exchange rate devaluation -Pricing reform -Tax reform	-Surface & ground water pollution -Land use -Deforestation	FINDINGS -Industrial bias of reforms increased rural poverty, unsustainable ag. practices, and fuelwood-gathering. (Civil war exacerbated this.) -A lack of regulation to accompany economic growth has caused severe deterioration of the urban environment -Despite greater domestic & multilateral attention to env. needs since war ended, institutional weakness impedes env. improvements.

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Ghana 1984-1992	International NGO Forum (1992)	Historical (cursory)	-General stabilization -Timber export promotion	-Deforestation -Poverty	FINDINGS -Devaluation, wage cuts, and reduced public expenditure mainly hit the poor and led to greater pressure on marginal lands. -Unsustainable logging has increased from timber export promotion, causing desertification, land productivity losses, and other env. problems.
Ghana	Lopez (in Munasinghe & Cruz (1994)	-PE model	-Trade liberalization -Reduced public expenditure	-Ag. productivity -Land use	RESULTS -Higher prices or lower input cost for ag. products tends to increase cultivated area far more than ag. intensity. Family size, capital availability and migrant population also increase cultivated area. -Price and wage reform will not significantly increase national income unless it includes reform of land management, especially the tenure system (currently similar to shifting cultivation.) -Public expenditure reduction, including reduced public employment, could increase ag. productivity and national income.
India 1991-1993	Kothari & Kothari (1993)	-Historical	-Trade liberalization -Privatization	-General	FINDINGS -Increased export values theoretically promote sustainable production of the export goods, but experience has shown that environmental and social responsibility are sacrificed for short-run profits. -Privatization of state enterprises may encourage even worse management of natural resources; public institutional reform is preferable. -Alternative growth strategies exist, focusing on democratization, common property management, human development, and env. sustainability.

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Indonesia 1979-1989 (proj. to 2020)	Wheeler & Martin (in Munasinghe & Cruz, 1994)	-PE model -Historical -Econometric projections	-Trade liberalization	-Industrial pollution intensity, location, and absolute level	RESULTS -Environmental regulation must accompany macro reforms to mitigate environmental side-effects of industrial growth. -Promotion of assembly processes, cleaner than materials processing, has led to lower pollution intensity, but overall levels are rising dramatically. A poverty-pollution tradeoff is evident.
Jamaica	WWF/HIID (1994)	-Historical -Analytical	-Public expenditure -Trade & pricing reform -Sectoral biases	-Water pollution -Air pollution -Land use -Deforestation	FINDINGS -Fiscal tightening has threatened an already weak env. control apparatus. -Reforms have reduced env. harmful subsidies and trade barriers. -Export sectors (bauxite, coffee, manuf., & tourism) were boosted without appropriate environmental considerations or controls resulting in large-scale land degradation, air pollution, water pollution, and unsustainability. -Kerosene, other fuel, & fuelwood pricing policy is not well coordinated. -Stumpage fees are still far below replacement cost, inducing deforestation and an implicit subsidy to coffee growers. -Inequity, weak institutions, and market failures threaten economic growth and will deter env. improvement until they are addressed.

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Malawi	Cromwell & Winpenny (1993)	-Conceptual model -Historical	-Price reform -Trade liberalization -Currency devaluation -Privatization of ag. markets	-Ag practices (i.e., -Spatial extent -Product mix -Prod'n intensity -Prod'n technique)	FINDINGS -Reforms' effects on environment vary according to types of crops cultivated, extensity, intensity, and technique. -Reforms affect smallholders and estate-holders differently. -Overall, reforms have limited the extent of cultivation, sparing fragile lands at the margin, and other effects are specific and varied. RECOMMENDATIONS -Without population stabilization and more off-farm employment opportunities, rural env. degradation will continue. -More ag. extension and access to capital and technology are needed.
Mali 1980-1994	WWF/ODI (1994)	-Case studies -Analytical -Historical	-Currency devaluation -Liberalization and privatization of agricultural markets	-Ag. practices	FINDINGS -Devaluation intensified and extensified cotton production and brought temporary pasture relief through livestock exports. -Ag. liberalization & price reform has mixed effects -Privatization increased farmer responsibility.
Madagascar 1989-1994	Barrett (1994)	-Historical	-Currency devaluation -General liberalization	-Env. NGOs -Ag. practices	FINDINGS -Devaluation hurts international env. NGO operations, which are import-intensive, while it contradicts NGO objectives by increasing ag. extent and extraction of forest products. -Foreign exchange inflows for environment have been far greater than IMF/World Bank inflows, allowing govt. to "play" interests off one another and balance stabilization and env. objectives.

