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# The Economic Case for Investing in Environment

## A Review of Policies, Practice and Impacts of relevance to Norwegian Partner Countries

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# List of acronyms

ACAP = Anapurna Conservation Area Project (Nepal)
ADB = Asian Development Bank
ASEAN = Association of South East Asian Nations
BTF = Bhutan trust fund for Environmental Conservation
CAMPFIRE = Communal Areas Mngmt Program for Indigenous Resources
CCICED = China council for International Cooperation on Env. and Devt.
CES = Consultants in Environment Sciences (Malaysia)
CFC = Chlorofluorocarbons
CITES = International Convention
CO2 = Carbon Dioxide
CPR = Common Property Resource
CSD = Commission for Sustainable Development
CTB = Community Toilet Blocks (India)
CTC = Community Toilet Complexes (India)
DALY = Disability Adjusted Life Years
DNS = Debt for Nature Swap
DOE = Department of Environment
DWASA = Shaka Water and Sewerage Authority (Bangladesh)
EDI = Economic Development Institute of the World Bank
EIA = Environment Impact Assessment
EQA'74 = Environment Quality Act of 1974 (Malaysia)
ESCAP = Economic and Social Commission for Asia and Pacific
FAO = United Nations Food and Agriculture Organization
FFA = Forum Fisheries Association
FRIM = Forest Research Institute of Malaysia
GDP = Gross Domestic Product
GEF = Global Environment Facility
GEO = Global Environmental Outlook
GIWA = Global International Waters Assessment
GNI = Gross National Income
GNP = Gross National Product
GNS = Gross National Savings
GS = Genuine Savings
HDR (x) = Human Development Report (UNDP) (year x)
HIID = Harvard Institute for International Development
ICRISAT = International Crops Research Institute for the Semi-Arid Tropics.
IDA = International Development Association
IEA = Integrated Environment Assessment
IFPRI = International Food Policy Research Institute
IIED = International Institute for Environment and Development
ILO = International Labour Office
INM = Integrated Nutrient Management
IPDC = International Programme of Development Cooperation
IPM = Integrated Pest Management
IQ = Intelligence Quotient
ITTO = International Teacher Training Organization
IUCN = International Union for Conservation of Nature

LDC = Least Developed Countries
LIC = Low-income Countries
LPG = Liquified Petroleum Gas
MBI = Market Based Instrument
MDG (x) = Millennium Development Goal (No.x)
MFA = Ministry of Foreign Affairs
MoE = Ministry of Environment
MOSTE = Ministry of Science, Technology and Environment (Malaysia)
NGO = Non-Government Organization
NNS = Net National Savings
NOK = Norwegian Kroner
NORAD = Norwegian Agency for Development Cooperation
NOx = Nitrogen (x)Oxide
NTP = Non-Timber Product
ODA = Overseas Development Assistance
OECD = Organization on Economic Cooperation and Development
O&M = Operation and Maintenance
OPP = Orangi Pilot Project (Pakistan)
PA = Protected Area
PEP = Poverty Environment Partnership
PRSC = Poverty Reduction Strategy Credit
PRSP = Poverty Reduction Strategy Paper
PTHP = Pakistan Trophy Hunting Programme
RIL = Reduced Impact Logging
RNR = Renewable Natural Resource
SAC = Structural Adjustment Credit
SANParks = South African National Parks
SIWI = Stockholm International Water Institute
TDRI = Thailand Development Research Institute
UIP = Urban Indicators Program
UNCCEE = UNEP Collaborating Centre on Energy and Environment
UK = United Kingdom
UN = United Nations
UNDP = United Nations Development Programme
UNEP = United Nations Environment Programme
UNESCO = UN Educational, Scientific and Cultural Organization
UNICEF = UN Children and Education Fund
USAID = US Agency for International Development
USD = United States Dollar
VCR = Value Cost Ratio
WCMC = World Conservation Monitoring Centre
WHO = World Health Organization
WRI = World Resources Institute
WWS = Water Supply and Sanitation

# Preamble

The document, which follows, is being submitted to Norad on 31st March 2007. The report has been prepared by Stein Hansen of Nordic Consulting Group AS (NCG Norway) under a framework contract between Norad and NCG Norway. Work commenced on August 2006.

