

# **A Critical Review of the Literature on Structural Adjustment and the Environment**

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## Abstract

This paper analyzes the available literature on the effects of structural adjustment programs (SAPs) on the environment whilst looking for convincing evidence on their success or failure. The studies covered refer to structural adjustment lending (SAL) programs by the World Bank as well as to general government structural adjustment programs with similar policy implication. SAPs are designed to reform economies to a more export-oriented and liberalized market economy while downsizing governments that have become inefficient bureaucracies. Because of the implications of such policies for debt accumulation and trade, a concise literature review on debt and trade liberalization is also included.

Most of the studies reviewed are not quantitative and often have not applied rigorous statistical methods. Panayotou et al. (1996) breaks down the research approaches employed in the literature into several categories: (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).

Opschoor et al (1996) points out that the various evaluation methods are hampered due to differences in context, sector focus and stage of the adjustment process. The results of the inquiry on the effects of adjustment policies are strongly influenced by what is examined, at which sectoral level and at what stage of the adjustment process. Adjustment programs are considered to have negative as well as positive effects – depending on the focus of the analysis. There are also issues in differentiating the effects of SAPs from underlying economic and social developments.

Due to the diversity of impacts on the environment from SAPs, most authors are unable to draw firm conclusions on their overall success or failure, but instead pinpoint the more common impacts and the most likely scenarios. However, the net result of the available studies and reviews is that the negative environmental impacts resulting from SAPs exceed positive impacts (Kessler et al 1998).

# 1. Introduction

Since the beginning of the 1980s the World Bank and the International Monetary Fund have introduced structural adjustment loans and stabilization programs to correct balance-of-payments distortions and to realize the conditions necessary for economic growth in developing countries (Opschoor et al 1996). Structural adjustment programs (SAPs) are designed to reform economies to a more export-oriented and liberalized market economy while downsizing governments that have become inefficient bureaucracies. They consist of combinations of exchange-rate policies, monetary and interest, fiscal, trade, public-sector and institutional policies. The main instruments are price reforms, trade political measures such as liberalization and devaluation, reduced government expenditures as well as removal of institutional obstructions to flexible responses of the private sector (Sebastian and Alicbusan 1989).

The review starts by looking at recent, more quantitative methods of analyzing the effects of SAPs, then at evidence of the environmental impacts of sectoral measures of the programs, next at debt accumulation and trade liberalization, and concludes by presentation of country case-studies and policy analysis of SAL programs of the World Bank.

## I. General Methodologies

### 2. Methodologies for Evaluating Effects of SAPs on the Environment

This section presents some recent models that have been developed to estimate the effects of structural adjustment on the environment.

#### 2.1. Strategic Environmental Assessment

The methodology for Strategic Environmental Assessment was developed by Kessler and Van Dorp (1998) and is aimed at generating specific conclusions for variable ecological regions and social groups. The analytical framework emphasizes:

- the environmental quality of soil, water, and forests and the requirements for their sustainable use;
- the environmental regulation or stabilization functions of these resources and the consequences of these impacts on human society (instead of solely short-term productive assets);
- the long-run consequences and thresholds of environmental degradation for different human systems using these resources.

The analysis combines both quantitative and qualitative methods. Quantitatively, the study compares the environmental indicator trends for the different types of water, soils and forests, with the social and economic indicators that are directly influenced by SAP measures. For example, the implementation of SAP measures coincides with a decline in the use of fertilizers in low external input agriculture and an increasing

consumer price index providing evidence of a relationship between SAP implementation and future soil depletion. Qualitatively, this paper incorporates the findings and developments of case studies. Difficulties with the model include:

- shortage of reliable quantitative data. In particular, long-term data, state indicators of environmental qualities, and data on issues related to regulation, diversity and cultural functions of natural resources;
- the absence of regional statistics. National statistics can hide important regional variation and are often inadequate to understand specific dynamics;
- uncertainties with respect to 'SAP implementation gap' in the nine countries reviewed;
- the short period since major SAP measures were implemented.

The analysis yields some interesting results:

1. In situations characterized by high external-input agriculture (HEIA) and in areas with high agricultural potential, SAPs have positive impacts by reducing environmental pollution. Here, the declining subsidies on agro-chemicals have led to reduced over-use of fertilizers, pesticides and machinery. This reduction in subsidies has also stimulated the adoption of more environmentally sound practices such as integrated pest management (IPM) and zero-tillage. SAP measures have further reduced pollution in these areas by the dismantling of highly inefficient parastatals (e.g. cocoa board in Cameroon). However, in situations characterized by low external-input agriculture (LEIA) and in areas with low agricultural potential identical SAP measures have resulted in negative impacts by reducing already low levels of external inputs. This forces farmers to increase use of organic matter and over exploitation of soil fertility (causing soil mining and soil depletion) or expanding croplands (causing deforestation).

2. SAPs have stimulated the expansion of cash crops, which may in turn increase the feasibility of external inputs and technology. This can also lead to increased deforestation and excessive pesticide use. An example of the first response can be seen in Mali (see Giraudy et al, 1996). The second negative development occurs with cotton in El Salvador. Land tenure, agricultural extension, the diversity of the agricultural system and the value of forest functions for local communities appear to be underlying key factors.

3. In some countries, SAPs have stimulated rural emigration through deteriorated agricultural input/output ratios and the enhancement of opportunities in urban areas, resulting in reduced rural pressures but increased urban pressures. In other countries SAPs have had the reverse effects, stimulating urban emigration due to increased urban unemployment. The result is increased rural pressures such as encroachment of marginal lands. Cultural and social ties, living standards and the relationship between rural and urban incomes and social services appear to be underlying key factors.

4. SAPs have stimulated the erosion of livestock levels in the short run due to a reduction in their value and trade liberalization resulted in reduced environmental pressures. However the opposite effect has been observed in high potential areas where land is easy to purchase and land management regimes are not put in place or respected (e.g. Venezuela).

5. The accelerated expansion of croplands and encroachment of marginal land already caused by population pressures is exacerbated by SAPs. This has resulted in

environmental degradation where fragile ecosystems are affected such as mountainous areas, semi-arid lands, coastal zones and wetlands).

6. There are examples of SAPs resulting in increased tree planting initiatives and improved local forest management regulations via increasing prices for fuelwood and energy sources, mainly in urban centers. However, tree-planting initiatives focus on the productive properties of trees, emphasizing the use of rapidly growing tree species in monocultures, while disregarding other forest services such as safeguarding biodiversity, preventing soil erosion, etc.

7. SAPs have accelerated the use of water resources for economic sectors such as industries, mining, tourism and irrigation, through the creation of dams and reservoirs.

## 2.2. Village Economy-Wide Model

“Village economies and peasant households represent the main link between the economy and the environment in sub-Saharan Africa, because the environment or natural resource base is a key input in their production systems. Holden et al (1999) presents a typology of village economies and village economy-wide models. The framework is applied to a specific case of a remote Zambian village that is characterized by a missing or negligible labor market, input supply constraints and credit rationing. The impacts of external shocks including SAPs, on cash-crop production and chitemene (shifting cultivation) are then examined. The findings indicate that structural adjustment policies, by decreasing the profitability of maize production, may encourage households to increase their chitemene production, resulting in more rapid deforestation” (Holden et al, 1999; 69). The changes predicted by use of the model are close to responses stated by farmers in a survey of 150 households.

## 2.3. Social Dimension

The following approach is developed by Reed (1996b). It stresses the need to understand the processes through which SAPs affect the environment. SAPs rarely affect the environment directly but their effects are transmitted through society via changing class structure, shifting social relations and evolving institutions. Two case studies on Venezuela and El Salvador (respectively p. 27 and p.26 in this study) are presented. By noting the effects of migration, poverty, NGOs, social relations and inequities, a clearer reading of the environmental impacts of adjustment becomes possible. Because social relations in adjusting societies change, such reforms can have negative long-term environmental impacts, e.g. in Venezuela, urbanization has severely intensified urban environmental degradation, and in El Salvador, watershed management has deteriorated dramatically because of consolidated social and economic relations that generated the environmental crisis. These two examples also raise questions about the viability of the World Bank’s current win-win strategy. That strategy encourages policy makers to give priority to policy reforms that increase economic efficiency while also generating positive environmental changes. The examples of Venezuela and El Salvador oblige analysts to ask what impact apparent win-win interventions have on the social fabric of adjusting countries that in turn, can possibly generate negative environmental impacts.