MATRIX TWO. SELECTIVE OVERVIEW OF STUDIES

Mexico 1980-1986	Adelman & Taylor (1990)	-SAM	-Agricultural policy -Wage repression	(INDIRECT) -Farm scale -Poverty	RESULTS -Agriculture-led development which removes biases against small farmers leads to higher growth and welfare than industrial-led growth. -Increasing minimum wages would have accelerated, not deterred, growth. -Rural productivity-enhancing policy, rather than urban income-enhancing policy, provides higher growth rates for industry and agriculture, and alleviates rural poverty.
Mexico 1989-1992	ITAM (in Reed, 1992)	-Analytical -Historical	-Reducing public expenditure -Tax & domestic price policy -Maquiladora program -Energy pricing -Privatization	-Soil erosion -Deforestation -Water resources -Poverty -General	FINDINGS -Public expenditure reductions have hit env. programs harder. -Oil, rather than forest, resources have been overexploited in order to finance debt repayment and ensure economic stabilization. -Inappropriate subsidies and overvaluation still promote soil-erosive annual crop production and chemical-intensive agriculture. -Border manufacturing (maquiladoras) suffers insufficient env. regulation. -Increased energy prices and demand reduction stem energy pollution but hurt environment through increased unemployment, poverty and migration. -Privatization effects are unclear but induce efficient resource allocation. RECOMMENDATIONS -Env. resources should be priced to reflect externalities, but perhaps rationed for vulnerable groups. -Land tenure issues need to be addressed to stem forest conversion. -International cooperation (e.g., debt-for-nature, funding) should be provided to mitigate excessive deforestation. -Better data collection, institutions and policy will be necessary to treat forest, water resource, and other env. issues.

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Mexico 1950-1990	Eskeland & Ten-Kate (in Munasinghe & Cruz, 1994)	-PE model -Historical	-Trade liberalization -Industrial policy -Taxation	-Industrial pollution -Urban air pollution	RESULTS -Trade liberalization supported low-pollution, consumer good industries. -Structural change, including public investment in petro- and agrochemical industries increased air, water, and toxics pollution. -Fuel taxes would reduce urban vehicular pollution and internalize environmental costs. Emissions taxes are appropriate for point sources. -Some regulation (clean fuel or energy efficiency) would complement market reforms to correct for market failure (externalities).
Morocco 70s-80s (proj. to 2020)	Goldin & Host (in Munasinghe & Cruz, 1994)	-CGE model -Econometric projections	-Trade liberalization -Water pricing reform	-Water use	RESULTS -Water price reform alone would decrease urban and rural water use by about a third, but GDP and consumption would fall slightly. -Trade liberalization alone increases GDP and consumption significantly, but water use increases as well. -With both reforms, real GDP growth occurs while water use falls.