This report presents the Consultants' findings and conclusions. These are based on a comprehensive review of available research and reports from the range of involved development cooperation institutions and research institutions.

The report is edited into four parts as prescribed in the Terms of Reference: The first part is a review of the latest understanding of the poverty – environment nexus where emphasis is now on the critical role of renewable natural resources assets upon which the well-being of the poor depends so crucially, along with the need for enhancement of their human capital and the institutions upon which much of their ability to invest in their resource base depends. The second part focuses on the investment impacts of different types of policy interventions., and is followed by part three which makes the case for environment-related investments as a basis for closing or at least narrowing the poverty trap. Finally, the status and degree of progress of incorporating and mainstreaming environment issues in the Poverty Reduction Strategy Papers of developing nations is reviewed with a focus on the performance of Norway's partner countries in development cooperation.

The findings and conclusions are presented at three levels of detail: first an executive summary, next a 30 page summary report, and finally a full report which presents the more in-depth analysis.

The Consultant would like to express his appreciation to Hans Olav Ibrekk, Norad for effective professional and transparent cooperation, valuable discussions as well as for logistical facilitation and assistance. Furthermore, the consultant has benefited from assistance in retrieving documents and data from the Environment Departments of the World Bank, the Asian Development Bank, FAO, UNEP and UNDP .

Conclusions and recommendations in this report are those of the Consultants and do not necessarily reflect those of Norad and institutions that have provided background material for this study.

Oslo, 14th. May 2007

Stein Hansen
Partner
Nordic Consulting Group AS

# Executive Summary

## The Poverty – Environment Nexus

- Even if there are cases where population pressure induces technological innovations that enhances the population carrying capacity of an area's natural resource assets, the dominating worldwide experience is that high population growth rates compounds poverty because existing limited natural resource assets become dissipated as they are shared among more people.

- The poor end up with the least fertile and environmentally most fragile land irrespective of tenure regime. Access to such low-value land becomes their key asset where each household cultivates a minimal area intensively for mere subsistence and survival. Short of options for feeding the family they tend to erode their scarce land asset and thus undermine the basis for escaping from poverty. Such fragile land is also more likely to be adversely impacted by environmental calamities such as periodic droughts and floods. The poor are not prepared and equipped to cope with such disasters, and tend to loose whatever land-based assets they may have. Repeatedly they must start all over again, often heavily indebted at high interest rates since their lack of collateral makes them risky customers to money lenders.

- As if this is not enough, the poor tend to lack access to potable water, and have to pay dearly for it delivered by private vendors. Cooking with fuelwood over open fires causes many of them to suffer severe respiratory diseases, particularly to women and children. Jointly, these factors reduce life expectancy and Disability Adjusted Life Years (DALYs). The resulting poor health reduces performance at school and at work, and thus future income prospects. This reinforces the "vicious circle of poverty"

- At the same time, poverty stimulates population growth because the children of the rural poor – contrary to those of the well-off – become economic assets to the household from a very young age. With high child mortality more children are needed as household labour for the labour intensive farm tasks.

- *These closely interlinked relationships constitute the vicious poverty, population, environment nexus, which the broad-based Millennium Development Goals (MDGs) focus on by means of mainstreaming environmental asset management into national Poverty Reduction Strategies.*

## Why invest in Environmental Assets?

- Per capita environmental resources assets are five times higher in rich than in poor countries, but the human and institutional assets of rich countries are 80 times higher! Poor countries depend much more on fragile environmental resources assets. Such assets – privately owned or in the form of access to the commons - constitute the main source of income and survival of the poor.

- A fundamental condition for breaking through the vicious poverty nexus is enhanced access to assets for the poor. Such assets include access to fertile

soils, to gathering and hunting, to equipment that makes use of these assets efficient, to relevant learning and extension services, to a functioning health care service, and assurances of a predictable policy regime that can guide their choices towards long-term management of their natural resource assets.

- While most man-made assets depreciate over time – some rather quickly – most natural resources can be sustained and even enhanced with rather modest efforts if properly done. At the same time, improper and excessive use – often as a result of increased population pressure – can irreversibly damage this income generating asset base.