#### 2.4. Second Best Theory

Maler and Munashinghe (1996) seeks to develop a basic analytical framework to trace the environmental impacts of macroeconomic policies, particularly to identify where unforeseen negative environmental effects may occur, and to design remedial measures. Three case studies are summarized to illustrate how macroeconomic policies might combine with local imperfections to harm the environment. The first case study is on Botswana by Unemo (1996), which is discussed in more detail later in this paper (see p. 23-27). The second, Lopez (1993) focuses on Ghana and concludes that in general, price and wage policy reforms that do not include changes in land management practices have very limited impact on national income, once the existence of land quality effects is considered. The last case study is on Morocco by Goldin *et al* (1994)<sup>4</sup> and establishes that trade liberalization combined with reformed water prices induces substantial reductions in agricultural water use and an increase in GDP. Thus, Maler *et al* (1996) concludes that the first-best remedy is to eliminate the subsidiary imperfections such as policy and market failures, without changing macroeconomic policies. This conclusion should be treated with caution as the case studies focus on only a couple of market implications whereas a real economy produces many obstacles to the success of the SAP with respect to the environment.

#### 2.5. Four Dimensional Analysis

Cromwell and Winpenny (1993) propose a simple structured approach to analyzing the environmental effects of economic reform with the focus on four dimensions: spatial coverage, scale of production, product mix and production techniques. The method allows extensive analysis, incorporating data, anecdotal evidence and structural limitations to provide an overall picture. The study concludes that economic reforms appear to have had an initial negative impact on the environment in Malawi, particularly on the crop mix and intensity of production. This is attributed to the already relatively fragile environmental base and underlying structural factors, such as inability to change production technique. The study reveals the insensitivity of adjustment loan prescriptions to local conditions. The authors qualify their conclusions as tentative because of unreliable data in some areas and the absence of data in other areas, primarily for certain economic indicators such as migration patterns and changes in agricultural price and input/output ratios.

#### 2.6. Integrated Market for Natural Resources Approach

Girma (1992) proposes a framework for examining macroeconomic policy effects on incentives and constraints in the environmental sector and an approach for adapting cost-benefit analysis of policy to incorporate sustainability concerns. Previous analysis has concentrated mostly on examining the natural resources market in isolation from the rest of the economy whereas the central idea of this paper is that markets for natural resource services should be incorporated in an integrated macroeconomic framework. Natural resource services are treated as a representative good which is both productive inputs and a consumer good. The environmental sector is modeled in the same way that other sectors are modeled in modern macroeconomics. The study does not provide an empirical example of the theory.

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<sup>4</sup> Study summarized on p. **Error! Bookmark not defined.**

## 2.7. Accounting for Chaotic Effects

Mearns (1991) does not propose a specific framework for analysis, but challenges the standard model of structural adjustment–environment linkages on five major counts. The first challenges “the pretensions of neoclassical economics” that it is a predictive science. The next three challenges all refer to the omission or relegation of the following concepts relevant to a full understanding of economic system–environment interactions: historicism (irreversible time and evolutionary change); scale limits and finally, access to or distribution of resources. The fifth and final point concerns the inadequate way that environmental change is conceptualized within the model with respect to uncertainty, chaos and nonlinearity, which allow random incidental effects to produce significant environmental changes.

The author concludes that structural adjustment–environment linkages require multiple and comprehensive analyses accompanied by extensive discussion between experts and individuals affected. Without detailed information on constraints within particular livelihood system, explanatory models are unable to anticipate the likely environmental consequences of policy reforms.

Logic and reference to non-economist studies support the argument. An example from Malawi highlights the point that a female small-holder, who has the majority of income originating from non-farm activities, will not invest effort into soil conservation if fertilizer essential for self-provisioning food is too expensive. Only by acknowledging the multi-faceted problem can a possible solution such as providing environmentally benign off-farm employment be achieved.

## **II. Sectoral Analyses**

### **3. Agriculture**

The following section summarizes key findings in the literature for the agricultural sector. The environmental impacts are primarily a result of substitution effects in crop production, changed pressure on the land due to the income effects of the reforms, restructuring of land tenure rights and credit availability.

#### **3.1.Substitution effects**

Agricultural policy reforms within SAP usually encourage a shift from the production of subsistence crops towards cash crops. Some evidence is emerging of changes in the types of crops cultivated under the adjustment period in Kenya (Richardson, 1996). The author says that it is difficult to attribute these changes solely to the economic reforms, but the switching effects which are consistent with the direction promoted under the reform process include the movement from maize towards high-value dairy farming and horticultural crops, particularly in land-scarce areas. The environmental impact of these changes is mixed. Greater regional specialization in maize production is likely to be environmentally benign, but will also increase the vulnerability of small farmers unless there is a significant improvement in maize marketing.



Movement towards dairy farming and horticultural crops were found to have had mixed environmental impacts, depending on the underlying technology and farm management practices. The reform program has failed to intensify agriculture as was originally planned. Constraints created on the use of chemical fertilizers and credit have encouraged manure use and composting. In some areas, sustainable increases in crop yields have been achieved by improved land and water management rather than via the adoption of 'improved inputs'. For example, in Machakos District there has been considerable investment in soil and water conservation, particularly in areas given over to high-value crops where tenure rights are secure. The area has also benefited from considerable research, training and extension, and long-term donor assistance in soil and water conservation. The author stresses that more information is needed for a plausible prediction of the supply and environmental response to changing economic incentives at the macro level.

### **3.2. Income effects**

Postigo (1996) argues that countries which have undergone SAPs have experienced economic stagnation accompanied by increased suffering on the part of the poorest of the population, which seems to be the result of extraordinary effort needed to meet the pressure from WB and IMF to service the external debt. If the link between poverty and environmental degradation is assumed, the author continues, then it could be concluded that since SAPs increase poverty, they have a negative impact on the environment. The paper notes, however, that previous government policies equally failed to solve the problem of poverty and that the actual impact of SAPs on the environment does not alter this situation.

Mackenzie (1993) makes a similar point regarding income effects of SAPs. The author stresses that the group responsible for the management of the natural resource base in agriculture is not targeted by the instruments of SAPs, and as a result experiences a negative income effect. There is evidence to link increased stress on women farmers who have significant responsibility for management of the land and household reproduction with a tendency towards unsustainable exploitation of the resource base. The paper suggests that the implementation of structural adjustment policies frequently increases the emerging contradiction between land use management for agricultural production to ensure survival and the long-term sustainability of the resource base. Where there is a difference in gender access and control of land, livestock and decision-making within the household, women frequently pay a double subsidy to capital. This is due to the fact that they contribute to the production of commodities either without a wage, or with an inadequate wage, and to husbands who appropriate the proceeds of their labor. In such a situation, maximization of short-term economic gain through unsustainable mining of the resource base may outweigh the long-term consequences of this action. There are many examples of this "reproduction squeeze" emphasize that SAP instruments (usually subsidies and prices) do not reach to the women who have the responsibility to labor in the field.

Some authors go further than that and question not whether SAPs have improved income, but that a higher income does not necessarily bring about more sound agricultural practices. For example, Mukherjee (1995) argues that cultivators in developing countries, like India, do not modify their land management practices and systems easily because society (particularly in the rural sector) is to a large extent influenced by customs, traditions, usage and conventions. A change in the farming system and in the farm management practices cannot come about in response to increases in producer's price margin. In addition, cultivators with very profitable crops that are extremely erosive will not implement conservation measures unless their returns are perceived to be currently affected by soil erosion.

### 3.3. Land prices and tenure

“Land reforms programs which provide secure tenure to farmers can have indirect benefits for the environment. Where private land ownership is clearly established, farmers are more likely to grow perennial crops and adopt intensive, agroforestry methods in favor of traditional annual crops and extensive cultivation practices (Southgate 1988, Southgate and Pearce 1988)<sup>8</sup>. This in turn favors soil conservation efforts, since perennial crops tend to be less erosive. A shift to perennials can also reduce demand for chemical fertilizers, with potential health benefits (although the same is not necessarily true of pesticide use, since many tree crops require heavy application of toxic pesticides)” (Young et al, 1995; 9). The positive effects of the establishment of tenure rights have been well studied and confirmed in the literature. A more recent and quantitative paper by Person and Munashinghe (1996) analyzes the importance of tenure to deforestation and soil erosion in Costa Rica. The authors use a CGE model, which differs from the standard approach of CGE modeling by the inclusion of undefined property rights and by the modification of the functioning of the markets for logs and cleared land.