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Pakistan	WWF/HIID (1994)	-Econometric growth model	-General reform (proxy variable = savings rate)	-Water quality -Sanitation -Waste generation	RESULTS -Reform (relative to no reform) reduces water quality and sanitation problems; the peak of the "environmental Kuznet's curve" comes sooner. -Reform with population stabilization further reduces env. degradation. -Reform nonetheless increases urbanization and waste generation.
		-CGE (& SAM)	-Trade liberalization -Tax increases -Energy price increase -Deficit reduction -Exchange rate devaluation	(INDIRECT) -Agric. sector -Manuf. sector	RESULTS -Reforms generally increase the marginal return to labor, which may or may not translate to higher wages. -Reforms induce a higher ag. share of labor, implying de-urbanization, but total urban pop. will still increase and exacerbate urban env. problems. -Trade liberalization would favor small-scale manufacturing (with lower pollution intensity than large-scale), but regulation of same is difficult. -Reforms increase govt. revenue, which might help env. programs.
		-LP model	-Ag. input prices -Ag. output prices	-Ag. practices -Waterlogging -Salinity	RESULTS-Increasing input and output prices tends to increase cropped area in "fresh" areas, but not in already saline areas. Some land reclamation may occur. -Aggregate fertilizer use will increase due to extensification. -Waterlogging may be ameliorated through price-induced changes in irrigation practices.
Philippines 1983-1991	Cruz et al. (1992)	-Historical -Analytical	-General adjustment policies	-Land use -Poverty	FINDINGS -Reforms induced poverty and frontier migration, exacerbating forest conversion and land degradation. -Failure to account for population, migration, open access resources, and informal sector responses contributed to unsustainable development.

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Philippines 1979-1992	Cruz & Repetto (1992)	-CGE model -Historical -Analytical	-General stabilization -General adjustment policies MODEL -Tariff reduction -Currency devaluation -Energy tax -Industrial subsidy -Resource rent tax	-Land use -Fisheries -Energy -Poverty -Other general MODEL -Soil-erosive ag. -Primary sectors -Energy sector -Factor prices -Income distribution	FINDINGS -Pre-SAP policies encouraged resource extraction, disinvestment in primary sector, energy- and material-intensity, taxed regressively, and failed to manage common property resources. Major resource depreciation occurred in forestry, soils, and coastal fisheries. -Poverty, population, and property rights have been major culprits in resource degradation. Stabilization policies may have exacerbated this. -Adjustment policies had inadequate env. and institutional components. RESULTS -Trade reform (tariff reduction and devaluation) increased soil erosion, deforestation, fishery exploitation, energy use, migration pressure, and demand for land, but improved incomes and income distribution. -Energy taxation decreases env. degradation, improves income distribution and BOP, but constrains economic growth. -Industrial subsidization promotes env. degrading sectors. -Resource rent taxation substantially reduces resource exploitation, reduces pressures on land, improves income distribution and BOP, and erosion-prone agriculture and aggregate output decline marginally. RECOMMENDATIONS -SAPs need to integrate informal sector responses (e.g., migration, ag. practices) and broad env. concerns more fully. -Resource rent taxes and env. charges, integrated with traditional adjustment measures, are required for sustainable development. -Trade liberalization's env. effects must be weighed against export gains. -Perverse industrial incentives in SAPs should be dropped. -Biases against sustainable ag. practices should be

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Philippines	Cruz & Francisco (in Munasinghe & Cruz, 1994)	-PE model -Historical	-Government management -Pricing policies -General	-Deforestation -Ag. practices	RESULTS -Industry-led growth strategy (pre-SAP) penalized lowland agriculture, while growth strategy failed from mismanagement. Ensuing poverty and poor labor absorption resulted in upland migration and forest conversion. -Forestry programs, tenure and market reform are lacking.
Philippines 1980s	International NGO Forum (1992)	Historical (cursory)	-General -Trade liberalization	-General	FINDINGS -Ag. price reforms have de-intensified commercial agriculture. -Tight monetary policy and lack of rural credit has forced smallholders off land, worsening rural poverty and degradation of common resources. -Oil subsidy cuts have decreased env. degradation in formal sector, but may have negative effects in informal sector.
Poland 1970-1991 (proj. to 2010)	Bates, Gupta & Fiedor (1994)	-LP model (dynamic optimization) -Analytical -Historical	-Pricing policy -Institutional change	-Energy use -Air pollution	RESULTS -Energy pricing reform results in lower energy intensity across all productive sectors, but industrial growth will entail higher aggregate consumption. -Per capita energy consumption will likely increase with rising incomes. -Pollution intensities will fall with reforms, and aggregate levels of sulfur dioxide, nitrogen oxides, and particulate matter (the biggest health threat) are projected to fall. Carbon dioxide emissions will increase. RECOMMENDATIONS -Institutional reform is required for env. policies to be effective.