- Worldwide experience has shown that investing in the natural resource assets of the poor can yield impressive returns and provide for sustainable income growth, but it requires a facilitating set of stable and predictable laws, regulations and institutions responsible for their implementation. The composition of different countries' assets clearly show that immediate action towards achieving the MDGs should focus on sustainable management and investments that could enhance scope, returns and resilience of the natural capital assets of poor countries.

- 17% of all lost DALYs in developing countries are due to a poor state of the environment, against only 4% in OECD countries. Lack of safe water and adequate sanitation constitute by far the most important cause with 40% of the environmentally induced loss of DALYs in developing countries. Next in line among environmental causes of loss of DALYs is indoor air quality.

- WHO estimates of the costs and benefits of various levels of meeting the Millennium Development Goals of water and sanitation globally are very high compared to any other public or private sector investment, and this suggests severe current underinvestments in this sector. The cost of saving a DALY by means of changing hygiene habits is only USD 20, and it is a modest USD 35 from safe rural water provision. Saving a DALY by means of improved energy-environment measures, such as less in-door smoke from woodstoves, is estimated to cost 2.5-5 times what it costs by way of changing hygiene habits, and 1.5-3 times what it costs to save the same by providing safe rural water. Saving a DALY by means of more modern gas- and paraffin stoves cost 4-6 times what it costs by means of rural water provision, and doing it by means of improved urban air quality costs 50 times what can be obtained by means of proper hygiene habit training.

- In spite of the high documented environment- and health cost-effectiveness, and poverty reduction impact of investing in water and sanitary projects in developing countries, such investments have received very modest attention in the Poverty Reduction Strategy Papers (PRSPs) of developing countries.

- When including the social and environmental costs of air pollution, soil degradation, loss of forest cover and wetlands, destruction of mangroves and coral reefs, and mismanagement of protected biodiversity hotspots, the overall verdict is a severe underinvestment, and as a result, loss – and in many cases irreversible losses - of valuable nature-based income generating assets (e.g.

loss of biodiversity, fertile soils due to water logging and salination, loss of reefs and shorelines) of particular importance for reducing poverty and enhancing economic income growth.

- Evidence shows that decisions leading to such natural asset destruction in most cases is a result of policy failure and market failure which jointly provide entrepreneurs and households with incentives to destroy rather than upgrade assets that traditionally have not counted in the national accounts. Tax incentives and concessions for forest-, wetland- and mangrove removal to give room for large-scale land conversion projects, reinforced by subsidized fuel, power, water, fertilizer and pesticides benefiting these same investors guide investments away from sustainable land and water resources use and erode these natural assets. The volume of such subsidy transfers from public accounts to the predominantly well-to-do developers in poor countries amounts to a multiple of annual development aid flows from rich to poor countries. In addition, marginalized poor migrate and clear and cultivate new fragile land in ways which are often unsuited for the land they have cleared. In total such settings makes it much more difficult to reach the MDGs.

- Nature tourism is often mentioned as having substantial potential for double dividends in the form of more sustainable management of tourist attractive fragile threatened ecosystems and income generation through local labour intensive services and trickle down businesses. Experience so far is mixed.

- Often visitors' willingness to pay has not been well captured, and what is captured is absorbed by tour organizers with little income impact on the local stakeholders, who as a result remain a pressure group for using these assets in a degradable way to secure some income in the short term.

- However, there is a growing evidence that the claimed potential is indeed huge, and careful planning and involvement of local stakeholders from project design through implementation and operation, combined with more efficient visitor payment schemes can generate substantial new employment and a more diverse income basis locally, and thus turn local stakeholder threats into sustainable natural heritage management wardens.

## The Natural Resource Curse and Debt Relief Impacts

- Since the 1970s, there has been increasing evidence of a negative link between natural resource abundance, economic growth and poverty reduction among nations. This has led to the notion of an apparent "Natural Resource Curse."

- 2003 data for 40 developing countries show a clear negative correlation between genuine savings in percent of Gross National Income (GNI) and mineral and energy rents in percent of the same. Virtually all mineral- and energy rich developing countries (with mineral and energy rents accounting for 20% of GNI or more) have an estimated negative genuine savings, reflecting that they maintain present economic consumption at the cost of future consumption by using up their natural resource assets without replacing it with similar or higher value investments in manmade or human capital.. Such development paths are non-sustainable.