Three scenarios are developed. The current situation of undefined property rights is taken as the base case. In the second case property rights are defined and the opportunity value of forests is set 28 percent higher than the value derived from deforestation. The definition of property rights results in a dramatic decrease in deforestation and an increase in the net import of logs. Sensitivity analysis shows that even a relatively small opportunity value of forests decreases deforestation dramatically. Varying the interest rate while keeping the opportunity value fixed shows that high interest rates promote deforestation and vice versa. In the third scenario, the effects of taxes on logs, land, unskilled labor, and capital are investigated. Resources shift to the agricultural sector, which increases deforestation for land and increases total deforestation. The increase in total deforestation can be explained by the lower price of unskilled labor, resulting from the discontinued production in the forest sector.

The authors note several data and model. Because of various data adjustments, the results of the simulations are mainly indicative and not necessarily precise quantitative measures. Second, because the model developed in this chapter is essentially static, the results are comparative snapshots of different policy experiments. Thirdly, the approach does not include all possible linkages with deforestation. Migration and population

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<sup>8</sup> Summary of the papers taken from Bishop and Young (1995).

growth are two causal factors that may be important, but are not investigated. Furthermore, the model neither allows for re-afforestation nor includes erosion and other external effects of deforestation.

Similarly, Lopez (1993)<sup>10</sup> points that the common property regimes may have traditionally been sufficient to ensure sustainable use of agricultural lands, population increases and pressures to shorten fallow periods no longer allow land to regain its fertility. These traditional arrangements have been overwhelmed ultimately by economywide forces. The policy simulations in the paper by Lopez(1993) show the primary force of changes in “supply response in agriculture is that of expansion of land already cultivated rather than that of agricultural intensification. This results suggests that, in general macro price and wage policy reforms that do not incorporate changes in land management practices have very limited impact on national income, land quality effects have been considered” (Maler *et al*, 1996;118).

### 3.4. Agricultural credit

The aim of financial market reforms is often to increase the availability of credit to poorer, small-scale farmers<sup>13</sup>. One argument put forward by Mink (1992) is that credit facilities can stimulate a shift towards perennial crops, which are often result in less soil erosion but which small farmers traditionally avoid because of their long maturation period. “More generally, improved access to credit will lead to increased investment in farm improvements, greater use of modern inputs and higher levels of productivity.

On the other hand, increased availability of credit may encourage the expansion of cultivated areas allowing for intensification through more use of machinery and industrialized inputs, such as agro-chemicals. These allow farmers to recover more easily from declining natural soil fertility, reducing incentives for soil conservation in the short-term and contributing to the eventual exhaustion of land in the long-run. A notorious case of environmental destruction linked to the availability of agricultural credit is the expansion of cattle ranching in Brazil during the 1980s. Subsidized credit for large-scale ranching is identified by several authors as one of the most significant causes of deforestation in Amazonia during that period” (Bishop *et al*, 1995; 9).

The same conclusions are reached by Opschoor and Jongma (1996). The removal of credit facilities and subsidized interest rates may affect environmental quality if it leads to changes in the sectoral composition and that are not environmentally neutral. However, monetary and interest reforms may also contribute negatively to environmental quality in so far as credits and subsidies benefited environmentally damaging activities. An example of the latter can be found in Costa Rica where relatively cheap loans have made it possible for large areas of land to be used for large-scale cattle farming on largely unsuitable land (Foy *et al*, 1989). In so far as credits and subsidized loans support environmentally beneficial activities, the opposite effect will result.

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<sup>10</sup> As summarized by Maler and Munasinghe (1996).

<sup>13</sup> The following two paragraphs are extracted from Bishop and Young (1995).

## 4. Forestry

SAPs effects on deforestation trends have been analyzed recently primarily through the interaction with agricultural land expansion.

Barbier and Beghin (2000) investigate the impact of SAPs introduced in Ghana in 1983 on forests and biodiversity, directly through the proximate causes of agricultural land expansion and timber production and indirectly through output and input prices for cocoa, maize and timber. A piecewise linear estimation procedure which separated the pre-adjustment period from the post-adjustment period influences was used to estimate a recursive model. The model consisted of forest loss as well as cocoa land, maize land and timber production equations as a function of input and output prices developed from an optimal control problem. A species-index for Ghana was also estimated using a species-forest area relation.

The authors demonstrate that cocoa and maize policies undertaken under the SAP since 1983 have reduced the impacts of cocoa land expansion and to a lesser extent timber extraction on forest loss. Although little impact was found on the timber and harvesting trends, the relative returns to timber production have an important impact on the rate of deforestation and biodiversity loss in Ghana. More specifically, higher agricultural and timber prices, even where subsidies on inputs are removed, may have helped reduce demand for forested land and therefore have aided biodiversity conservation.

Glomstrod and Monge (1999) find, on the contrary, that SAP in Nicaragua has increased deforestation because of agricultural expansion. They investigate the impact of structural adjustment policies, advocated by the World Bank, on deforestation taking place when the agricultural frontier advances into forest reserves in Nicaragua. A computable general equilibrium model incorporating deforestation by squatters is used for policy simulations. The opportunity cost of migrating to the frontier does not simply depend on wage income opportunity, but also on market prices of basic grain which determine the capacity to consume beyond subsistence food-level given a certain real wage. The first scenario with reducing public expenditures both conserves forests and enhances economic growth, while showing positive distributional effects. Noticeably, there are policies which initially intensify deforestation, but turn out to ease the pressure on forests over time. authors conclude that rapid economic growth does not ensure less pressure on forest reserves.

The fact that increased agricultural output prices lead to deforestation is confirmed by one more study. Angelsen et al (1999) empirically examine the role of agricultural output and input prices, the connection between income and changes in resource use, and the effects of technological change. In the review of previous studies on deforestation, the authors mention that Sankhayan<sup>21</sup>'s model of the Southern Highlands

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Review taken from Bishop and Young (1995).

<sup>21</sup> Sankhayan, P.L. 1996. "Effects of structural adjustment programs on cropping pattern and environment – a study in the Southern Highlands of Tanzania", *Structural Adjustment Policies and Environmental*

suggests that the SAP is likely to increase pressure on forest resources, as more wood for curing is required to meet increased tobacco production. To clarify the cause of deforestation, two different models of agricultural land expansion are discussed in the current study: the subsistence (population) approach (SA), and the market (open economy or profit-maximizing) approach (MA). The SA and MA refer to different assumptions made about household behavior and the labor market, the latter being the most important. In the SA no labor market exists, whereas a perfect labor market is assumed in the MA approach. The subsistence approach seems to dominate the thinking on the causes of and remedies for deforestation within the development aid community. A main policy recommendation according to this approach is population control and agricultural intensification; increased productivity will reduce the deforestation pressure. The MA approach, on the other hand, emphasizes the importance of alternative employment. It also highlights the counter-productive effect on deforestation from intensification programs that increase the profitability of agriculture close to forests. The major result of the regression analysis is that producer prices, in particular of annual crops, are important factors in encouraging the expansion of agricultural. A more complex Chayanovian<sup>22</sup> model with subsistence requirements and imperfect labor and credit markets would provide a more realistic description of farm households' behavior and the constraints that they face. A significant conclusion from this study is that increases in productivity and/or output prices in Tanzanian agriculture have the likely result of more forested areas being converted to agricultural land. Recent economic liberalization has increased agricultural output prices to which Tanzanian farmers have responded by increasing agricultural area and production. The authors warn that results of the study should be interpreted with great caution due to issues with data quality.

## 5. Wildlife-based Sector

SAPs affect the wildlife-based sector (e.g. wildlife tourism) by encouraging openness and by shifting relative prices, making other sectors economically unattractive.

A study on Kenya finds that the wildlife sector has been indirectly affected largely via the exchange rate and public expenditure cut-backs (Richardson 1996). The author analyzes reforms supported by the World Bank, which were not included in the SAL/SECAL program of the Bank, but are regarded as "adjustment type" support, because of their conditional nature and emphasis on the generation of foreign exchange and the need for institutional and pricing reforms. Over the period 1980-1989, the exchange rate reforms have increased the demand for wildlife services, but at the same time the capacity of the sector to manage the wildlife resource effectively has been seriously eroded by the pattern of public expenditure cut-backs. The sector has now been targeted for institutional and management reforms, and substantial investments are being made in the physical and human capital. The emerging short-term evidence suggests, the paper notes, a substantial improvement in wildlife management.

In contrast, Munashinghe *et al* (1994) study of Zimbabwe concludes that wildlife-based activities are better for the environment. The wildlife replaces cattle ranching under

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*Degradation in Tanzania, Zambia and Ethiopia*, Preliminary Seminar Report, 9-10 January, Agricultural University of Norway, Aas.

the new policies of openness. Considering the carrying capacity of the arid soil and the vested interest people have in preserving the environment for wildlife based activities, the author concludes that a shift to wildlife sector actually helps improve the ecological balance in the country. The study does not however discuss the possible negative effects of further expansion of the wildlife-based sector, such as large-scale tourism practices.