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Poland 1980-1982	Zylicz (in Kierzkowski et al., 1993)	-Historical -Analytical	(from market transition) -Recession -Trade liberalization -Taxation	-Air pollution -Water pollution -Hazardous waste	FINDINGS -Initial decrease in industrial production from recession caused a temporary decrease in air and water pollutant emissions from industry. -World Bank projections showed that air pollution will increase due to increased industrial production from structural adjustment. -Liberalized trade, without appropriate environmental regulation, allowed excessive "imports" of hazardous waste. -PPP would presently shut down too many industrial plants and must wait. RECOMMENDATIONS -Reforms must be accompanied by policies such as decentralization, stronger property rights, emissions markets, pollution control subsidies, and, only when industry becomes competitive enough, Pigouvian taxes.
Sri Lanka (proj. to 2010)	Meier et al. (in Munasinghe & Cruz, 1994)	-PE model	-Energy pricing -Energy policy	-Greenhouse gas (GHG) emissions	RESULTS -DSM (demand-side management) would be a difficult and non-comprehensive strategy for reducing GHGs, whereas pricing reforms would be easier and have better net impact for the environment. -Carbon taxes will be effective as energy demands increase over time.

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Tanzania 1980-1990 (proj. to 2010)	WWF/ODI (1994)	-Conceptual model -Econometric projections -Survey data	-Pricing policy -Tax policy -Trade liberalization -Institutional reform	-Deforestation -Soil erosion -Other general	FINDINGS -Reforms have promoted extending ag. margin, while increased input prices and limited technology access have discouraged intensification. -Poor ag. extension and land law have not been addressed. -Inappropriate incentives still promote deforestation and soil erosion. RESULTS -Present SAP policies will increase income and power inequality, while inducing env. degradation in the informal sector. -Lack of internalized env. costs will lead to overexploitation of resources, with only short-run gains for the elite. -Alternative sustainable SAPs (including subsidized ag. inputs, tariffs on polluting inputs/industries, public expenditure stability) would slow increases in air pollution, energy and water use, while reducing deforestation, biodiversity loss, and soil erosion. RECOMMENDATIONS -Objectives of SAPs should include participatory development, govt. accountability, assistance for vulnerable groups, and integration of env. and social factors. -Pacing and sequencing reforms with priority to social sector restructuring and institutional strengthening is advised. -Parallel policy priorities include ag. extension, land tenure reform, logging/industrial taxation and regulation, wildlife protection, energy efficiency R&D, and improved credit for small farms and enterprises.

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Thailand	Panayotou & Sussangkarn (1991)	-CGE Model (90 sector) -Analytical -Historical	-General market -General institutions -General policies MODEL -Reducing export taxes -Increasing oil prices -Promoting labor-intensive manufactured exports -Promoting tourism -Reducing public expenditure	-Land use -Pollution -Poverty -Population	FINDINGS -Industrial export-led growth has sacrificed env. integrity. -Adjustment policies have failed to account for env. externalities. -Population and poverty issues are equally crucial development variables. -Institutional (e.g., land tenure, enforcement), market, and policy failures account for most unsustainable development practices. RESULTS -Cuts in rice and rubber export taxes stimulated agriculture at the expense of industry and service, reducing pollution and tourism-related degradation, but with mixed env. effects for agriculture. Rice is chemically intensified (-), but entails more investment and improvement. Rubber is extensified onto some marginal areas (-), but replaces some more erosive crops in already cultivated lands (+). -Oil price increases generally reduce energy intensity and use across most sectors, thus reducing pollutant emissions. -Increased labor-intensive exports entail generally less aggregate pollution and degradation, but often contribute to toxic and water pollution. -Tourism effects include ag. reduction (+), transport increases (-), and accelerated coastal and mangrove destruction (-). More research needed. -Public expenditure reduction reduces urban and industrial pollution, but increases resource depletion, deforestation, and ag. pollution.

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Tunisia	Mink & Partow (in Munasinghe & Cruz, 1994)	-PE model -Historical -Analytical	-Pricing policies (in livestock sector)	-Rangelands -Desertificatio n -Soil erosion	RESULTS-Pricing reforms will have differential effects on livestock production across regions, though they are likely to balance livestock with agriculture. -Higher beef prices will likely increase the herd size, causing further pressure on already marginal lands. RECOMMENDATIONS -Structural adjustment policies have not adequately accounted for the environmental externalities of the large livestock sector.

MATRIX TWO. SELECTIVE OVERVIEW OF STUDIES

Venezuela 1989-1993 (proj. to 2003)	WWF/HIID (1994)	-Macro model (CGE -Historical -Analytical	-(not well specified) -Trade liberalization -Currency devaluation -Pricing policies	- Urban environment -Land use -Pollution -Parks	FINDINGS -Despite compensatory social programs, adjustment policies have worsened social conditions and degraded the urban environment; rural env. effects are unclear. -Poor coordination and enforcement of public agencies have negative env. effects, particularly with regard to the oil industry. -Reforms gave lower priority to env. objectives. -Env. legislation and enforcement need strengthening and reform. -NGO/collective action has been undermined by adjustment process. -Env. expenditure cuts and privatization have had mixed env. effects. -Park system cuts, mining pressure, and informal ag. encroachment/exploitation may be threatening protected areas. RESULTS -A pure free market reform scenario displays far worse env. outcomes than exchange control or exchange control and redistribution. -Institutional and env. policy reform might change above result. -Sociopolitical feasibility analysis reveals that env. conservation would respond positively to increased oil revenue, negatively to foreign capital inflows, and insignificantly to social peace, alternative technology, institutional stability, or "pressure from the IMF."

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Vietnam 1986-1993	WWF/HIID (1994)	-CGE model -Historical -Analytical	-Trade liberalization -Pricing policy -Property rights -Direct foreign investment -Development assistance	-(De/re)forestation -Land use -Waste -Water & air pollution	RESULTS -Labor- and technology-intensive, rather than energy-intensive, industry would reduce waste, air & water pollution problems. -Continued macro stability and reform will promote sound resource management, especially when combined with appropriate price policy. RECOMMENDATIONS -Ag. policy & investment must balance that of industrial promotion. -Property rights reform, internalization of env. costs, and regulation are all necessary preconditions for sustainable growth with reforms. -Market-based env. policy should be pursued, but with enforcement and, where necessary, regulation to prevent irreversible env. effects.
Zambia 1985-1993 (proj. to 2010)	WWF/ODI (1994)	-CGE model -Econometric projections -Analytical -Historical	-Pricing Policy -Public management -Regulation -Trade liberalization	-Deforestation -Biodiversity -Water pollution	RESULTS -Adjustment policies should lead to less investment in commercial agriculture, but more shifting cultivation and rural migration. -Poverty and inequity have been exacerbated by adjustment, but it is "hoped" that future reforms will treat those issues. -Woodfuel gathering will exacerbate deforestation unless electric sources are subsidized. -Wildlife/env. programs may reduce poaching and pollution, but funding and institutional viability are key factors. -Demand reduction policies should be pursued only insofar as they are shown to improve social welfare. They are not an end, but a means. -Adjustment policies have failed to account for the lack of pre-existing markets and effective institutions, thus contributing to waste and damage.