## 6. Energy

The energy sector is the only one in which the structural adjustment influence has been unquestionably positive. The study that best confirms this is Meier *et al* (1996). The study presents a multi-criteria model linking the financial to the technical representation of the energy sector with demand and supply modules for each major subsector. The model concludes by feeding the investment requirements for capacity expansion back to the financial module. Thus, adjustments in the capacity expansion plan feed back automatically into the asset and liability accounts of the financial statements. The model thus achieves a completely consistent set of prices, demands, technical sector configuration, investment and financial representations of the major sector institutions which permits simulation of a wide range of policy options<sup>25</sup>.

Three pricing scenarios are designed. A first is a 'business as usual' scenario, in which the tariff is set in such a way as to maintain the historical average of 3 % return on equity. The second tariff policy is based upon an 8 % rate of return on equity. This reflects typical World Bank practice for power sector lending, and implies a substantially higher rate of return than has been achieved at any time during the past twenty years. The third option is to base the tariff on the long-run marginal cost (LRMC). The results indicate that setting electricity prices to reflect the LRMC has a significant, and unambiguously beneficial, impact on the environment. It is true that the environmental benefits that follow from pricing reforms are dependent upon assumptions about the price elasticity of demand. The authors find that even under the unlikely assumption of zero price elasticity the environmental impact of price reform is not negative.

In regards to greenhouse gas (GHG) emissions the multi-sectoral approach yields that the imposition of carbon taxes on fuels has a more direct impact than adding the equivalent externality cost to the electricity tariff. The second important result is that pricing policy has a more general impact than physical approaches to demand side management (DSM). DSM programs are difficult to implement, and limited in scope. Nevertheless, the results suggest that it is hard to justify more expensive measures for GHG emission control, such as wind energy, or the substitution of diesels for coal plants, where the most cost effective measures (such as DSM, transmission and substitution loss reduction, and maximum implementation of mini-hydros) have not been implemented first. A number of transportation sector measures, advocated on grounds of ameliorating local air quality impacts, or general improvements in the fuel efficiency of the sector, prove to have significant GHG emission reduction benefits as well. The introduction of vehicle inspection and maintenance programs would bring significant reductions in both particulate and GHG emissions. Measures which tend to increase local environmental

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<sup>25</sup> For more detail see (Meier 1995).

impacts have also tended to be very expensive. The maximum hydro-no coal scenario, which brings very large GHG emission reductions would have a large impact on biodiversity because some of the larger hydro projects, such as the high dam variant of the Kukule project, would inundate forests of high biodiversity value. Other measures, more modest in cost, such as long run marginal cost pricing and wind power all reduce GHG emissions and local air quality related health impacts.

Meier *et al* (1996) concludes that the emphasis given to efficiency pricing in both project loans and adjustment lending is therefore justified not only on grounds of economic efficiency, but also on grounds of minimizing the environmental damage of economic development.

## **7. Urban Environment**

The main concerns for the effects of SAP on the urban environment are the uncontrolled flood of migrants from the rural areas, the advocated reduction in public expenditure causing insufficient urban services such as water purification and waste hauling, and increased urban pollution. Riddell (1997) argues that countries have suffered from reduced formal employment, decline in services, reduced education facilities, mounting inequality, brain drain, and a general decline in living standards. A decrease in employment in the formal sector encourages people into the informal sector which is beyond the scope of government policies, particularly taxation and regulation. Riddell (1997) concludes that in general, SAPs impoverished human life in African cities by increasing the cost of living, reducing wages, reducing social services and housing, and by decreasing employment facilities.

With respect to air pollution, Onursal and Gautam (1997) look at the effects of SAP-related liberalization and air pollution in Mexico. They say that due to the trade liberalization, the number of new imported cars has increased considerably. However, since most air pollution time series start in the 1990s, it is difficult to assess SAP effects correctly. Some data, in fact, shows slightly declining (or constant) pollution. Data quality is simply insufficient to draw broader conclusions (Onursal *et al*, 1997)

## **8. Public Sector Reform**

Environmental protection is the responsibility of governments in most countries<sup>29</sup>. Cutbacks in public spending under adjustment can adversely affect the level and quality of services such as waste management and sanitation, regulation and enforcement of pollution standards, protection of protected areas, etc. Environmental quality may therefore decline even where the rest of the economy is ameliorating.

On the other hand, lack of funds may reduce public investment in projects with adverse environmental impacts, such as road and dam construction or settlement projects in frontier areas. Evidence from the Brazilian Amazon supports the notion that public spending on transport and other infrastructure is closely linked to the settlement of

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<sup>29</sup> The analysis in this paragraph is taken from Bishop, J, and Young, C. 1995. *Adjustment Policies and the Environment: A Critical Review of the Literature*. CREED Working Paper Series No. 1

frontier regions and thus the rate of deforestation and land degradation (Binswanger 1989, Mahar 1988, Reis *et al* 1992). Conversely, it may be argued that continued lack of public infrastructure and access to external inputs and markets obliges producers to maintain unproductive and environmentally destructive practices, such as slash-and-burn cultivation of annual food crops. Ozório de Almeida *et al* (1993) examine this hypothesis in another study of the link between agricultural expansion and deforestation in the Brazilian Amazon.

In regards to public sector expenditures and revenues, Richardson (1996) concludes that in the environment-related sectors in Kenya, no efficiency gains have been achieved. Over the adjustment period, the decline in real expenditures, the erosion of civil service salaries, and the increase in corruption and theft have had a detrimental impact on the effectiveness of the public services, including the environment related sectors. Although development expenditures have tended to keep pace with inflation, there has been a disturbing trend in the relationship between external funding and the government contribution to development projects. Over the adjustment period, there has been a pronounced growth in the dependence on external sources to fund environment-related development projects. Development priorities have been determined more by the availability of finance from donors, rather than in line with the economic, social and environmental viability of projects.

Postigo (1996) argues that institutional policies that decrease public expenditure usually lead to a significant weakening of the state. If it is agreed that environmental control requires an important role for the state, it could be concluded that SAPs have a negative impact on the environment. The state should perform the functions of an environmental regulator; if the state does not, in fact, do so adequately, it should be strengthened. The bias within SAP policies against the state has impaired the national capability of developing countries to manage their natural resource base properly.



### III. Effects Through Indebtedness and Liberalization

#### 9. Debt and the Environment

An early focus of studies of the environmental consequences of adjustment reforms was the specific role of external debt in natural resource depletion and environmental degradation. Some authors have argued that developing countries were forced to increase environmentally harmful, export-related activities in order to service their external debts. This claim was most commonly made in reference to tropical deforestation. Attempts to test this hypothesis include elaborate econometric analyses of the proximate causes of deforestation (see Burgess (1992) for a review). The results of this research, however, are contradictory.

For example, Capistrano (1990) and Capistrano and Kiker (1990) test the significance of debt service payments as an explanatory variable for deforestation (measured in terms of industrial roundwood removal from broadleaved forests). Covering 45 developing countries between the years 1967 and 1985, the model also includes a range of other variables relating to the forestry sector, agriculture and the economy as a whole. The debt-service ratio was found to be a significant explanatory variable for the years 1972-75 only, and had a negative coefficient. This counter-intuitive result may reflect the readiness of international capital markets to offer credit during the early 1970s, which could have reduced pressures to sell off timber resources. A positive and significant relation was also found between devaluation and deforestation for the period 1976-85.

Contrary to claims from some quarters, these results suggest that the level of exposure to foreign debt was not correlated with timber removals. On the other hand, devaluation of the exchange rate - an important element of many adjustment programs - was found to be closely related to levels of deforestation. Thus while indebtedness itself may not lead directly to deforestation, the adjustment measures adopted as a consequence of high levels of debt may be significant.

Of course, using industrial logging as a gauge of deforestation can produce misleading results for countries where logging is not a significant cause of deforestation, or where timber derives mainly from plantation forests (Burgess 1992). A slightly different approach is adopted by Kahn *et al* (1992, 1994). In this case, high levels of debt are thought to provoke countries to behave in a myopic fashion, resulting in higher levels of deforestation than would occur otherwise (Kahn *et al*, 1994). Economic variables are grouped into factors which contribute to GDP (labor, land), and alternative "unproductive" activities including government spending, debt service and investment. Population is incorporated through the definition of a minimum consumption standard.

The main conclusions of the analysis are that variables which contribute to GDP should reduce deforestation, while variables which compete for the use of GDP should increase deforestation. Debt is included in the latter group. The authors find a strong positive correlation between deforestation and public sector external debt, especially for the period 1981-85.

However, Bishop and Young (1995) criticize this approach for its arbitrary definitions of productive and unproductive activities. For example, governmental

spending on public health and education are considered unproductive activities, despite their evident contribution to growth in GDP. Bishop and Young (1995) goes on to note that causality and autocorrelation have not been addressed in this paper.

## **10. Trade Liberalization and the Environment**

Adjustment reforms typically favor export industries and tradable goods sectors. Since many developing countries have a comparative advantage in resource-intensive activities, critics have suggested that adjustment programs stimulate over-exploitation of these resources, resulting in their rapid depletion and environmental degradation.

Runge (1993)<sup>30</sup> gives five separate effects of trade growth on the environment, namely the effects on (1) allocative efficiency, (2) scale of economic activity, (3) output composition, (4) technology, and (5) environmental policy. Heerink et al (1996) notes that explicit accounting for changes in transport flows that result from trade growth is also needed. The study also suggests analyzing the effects of changes in prevailing structure of trade impediments. The two most relevant features are the anti-processed product tendencies of tariffs of industrial countries and the high barriers against labor-intensive imports from poor countries.

The main themes examined in the literature are (1) cross country analysis of the pollution heaven hypothesis, (2) estimation of the effects of changed scale and structure of the economic activity using CGE, and (3) sectoral analysis of the impacts on agriculture;

### **(1) Pollution Heaven Hypothesis**

The hypothesis states that “dirty” industries migrate to low-income countries after trade liberalization because of difference in costs of pollution abatement and slacker environmental standards. Beghin (2000) does an excellent survey of the literature on this topic, which we present next. “The available evidence of specialization in dirty activities by developing economies is inconclusive. There is convincing evidence that under an import substitution strategy, countries have specialized in pollution-intensive manufacturing activities for which they are not truly competitive. Outward orientation has reduced the pollution intensity of output in several countries through a composition effect (Birdsall and Wheeler 1992). There is also evidence of lower energy intensity brought about by a strong increase in the domestic price of oil following trade liberalization (Vukina et al. 1999).

Similar findings emerge for natural resource use. For example, a recent study has assessed the impact of trade liberalization on agriculture and soil erosion in Sri Lanka (Bandara and Coxhead 1999). This study finds that openness increases the demand for land in tea production, which is a relatively less erosive sector than other crops, and thus has environmental as well as economic benefits for the Sri Lankan economy. In the long run, an increased demand for land has a positive impact on the emergence of land markets and reduces the uncertainty on the returns to land conservation investment. However, some countries do show patterns of specialization into dirty activities following trade liberalization: e.g., Indonesia (Lee and Roland-Holst 1997, Strutt and Anderson

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<sup>30</sup> As summarized in Heerink et al (1996)

1999), China (Dean 1999, Jha et al. 1999, Dessus et al. forthcoming), Costa Rica (Dessus and Bussolo 1998, Abler et al. 1999), and Turkey (Jha et al. 1999). These countries are expanding or specializing in activities that are harmful to the environment. Both scale and, possibly, specialization induce environmental degradation. There is no definite evidence on which effect is dominant. Evidence reviewed by Beghin and Potier (1997) suggests that the scale effect is the most important. Countries face more domestic pollution following trade liberalization because their aggregate activities have expanded, but not necessarily because they are specializing in dirty activities. However, new numerical evidence from a study by (Ferrantino and Linkins 1999) suggests that specialization is a more important determinant of pollution than scale. These authors provide estimates of the output effects of trade liberalization (the Uruguay Round and a hypothetical liberalization scenario in manufacturing) on toxic emissions using a multicountry, applied general equilibrium model. Liberalization slightly reduces global pollution by rationalizing formerly protected sectors, which are pollution-intensive. Parts of Asia, as well as the economies in transition may become more polluted as a result of liberalization.

The specialization in dirty activities is not by itself evidence of externalities, but there is evidence that the burgeoning, often informal, environmental protection in many countries does not internalize the cost of pollution appropriately (Pargal and Wheeler 1996, Hartman et al. 1997). Furthermore, resource allocation tends to be more efficient under free trade, because world prices are often closer to social prices than the former distorted domestic prices. The energy content of aggregate manufacturing output tends to decrease with trade liberalization. Capital-intensive dirty production relocates from developing to developed economies, where it is more resource-efficient and less polluting (Ferrantino and Linkins 1999). Vukina et al. (1999) find a result consistent with that of Ferrantino and Linkins in looking at the impact of market and institutional reforms on pollution emissions and energy use in 12 former centrally planned economies. The energy use per unit of aggregate product declines drastically with market reform, although the decline in energy use may have been caused by the cleaner composition of manufacturing output following trade and price liberalization.

The findings just discussed are consistent with the earlier findings of Lucas et al. (1992). Outward-oriented economies have lower pollution-intensity of aggregate output relative to inward-oriented ones and have been exhibiting declining pollution intensities with outward-oriented growth in the 1980s. However, the robustness of the systematic link between openness and declining pollution intensities of output has been questioned by Rock (1996). Measuring openness and market integration at the margin remains challenging in the context of large panel data of countries and industries” (Beghin, 2000).

## **(2) Estimation of the effects of changed scale and structure of the economic activity using CGE**

A recent study exemplifying the approach used in this type of analysis is *Abler et al* (1999). The objective of this paper is to examine the environmental impacts of trade liberalization in Costa Rica. A CGE model of the Costa Rican economy is constructed, which includes eight environmental indicators. The indicators cover deforestation, pesticide usage, overfishing, hazardous wastes, greenhouse gases, and urban air pollution.

This study is relatively unique in two respects. First, it explicitly recognizes and models uncertainty regarding the values of the economic parameters in the CGE model.

Rather than picking one or a small number of sets of 'reasonable' parameter values, this study treats the economic parameters of the model as random variables drawn from pre-specified distributions. Evaluation of each policy option takes the form of a Monte Carlo experiment in which a large number of random samples of the parameters are drawn, thereby generating an entire distribution of results rather than a single set of estimates.

Secondly, unlike most other studies of trade policy in developing countries, this study permits technology to change in response to trade liberalization. These changes in technology, in turn, lead to changes in economic activity and the environmental indicators. For developing countries, the principal effects of trade liberalization on technology are likely to arise through imports of machinery and equipment embodying new technologies.

Three trade policy scenarios are investigated here. In the first policy scenario, ad valorem rates for tariffs are limited to 5 percent. In the second, export subsidies are also limited to 5 percent, and in the last one, import tariffs, export taxes, and export subsidies are all limited to 5 percent. The authors warrant that their results cannot necessarily be extended to other countries. The environmental impacts of trade liberalization might be greater in a country with greater preexisting trade distortions than those of Costa Rica. With this in mind, four major conclusions emerge. First, the directions of environmental impacts of the trade liberalization scenarios considered here are generally negative. In the third scenario, which involves the greatest degree of liberalization among the scenarios considered, five of the eight environmental indicators worsen in the case where technology is constant. In the case where technology is variable, six of the eight indicators worsen.

Secondly, even though the directions of impacts are generally negative, the magnitudes of impacts tend to be small relative to the base-period values of the environmental indicators, in the sense that most indicators change by less than 5 per cent. The two exceptions are pesticides and organic wastes, where moderate increases (between 5 per cent and 10 per cent) in environmental pressures occur in some scenarios.

Thirdly, the positive environmental impacts of the trade policy changes considered are also generally modest, in the sense that indicators which improve at all do so by less than 10 per cent. Fourthly, the results for the case where technology is constant are not substantially different than where technology is allowed to vary in response to trade liberalization. Nevertheless, the results differ in ways relevant to environmental quality in some cases. The most important difference involves hazardous wastes, which decline moderately given constant technology but decline little or even increase when technology is variable.

### **(3) Sectoral Analysis of the Impacts on Agriculture**

Anderson (1992a, 1992b) uses a GLS model to examine the effects of trade liberalization for three ecologically sensitive products, such as grains, ruminant meat, and sugar. Results of a reference scenario for 1990 are compared with the results of a liberalization scenario in which all food price distortions in industrial and developing economies have been removed and full adjustment has been accomplished within the same year. This is a partial equilibrium model, implying that the focus is on efficiency gains within agriculture. The simulation results indicate that the total world food production barely changes as a result of trade liberalization but that the regional distribution of food production changes considerably. There are production declines in

Western Europe, Japan, North America and East Asia and increases in China, Latin America, and sub-Saharan Africa. With respect to specific effects on the environment, Anderson (1992a, 1992b) argues that there is an exponential relationship between the price of farm output and the use of farm chemicals per unit of output. Therefore, the relocation of cropping production will substantially reduce the use of chemicals in poor countries. In addition, urban environmental pressures will reduce the flow of labor to urban areas subsidies due to higher agricultural prices. Deforestation might be affected, but Anderson argues that the land area is considerably the least responsive factor to changes in farm output prices and even if so, this will need to be weighted against reforestation on former farmland in developed countries.