MATRIX TWO. SELECTIVE OVERVIEW OF STUDIES

Zimbabwe 1991-1992	International NGO Forum (1992)	-Historical (cursory)	-Trade liberalization -Currency devaluation -Price reform -Public expenditure	-Ag. practices -Water resources -General	FINDINGS-Fiscal austerity and rising food prices from devaluation exacerbated hunger and poverty during a major drought, triggering further encroachment on marginal lands and mismanagement of water resources. -Lack of land reform favors wealthy, white landowners while worsening environmental conditions and poverty for rural blacks.
Zimbabwe	Muir, Bojö & Cunliffe (1994)	-Analytical -Historical (some basis on BCA's)	-Currency devaluation -Fiscal & monetary policy -Land tax -Pricing policy -Trade controls	-Wildlife management -Land use	FINDINGS -Devaluation corrected market distortions (on imported inputs) and increased access to foreign exchange, boosting wildlife tourism and hunting activities -- presumably an incentive toward better resource management. -The lack of fiscal responsibility and low priority afforded to resource management programs continues to adversely affect the environment. RECOMMENDATIONS -A proposed land tax should increase land utilization and may be biased toward intensive agriculture, with probable negative env. impact. -Pricing reform for beef would reduce the herd and its impacts. -Substantial institutional and policy reform are needed.

MATRIX TWO. SELECTIVE OVERVIEW OF STUDIES

REGIONAL STUDIES

Africa 80s-90s	Krugmann (1994)	-Historical	-General adjustment policies -Trade liberalization	-Desertificatio n	RECOMMENDATIONS -Env. data must be collected and policy analyses must be multidisciplinary, integrating env., social, and economic issues. -Pricing policies and general reform should account for env. externalities. -Small-scale, labor-intensive ag. and enterprise should be promoted. -Pastoral economies should be balanced with ag. export promotion. -Harmonization and institutional reform are vitally needed. -Participatory development and apt institutions should be sought. -Internalization, participation, harmonization, and attention to vulnerable groups/sectors are also required for effective trade liberalization. -Regional integration and intra-African trade should be promoted. -Env.-friendly tourism should be a priority sector for some countries. -Community access to information should be facilitated and communications control should be liberalized. NGO/grassroots can be integral.

MATRIX TWO. SELECTIVE OVERVIEW OF STUDIES

sub-Saharan Africa 1980s	Cheru (1992)	-Historical -Analytical	-General adjustment policies	-General	RECOMMENDATIONS -Land reform and rural development strategies, emphasizing diversification and local consumption, should have priority. -Ag. institutions, such as extension, research, marketing and credit, should be developed, strengthened, and reformed -- not cut. -Access of poor to infrastructure, technology, education and services, especially for resource management, must be improved. -Govt. efforts should integrate efforts with NGOs and cooperatives. -Reproductive health and women need greater emphasis in rural areas. -Labor-intensive, diversified, sustainable agriculture needs promotion. -Debt relief should be conditioned on sustainability and democratization. -Local governments should be held accountable for above reforms.
sub-Saharan Africa	Adams (1992)	-Historical	-General adjustment policies -MDB structure and practices	-General	FINDINGS -World Bank and IMF are not subject to public scrutiny or private market discipline, and have thus made environmentally, socially, and economically irresponsible judgements in adjustment lending. -A vicious circle of lack of accountability for the MDBs and dependency of LDCs promotes liquidation of natural resources, lack of attention to human and natural capital investment, and general unsustainability.

[Note: Gender and environment studies to go here, as well.]

THEORETICAL OR IMPACT-SPECIFIC STUDIES

MATRIX TWO. SELECTIVE OVERVIEW OF STUDIES

(theoretical)	Barrett (1992)	-Optimal control model	-Input/output price changes -Discount rate	-Soil erosion	RESULTS -Input and output price change effects on soil conservation cannot be generalized and are site- and technique-specific. -Contrary to Barbier's (1988) finding that higher discount rates discourage soil conservation, these results are ambiguous. -Generalizations about adjustment reforms and soil conservation often ignore farmer incentives for conservation or depletion. -Soil erosion is not necessarily suboptimal, but externalities need to be borne by soil depleters to achieve optimality.
(theoretical)	Girma (1992)	-Dynamic macro & micro model -Benefit-cost analysis	-Monetary policy -Fiscal policy -Market reforms -Institutional reforms	-General	RECOMMENDATIONS -Env. sector can and should be integrated with other sectors in macroeconomic models. -Market failure should be accounted for to avoid policy failures. -Research should be undertaken to inject env. factors into CGEs. -Institutional reform is necessary for env. market efficiency, and env. market intervention should be only a second-best resort. -Env. CBAs should accompany env. impact assessments.
(various LDCs)	Martens (1989)	-Legal -Analytical	-General	-Deforestation	RECOMMENDATIONS -Environmental SALs should be formulated, specifically focusing on, rather than marginalizing, resource concerns. -Key features of said programs would be participatory planning, Bank flexibility, NGO participation, and strict enforcement procedures.
(African LDCs)	Due & Gladwin (1991)	-Analytical -Discussion	-General	-Gender and environment	FINDINGS -Since gender division of labor rules force women in African LDCs to produce mostly nontradable goods, SAPs are biased against female welfare, production and productivity.
(various LDCs)	Mehra (1991)	-Analytical -Discussion	-General	-Gender and environment	FINDINGS -SAPs have restricted their own success by ignoring structural constraints and production demands on women farmers. More attention to female nonmarket productivity can yield high returns.

MATRIX TWO. SELECTIVE OVERVIEW OF STUDIES

OVERVIEWS AND META-ANALYSES (in chronological order)[7]

(various LDCs)	Hansen (1988)	-Historical -Discussion	-General	-General	FINDINGS -Traditional treatment of environmental issues in lending, in a project-by-project framework, is inadequate; integration of environment in macro policy will be more manageable and effective. -Neither structural nor sectoral adjustment loans have sufficiently targeted environmental objectives. -The environmental ramifications of adjustment's effects on poverty, agricultural practices, migration, infrastructure, and fiscal austerity may be reasonably approximated and integrated into policy planning. -Further research, data collection, and information dissemination are paramount in this area. -Political feasibility and commitment are prerequisites for effective policy implementation. -Global commons issues and external terms of trade must also be considered and addressed.

[7] Publications in which the main body of analysis involves country studies have been broken down by country and included in the "Country Studies" section.

MATRIX TWO. SELECTIVE OVERVIEW OF STUDIES

(various LDCS)	Sebastian & Alicbusan (1989)	-PE models (for 43 countries) -Historical -Meta-analysis	-General	-General	RESULTS -In aggregate, SAPs may have a net positive impact on the environment through correcting market failure, enabling market mechanisms, and reforming institutions. -Price adjustments (e.g., changes in subsidies, taxation) in agriculture and energy have had positive environmental effects where resources have shifted toward less-degrading activities. -Programs, policies, and trade arrangements which have introduced, promoted, or opened channels for new technology and techniques in agriculture or energy conversion imply efficiency and sustainability gains. -Devaluation can inhibit new technology and capital imports (-) and may require complementary trade or pricing policies to promote environmentally sustainable technology transfer or investment. -Public expenditure reductions may reduce aggregate demand (+), cut environment and agriculture programs (-), or exacerbate conditions of poverty (-). -Institutional reforms in marketing, land use, land tenure, and conservation will have positive effects. RECOMMENDATIONS -Current policy measures can be "modulated" to meet environmental objectives. -Environmental policy formulation must consider institutional changes, input price composition and responses, responses to incentives (elasticity estimates), fostering environmentally benign technology use, and effectively channeling information and market signals. -Analytical frameworks should include the interactions of political, technological, and macroeconomic factors with all productive assets -- including the environment -- in an economy.