Lutz (1992), on the other hand, proves that the responsiveness of production factors in developing countries to agricultural price changes depends on farm size. The responsiveness of large farms is very significant, while the response of small farms is comparatively small and inelastic for all factors of production. Therefore, increased agricultural prices will result in more intensive use of resources and associated negative environmental effects of that subsector in countries with a commercial farm sector. Lutz (1992) concludes that higher world agricultural prices would lead to economic benefits for developing countries, but the associated environmental effects are expected to be negative. However, Lutz (1992) emphasizes, because of positive offsetting effects of higher income, the impact cannot be identified unambiguously without empirical examination.

The criticism by Heerink *et al* (1996) is that these studies make no distinction between environmental effects for different groups of developing countries. For example in Sub-Saharan Africa, the current use of chemicals is low and is projected to remain unresponsive to higher output prices, however, use of chemicals will be beneficial to restoring the nutrient balance in these countries. Secondly, the reallocation of food production might lead to higher environmental damage because of the erosiveness of certain crops. Lastly, increased trade aggravates transport-related environmental externalities such as the air transportation of kiwis, eggs and flowers.

Additional considerations to that of the authors did not include the possible changes in the structure of agriculture in developing countries, such as a shift to large, industrial size farms, which will significantly alter the impacts on the environment. Secondly, the evidence that deforestation is due to increased demand for agricultural land is mounting. In contradiction to Anderson (1992)'s conclusions that land area is by far the least responsive factor to changes in farm output prices, more recent studies such as Angelsen *et al* (1999) suggest that the main reason for deforestation is the expansion of agricultural land due to higher output prices. Finally, reforestation of former farm land in rich countries cannot be a surrogate for deforestation in poor countries, where a forest is a source of energy, as fuelwood, and of medicine.

Heerink *et al* (1996) further discuss the impacts of trade liberalization on soil degradation in low-income countries. The major problems that were identified are soil erosion, nutrient depletion, salinization, water logging, and compaction. The authors distinguish four elements that will be affected by higher prices after liberalization: current versus future production decision, farm practices, productivity versus conservation investments, and farmer private discount rate. First, higher output prices may induce

farmers to increase their production at the expense of soil quality or to cultivate marginal lands resulting in declines in land productivity. Important determinants in this case are input and output prices, private discount rates, and land tenure arrangements. Secondly, with respect to farm practices, it is the decision of the farmer whether to replenish topsoil's organic matter to prevent degradation. Thirdly, the higher incomes that result from price increases permit farmers to undertake productivity and conservation investments. The last significant point is that the farmer's private discount rate, which is affected by the change in prices. Because of the qualitative nature of the argument, the authors cannot reach unambiguous results.

## IV. Country Case-Studies

### 11. World Bank Studies

Munasinghe, M., Cruz, W. 1994. *Economywide Policies and the Environment: Emerging Lessons from Experience*. Washington, DC: World Bank.

The extensive case studies in the book found five principle ways in which economywide policies interact with the environment:

- Removal of price distortions, promotion of market incentives, and relaxation of other constraints generally contribute to both economic and environmental gains.
- Unintended adverse effects occur, however, when economywide reforms are undertaken while other neglected policy, market or institutional imperfections persist.
- Measures aimed at restoring macroeconomic stability will generally yield environmental benefits, since instability undermines sustainable resource use.
- The stabilization process may have unforeseen adverse short-term impacts on the environment.
- Macro policies will have additional longer term effects on the environment through employment and income distribution changes.

The conclusions are reached by giving specific examples of the effects from the country studies. Several research methods are employed. For China, the authors use farm-level data and surveys of farmers' reaction to changes in strategic prices and policy variables to design farm level models. Only effects on agriculture are estimated and no shortcomings in data and models are indicated. The studies on Costa Rica and Morocco<sup>35</sup> use a Computable General Equilibrium (CGE) model to estimate the effects of introducing property rights on forest resources in the first country and the simultaneous introduction of trade and water reforms in the second.

Socio-economic and land-mapping data are combined to analyze the effects of on-going trade liberalization and public employment reduction on agricultural productivity and land use in the Ghana's western region. It found that agricultural supply changes are associated with expansion of cultivated area rather than with agricultural intensification.

In Indonesia, the authors analyzed the pattern of industrialization over the last 14 years in terms of distribution of industries spatially and sectorally and projected the development under the same policies. Despite the improved profile from an environmental perspective, the effects of scale outweigh the gains and lead to pollution

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<sup>35</sup> The study on Morocco is summarized on p. **Error! Bookmark not defined.**

aggravation. Mexico's situation under trade liberalization was analyzed more qualitatively by looking at which sectors are promoted by free trade and which sectors grew due to country-specific forces. The authors conclude that industrial pollution has resulted from internal structural changes rather than the Bank's advocated liberalization.

The Philippines study looked at how policies on agriculture affect forestry through population migration processes. The government policy of favorably protecting corn crops, which is an upland environmentally damaging crop, while not supporting rice production in the low lands, induces a migration pattern exacerbating deforestation. The authors find by econometric analysis and multinomial discrete choice framework that migration decisions are most responsive to low land incomes.

The analysis of the Polish and Sri Lankan energy sector uses a similar approach focusing on projections of energy generation and corresponding emissions from three different models and concludes that additional environmental regulations are necessary beyond efficiency-improving price control.

For Tunisia the analysis of agriculture subsidies is very qualitative and it finds that policies on agriculture subsidies did not consider the different effect in different bioclimatic zones.

An analysis of Zimbabwe found wildlife-based activities to be less environmentally damaging than cattle ranching and yet these activities are promoted if the government interventionist policy is limited. The possible negative effects of the further expansion of the wildlife-based sector, such as large-scale or hunting tourism, are not discussed.

All the studies were guided by the basic assumption that economic policy reforms are almost never the fundamental cause of environmental problems, argue Bishop and Young (1995). An example of this approach is provided by the Indonesian case study. Pollution was found to have increased dramatically almost everywhere following adjustment, due to accelerated industrial growth. Moreover, the paper anticipates that by the year 2020, "dirty" processing industries will still account for more than 80% of Indonesian industrial output (outside of Java). However, adjustment is not seen as the primary cause of such problems, but rather as a potential solution:

"Thus, Indonesian industry in the aftermath of liberalization has a much-improved sectoral and locational profile from an environmental perspective" (World Bank 1994: 68).

## 12. WRI and WWF studies

*Structural Adjustment Programs: The Philippines Case.* Washington, DC: World Resource Institute.

Using a CGE model, Cruz et al (1992) show that macroeconomic policies without adequate environmental controls and policies have increased emissions, pollution concentrations and congestion, increased pressure on open-access resources and encouraged the over-exploitation of depletable resources. The study focuses on two periods: the 1960s and 1970s, which is considered to be the origins of the debt crisis, and

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<sup>36</sup>The review of the study is taken from Bishop, J, and Young, C. 1995. *Adjustment Policies and the Environment: A Critical Review of the Literature.* CREED Working Paper Series No. 1

the 1980s, when stabilization and structural adjustment programs were implemented<sup>37</sup>. Adjustment reforms undertaken in the second period were further assessed and compared to alternative reforms using a CGE model. Incorporating land as a factor of production, the model assessed the changes in land use associated with alternative adjustment policies. Thus the model was able to highlight the effects of macroeconomic policy changes in resource-intensive sectors such as logging, fishing, mining, upland agriculture and energy supply.

Reed, D. (Ed) 1992. *Structural Adjustment and the Environment*. Westview Press.

The WWF study provides pre- and post-adjustment analyses of the Ivory Coast, Mexico and Thailand. The book's format is unusual: local research teams undertook most of the primary work; their results were interpreted and written by the London Environmental Economics Center; and overall conclusions were written by the editor, a member of WWF. The quality of the case studies is mixed, depending on the availability of data and previous research by the country teams. Only in the Thai case were these extensive enough to support empirical work; the other two studies mainly offer plausible hypotheses.