MATRIX TWO. SELECTIVE OVERVIEW OF STUDIES

(various LDCs)	Hansen (in Winpenny, 1991)	-Discussion -Meta-analysis (of 93 World Bank and ADB structural adjustment programs)	-General	-General	FINDINGS -Across-the-board public expenditure cuts may have positive environmental effects through reducing harmful infrastructure projects and subsidies, but may exacerbate poverty and resource destruction in the informal sector. -Cuts in environmental programs will probably be harmful. -Increases in ag. output from liberalization may conserve soil (if tree crops are grown) or deplete it (if cash & food crops are grown). -Increased ag. output prices should encourage better stewardship, but may increase cultivation intensity and extent. -Increased ag. input prices may induce land conservation. -Increased energy prices may reduce pollution & use, but may induce exploitation of open access resources or harmful energy substitutes. -More data are needed on interactions between formal & informal sectors.
(various LDCs)	Killick (in Winpenny, 1991)	-Discussion	-General	-General	FINDINGS (PROS) -Macro stability reduces economic uncertainty, promoting more predictable policy responses and better resource management. -Good macro management should achieve higher living standards, decreasing the tendency to mortgage the future to serve basic needs. -Stability promotes "pro-future," rather than short-term "crisis-driven" policy. FINDINGS (CONS) -Structural shifts from non-tradeable to tradeable tend to increase pollution, non-renewable resource use, and ag. intensity. --Short-term macroeconomic targets put env. objectives at a lower priority. --Privatization/deregulation weakens potential for mitigating externalities. -Shifts in power structure and philosophy favor capitalists & industrialists, making regulation and taxation of same more difficult politically.

MATRIX TWO. SELECTIVE OVERVIEW OF STUDIES

(various LDCs)	Reed (1992)	-Meta-analysis -Case studies (3 countries) -Discussion	-General	-General	RECOMMENDATIONS - - - - -
(various LDCs)	Markandya & Richardson (1993)	-Meta-analysis -Discussion	-General	-General	FINDINGS -Public expenditure cuts may intensify rural poverty and shrink ag. and env. programs, but demand reduction may reduce resource exploitation in the formal sector. -Taxation will have mixed effects, depending on subsequent public expenditure and on implicit resource use incentives. -Devaluation shifts resources toward exports. Env. effects depend on specific products and production practices induced. Both resource exploitation and conservation incentives are introduced. Increased import prices for env. damaging inputs will discourage their use. -Trade liberalization will have mixed ag. env. effects depending on changes in land use, but may facilitate efficient technology imports in ag. & industry. -Pricing policies(controls, subsidies, etc.) will have positive effects insofar as they reflect env. externalities and remove env. damaging distortions. -Financial reforms have mixed effects, depending on responses in savings and investment. Above criteria apply to consumption/production responses. -Land reform will promote sustainable practices if tenure security is established and may reduce encroachment if distributed to poor. -Research and extension will enhance land management and communicate some benefits of freer markets to rural agriculture. -Project investment policy effects depend on env. nature of projects.

MATRIX TWO. SELECTIVE OVERVIEW OF STUDIES

(various LDCs) 1979-1987	Warford, Schwab, Cruz & Hansen (1994)	-Historical -Discussion	-General	-General	FINDINGS -Structural adjustment is a necessary and perhaps sufficient condition for environmentally sustainable development. -The environmental failings of early-80s SAPs have been addressed - and many reversed. -MDB staff require training in the interplay of macroeconomics, adjustment, and the environment. -Policymakers need to be more aware of the physical and cultural context in which SAPs are implemented. -Government policy failure currently inhibits the environmentally beneficial potential of SAPs. -Priority must be given to policies that address economy and environment simultaneously.

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