The Thai report reaches the same conclusions as the report by Cruz et al (1992)<sup>38</sup> study on the Philippines. Thailand's pre-structural adjustment economy was less distorted than that of the Philippines but a high proportion of government subsidies went to pollution-intensive industries. SA reduced an import-substituting bias and increased the efficiency of manufacturing hence reducing pollution per unit of output. However, a number of distortionary policies remained (e.g. a higher tax on organic fertilizers than chemical ones) and serious market failures were not addressed. These include open access to resources, insecure land tenure and credit rationing that makes it difficult for small farmers to acquire better technologies. As a result some environmental problems simply took on new forms (overuse of some agrochemicals, rather than extension of the agricultural frontier), while others were exacerbated.

Reed D. (Ed.), 1996. *Structural Adjustment, the Environment and Sustainable Development*. Earthscan, London.

The nine country studies coordinated by the WWF and executed by local economic research institutes with the support of the ODI and HIID, applied a sectoral approach, with case studies for certain economic sectors and future economic growth patterns. The general method that was applied can be described as pragmatic and was based on the reconstruction of basic relationships between economic development and the emergence of environmental problems over past decades. Changes during the adjustment phase relative to historical trends were analyzed and probable causes

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<sup>37</sup> The following paragraph is taken from Bishop, J, and Young, C. 1995. *Adjustment Policies and the Environment: A Critical Review of the Literature*. CREED Working Paper Series No. 1.

<sup>38</sup> Cruz, W. and R. Repetto (1992). *The Environmental Effects of Stabilization and Structural Adjustment Programs: The Philippines Case*. Washington, D.C., World Resource Institute



identified. The methodological difficulties identified were first, with the exception of Venezuela, each research institute experienced problems in obtaining consistent data on the economy and the environment over an extended period. Secondly, isolating the impacts of structural reforms on the environment from those, which would have occurred, had those reforms not been implemented. Separating the “with reforms” from the “without reforms” scenarios was a further complication due to the fact that adjustment programs were implemented intermittently in several countries. The scarcity of reliable quantitative data limited the applicability of computable general equilibrium (CGE) modeling, and hence was only for Venezuela, Vietnam and Pakistan.

#### Case study for Cameroon

The approach followed in this study was eclectic. Researchers identified links between adjustment and the natural environment that seemed plausible on a priori grounds, based on their knowledge of adjustment, environmental processes, and local circumstances. These were qualitatively studied and conclusions were reinforced by field surveys and local professional opinion. The analysis conducted from a macro perspective was complemented by a review of the issues at the grass roots level in four different but important regions, the fertile farming area of the North-West Province, the populous but semiarid Far North Province, the cocoa-producing area of the East Province, and the forestry economy of the South Province. Data availability is patchy, impressionistic and sometimes anecdotal. The study concluded that SAP measures continued the bias of incentives toward extensive rather than intensive farm cultivation. The more intensive use of existing land was penalized by the increased costs of inputs, the shortage of credit and the scaling down of extension advisory services, felling trees has become more profitable than activities related to other exports, whose selling prices were reduced. The social repercussions of adjustment were intended to be offset by various actions to be undertaken by the World Bank and other donor agencies. In practice, the weakness and inefficacy of adjustment alienated some donors, and many complementary programs failed to materialize. The conclusion to be drawn is that social and environmental programs intended to offset adjustment measures should be contained within the initial design of the SAP and not left to separate or subsequent programs. In addition, the authors note that the interpretation of the adjustment-environment links requires an understanding of the crucial role of women as cultivators, especially of food crops and as gatherers of fuelwood.

#### Case Study for Mali

The approach undertaken was the same as that for the Cameroon study outlined above. The main effects identified from adjustment lending on the environment are increases in both the extensification and intensification of agriculture and long-term decline in soil fertility from intensive cotton monoculture.

#### Case Study for Tanzania

The research approach used in this study was used to identify the conceptual relations between SAP and the environment while utilizing limited data and other information sources. With respect to deforestation, there is a lack of data to identify trends over time, but anecdotal evidence suggests an increase over time. Land clearing

accounts for about 40 percent of deforestation in area terms<sup>39</sup>. Structural adjustment encouraged expansion of output at the same time as increasing fertilizer prices. The net effect was that the expansion of agricultural production through intensification was not viable for most small farmers. Soil erosion is another major environmental problem. Since structural adjustment began in 1986, there has been a 17 percent increase in the area planted to the nine major food and cash crops grown in Tanzania. Using Barbier's<sup>40</sup> categorization of "erosive" and "nonerosive" crops, about 80 percent of this increase was in erosive crops: maize, sorghum, cassava, cotton, and tobacco (Barbier, 1992). The regression analysis shows that for maize, rice, sorghum, and cassava (i.e., the food crops), the area cultivated increases as yields decline and vice versa for cotton and tobacco (i.e. the cash crops).

#### Case Study for Zambia

The research approach in this study is the same as that for Tanzania. The main environmental problem in Zambia is that of loss of wildlife, which has accelerated during the SAP period. The key cause of big game loss is from poaching for trophies. The increase in urban unemployment and erosion of farm incomes resulting from structural adjustment have clearly increased incentives for poor people to collaborate with the organized poaching gangs. The effects of SAP have been mixed. Positive effects have resulted from the removal of restricted access to foreign exchange and negative effects from the decreased funding for the National Parks and Wildlife Service. Deforestation is another significant environmental problem, resulting primarily (over 90%) from land clearing for agriculture. The contribution of SAP to accelerated deforestation is difficult to distinguish. With respect to worsening urban water pollution, the cut in the public works budget of the structural adjustment process may have contributed to this deterioration.

#### Case study for El Salvador

The World Bank assumed a leadership role in advising and supervising the economic reform in El Salvador in 1991. The economy has been growing at fairly high rates under structural adjustment, and the most important contributors to that growth are commerce, industry, and services in general i.e. economic activities that are highly concentrated in the metropolitan area and its surroundings. Development activity in the metropolitan area as well as migration from rural areas has affected seriously the urban environment in several ways. This has led to increased volumes of untreated domestic and urban waste, accelerated deforestation caused by the growth of housing projects and fuelwood harvesting, potable water provision, and air contamination are the most acute problems. In the rural regions, poverty has been exacerbated and as rural survival strategies are a major factor in land degradation this has led to higher levels of erosion, sedimentation of major rivers and dams, and the general loss in the capacity of the water resources.

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<sup>39</sup> Source of this figure not supplied in the study.

<sup>40</sup> Barbier, DE. The Role of Smallholder Producer Prices in Land Degradation: The Case of Malawi. Paper presented at the European Association of Environmental and Resource Economists Annual Meeting, Stockholm, June 11-14, 19991.

The study does little to show the connection between rural poverty and World Bank adjustment lending. Overall, an attempt to distinguish the effects of adjustment lending versus country specific developments and external shocks is not made. The analysis focuses on more “before and after” rather than “with or without” the SAP. Only in regards to institutional strengthening does the study concentrate on the link between SAPs and agriculture. The authors identify the most serious negative impacts as being those on institutional capacity as the agricultural agencies responsible for the small and medium-size agricultural producer’s lack the sensitivity of local reality, poor human resources management, and inappropriate location of extension services after the involvement under World Bank guidance.

#### Case Study for Jamaica

The only direct reference to the effects of the World Bank’s sponsored adjustment on the environment is with respect to the government’s capacity to deliver efficient social services. Environmental institutions were badly weakened by the reduction in public expenditures and redundancies in the public sector. It also notes that adjustment has affected the government’s capacity to deliver efficient social services, among them waste management. Except for this point on institutions, the study only investigates the effect of the overall Jamaican development approach, which did not explicitly incorporate environmental considerations. It makes no effort to distinguish the Bank’s role, whether political or economic, in influencing this approach in any way. In conclusion, the case study does not provide reliable results about structural adjustment lending and the environment.

#### Case Study for Venezuela

The study is well supported by available data and draws a convincing causal relationships between SAPs and environment. The three most important relevant elements are:

- A reduction in public spending, which led to a direct weakening of state institutions and programs (particularly those of the Ministry of the Environment, MARNR) and had indirect environmental impacts caused by the considerable increase in poverty.
- Encouragement of foreign investment, which permits the expansion of oil, mining, and tourist industries; and
- Relaxation of controls, which allows increased deregulated exploitation.

With respect to institutional capacity, the author points out that the structural adjustment process is influenced by cooperative action between environmental NGOs being replaced by a struggle to obtain the scarce resources that the state is making available. The national park system has been affected in two ways: directly by a reduction in the budget and indirectly as external factors put pressure on the park system, resulting in a decline in effective resources per unit of area of national parks.

The study explores future impacts by simulating three scenarios: (1) the “free market“ scenario following the liberal market reforms introduced in 1989-93 under structural adjustment (freer trade, crawling peg exchange rate, increasing public

spending); (2) “exchange control” policies introduced under SAP in 1994 including exchange controls, price regulation in some sectors, and stricter controls on public spending; and (3) as the second scenario but with an additional policy that would redistribute income to the poor at the expense of reducing profits. Each scenario is considered over the period 1994–2003 using the CENDES<sup>41</sup> model. The results from the model, which are macroeconomic variables, such as total income, exports, etc., are disaggregated into production sectors using an input-output matrix. The sectoral outputs derived are then fed into an equation that links economic and other indicators for each of the 38 subregions of Venezuela to calculate a measure of environmental quality. The impacts are calculated on the assumption that no further environmental measures are introduced to mitigate environmental impacts. The main results from analysis of each of the scenarios are:

- Wide variations in regional indices remain in all the scenarios. However, the free market scenario varies the most.
- Of the three, the scenario that is most environmentally harmful is that of the free market scenario. This is followed by exchange controls and finally exchange control with distribution.
- The causal chain in the model is mainly through a higher growth rate in general and activities of the more aggressive industries (e.g. mining and oil).

#### Case Study for Pakistan

Four related in-depth studies were conducted to analyze the impacts of economic reforms on the environment and society. The first is aimed at providing a rough long-run (50 year) picture of the relationships between economic growth, population growth, and environmental degradation in both the presence and absence of reforms. The study involves the construction of a simple long-run economic growth model. The second study complemented this analysis by providing more detail on the impacts of specific reforms upon individual sectors of the economy, although still in a macroeconomic context, using the CGE model. The third study addresses distributional impacts, focusing on the regressivity or progressivity of fiscal elements of reform programs. It makes use of the Applied Economics Research Centre (AERC) tax policy simulation model. The fourth study focuses on agriculture. It analyzes the impacts of economic reforms on cropping patterns, groundwater balances, and salinity for irrigated crops in the Indus Valley and it involved use of the Indus Basin model (revised) (IBMR), a linear programming model development by the World Bank.

The first one is a simple long-run economic growth model defining reforms only as an increase in the national savings rate. Taking this projected economic growth, the authors input it into the Environmental Kuznetz relationship found by other studies. The model finds that the reforms alone bring higher aggregate emissions as compared to the business-as-usual scenario, however there are higher number of people with access to safe water and sanitation. The model is limited by the simplified relationship among

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<sup>41</sup> CENDES stands for Centro de Estudios del Desarrollo simulation model (i.e. the SEVEN Model, Simulation of the Venezuelan Economy, by Luis Mata Mollejas). The model assumes externally determined oil revenues and prices, with government share fixed; consumption determined by wages and other real variables and by interest rates; monetary markets are brought into equilibrium through institutional constraints and are not simply a function of interest rates. The model is calibrated using historical data from 1950 to 1993.

economic development, population growth and environmental quality. The model does not account for feedback from environmental quality to economic growth. In addition, evidence for an inverted U-shaped Kuznetz curve has been proved only for developed countries and certain studies indicate the widening gap between the trends in developed and developing countries (refer to study from econometrics paper). And lastly, actual reforms are much more wide than increase in the savings rate.

The second model that the study develops uses a CGE model. The CGE model sacrifices the dynamic features of the growth model in return for rich detail on policy instruments. The functional forms in the CGE were not estimated but calibrated from the values of parameters in the Social Accounting Matrix of 84-85. In contrast to the growth model, the impact of economic reforms through increasing efficiency upon the environment are positive. The study considers that CGE is not dynamic and concludes that in the absence of effective policy intervention, the more rapid economic growth triggered by reforms will intensify most forms of environmental degradation in the country in the short and medium terms.

The tax policy simulation model predicts that fiscal reforms can loosen the current fiscal constraints on public investment in social and environmental programs, which improve the quality of life of the poor. The agricultural model, IBMR, concludes that price reforms need to be in effect for 18 agricultural commodities, water, and fertilizer to see any significant change. Under this scenario, cropped areas in non-saline areas tend to increase. Reforms are likely to increase the aggregate application of fertilizer due to the effects of increased cropping outweighing the shift toward crops that are less fertilizer intensive.

The four analyses indicate that environmental and social impacts of SAPs in Pakistan are complex and not unidirectional. The CGE model predicts net environmental benefits due to the shift away from heavily protected and polluting industries such as textiles and leather and the stimulation of more efficient energy use and other polluting inputs. The other three analyses help address three shortcomings of the CGE model: dynamics, distribution, and environmental feedbacks. The results obtained are opposing. The three main conclusions are as follows. That long-run growth brings environmental deterioration as the turning point for the environmental Kuznetz curve is in the distant future. Secondly that the distributional implications of tax reforms are detrimental to the poor; and finally, that the agricultural sector increases its negative strain on the environment. Because of the different methodologies, it is not possible to reconcile the conclusions of these four approaches.

#### Case Study for Vietnam

The study uses a CGE model, capturing the impact of environmental changes on the economy in a general equilibrium framework, with all indirect effects in different sectors fully taken into account. Six different policy shocks are simulated separately and analyzed in terms of income, employment, and environmental effects. Liberalization of commodity trade may reduce the unemployment-related forest encroachment but will not halt or reduce it, thus requiring complementary reforms. The second scenario demonstrates the point that agricultural subsidies would not be an appropriate reform neither in purely economic nor in sustainable development terms. The third simulation proves that more secure property rights are a boon to both income and employment generation through increased productivity in land-based activities. The authors also conclude that clear property rights are the most effective means of promoting long run

horizons to resource users and promoting more environmentally and economically sustainable practices. The fourth scenario considered a redirection of some investment toward labor-intensive light industry and services away from capital-intensive heavy industry. This would have created more jobs and have been less harmful to the environment. Fifthly, the authors look at a reforestation program financed entirely by a tax on logging and conclude that this would bring a net gain in real income and a net employment gain. And lastly, the effects of an intersectoral transfer of income are considered, again with an aim to remove externality-induced distortions. The model includes a 20 percent surcharge on energy prices, with the proceeds used to finance reforestation in watershed areas. An increase in real income and jobs is observed. The authors note no difficulties with data although the same limitations apply to the CGE models used. Considering that some of the policies are implemented simultaneously or under already existing policy distortions, the outcomes of simultaneous testing might be reverse.

## 12. Analysis of World Bank Policies

The main issues regarding direct World Bank policies (as opposed to the indirect results of the macropolicies implemented under structural adjustment lending (SAL)) are those of the integration of environmental conditionalities in lending, the effect on other donors and finally, pressures exerted to service external debt.

With respect to the first concern, Bojö (1997) analyzes World Bank studies, including Munasinghe (1994), Alicbusan (1989) and Warford et al (1994) and concludes that the World Bank is aware that environmental impacts of adjustment may be both positive and negative. However the latter is not seen as an argument for a reversal of policies, but as evidence of the need for complementary measures to mitigate specifically against these impacts.

A study by Postigo (1996) argues that the problem with SAPs promoted by the World Bank and the IMF is that they not only have fostered a change of development strategy but also have put strong pressure on indebted countries to comply with the service of their external debt. In this way, SAPs have pushed developing countries to make an effort far beyond their capabilities, with the result being the acute impoverishment of their lower-income populations and the institutional collapse of the state.

The effects of the World Bank supported SAP cannot be studied in isolation from other aid cooperation and government development programs, argues Hansen *et al* (1999). It gives an example with the Agricultural SAL (ASAL) from 1994 to the Philippines, which does not address adverse environmental effects but is implemented simultaneously with the Agricultural Input Program Loan by the Asian Development Bank which aimed at improving the regulation and monitoring of pesticide use. The authors also analyze the available body of literature on SAP-environment connections at the time the loans were prepared, the government openness to reforms and relations between the Bank and the Government of the Philippines in order to evaluate Bank's performance in integrating environmental issues in SAPs. They conclude that SALs are

reasonably well designed. Lastly, the study provides evidence supporting the hypothesis that there has been a shift towards greater emphasis on the environmental issues in adjustment programs since 1987. The study emphasizes the changes in the World Bank's organizations and priorities and the explicit environmental concerns, which have become an integral part of adjustment programs and where they seem to be missing, one will most likely find complementary lending operations by the Bank or by other agencies. The authors warn that the transferability of the Philippine study would be premature because there is less government capacity to implement environmental undertakings might be established in other parts of the world.