- Contrafactual studies show that if these countries had consistently invested these rents rationally between 1970 and 2000, their produced assets (manmade national wealth) would have been 3-5 times higher than what it actually is.

- The main African Norwegian partner developing countries are experiencing such loss of national wealth, and their estimated genuine savings gap in percentage of GNI is around 20%. In contrast, Asian partner countries appear to invest enough in manmade assets to offset the income scope reduction in their natural resource assets. This does not imply that their degradation and irreversible destruction of natural habitats is of no concern to humanity.

- Debt for Nature Swaps (DNS) has time and again been proposed as a win-win solution to the debt-crisis of poor developing countries, and the threats to these countries' endangered natural environment. However, key incentives underpinning such DNSs remove fiscal barriers to any kind of investment, including investments that threaten the country's endangered ecosystems. This combined with the fact that outsiders have limited control with what kind of investments a government with a poor governance record, now freed of it's debt service burden, will allow, constitute high environmental risks that DNSs may work counter to what the DNS promoters had hoped for.

## Integration of Environment in Poverty Reduction Strategy Papers

- Progress in member countries completion of their PRSPs is monitored yearly by the World Bank. All the enthusiastic speeches at international conferences notwithstanding, evidence so far show that mainstreaming of environment issues to meet the MDG7 targets into PRSP is far short of target rates.

- However, year by year, new PRSPs are published with explicit environment issues being addressed, in most cases related to water and sanitation, but achieved access rates are still far short of the required ones.

- However, statements in PRSPs and commitments and budget allocations to meet the MDG7 target do not yet match. V*ery few national PRSPs prepared so far actually identify, target and make significantly increased commitments to environment management actions as priority issues. There is no significant correlation between a well mainstreamed PRSP and implementation and monitoring of poverty reduction measures.*

- Furthermore, *the local capacity to undertake and implement the PRSPs is not at all in place, and the PRSPs do not explicitly make commitments to appropriately deal with this shortcoming. As a result, the likelihood of achieving the MDGs becomes small. Clearly, the politicians bear the responsibility for the outcome.*

- *In the case of Norwegian partner developing countries, they all are found to perform significantly poorer on implementation than on promises, reflecting the unsurprising tendency to be overly ambitious when presenting plans to donors, knowing that there is hardly any penalty for not performing.*

# Key Findings and Conclusions

## 1. The Poverty – Environment Nexus

Figure 1 below sums up as simply as possible the present understanding of the complex population, poverty, environment nexus[1]. In the figure a (+) denotes a compounding effect, e.g. environment degradation increases poverty, or high discount rates as a result of poverty leads to environment degradation. Likewise, a (-) denotes an amelioration effect, e.g. a so-called "Boserup effect" (named after studies conducted by Ester Boserup (1965), well-known agricultural development economist) which claims that population growth enhances the likelihood that new technologies are developed and brought into use with more people around, and this helps to reduce poverty and environmental damage.

In short, the conclusions presented in figure 1, derived from D.W. Pearce[2] (2005), are:

- *Population growth is likely to have a compounding effect on poverty* because existing limited assets become dissipated as they are shared among more people. This will be especially true for land, but it will also apply to open access resources such as fisheries. Communal management can be effective in limiting access to such resources, but often the capacity and power to enforce is lacking. Besides, with such limitation of access, the focus shifts to the fate of those excluded.

- However, some have argued along the lines of Ester Boserup (1965) op.cit. that there may be *ameliorating effects from population growth* if population growth triggers technological change which materializes in the form of improved productivity of labour and capital.

- The *net population growth effect* is thus for empirical analysis to determine on a case by case basis.

- At the same time, *poverty increases population growth*, in part because children of poor families become assets that can carry out important productive tasks at an early age for the family economy when overall family productivity is low and access to technical implements is extremely limited, and because with high child mortality, many children are needed to provide the parents with old age security.

- *Poor people* are forced to think about "tomorrow", i.e. they apply very high discount rates as basis for their resource use decisions. This stimulates *resource mining*, partly out of subsistence necessity, partly because their technological option for harvesting marginal and vulnerable land and forest resources may be limited to those that result in erosion and soil depletion, and

[1] For an early analysis and figure presentation of this nexus, see also Stein Hansen (1993), "*Miljø- og fattigdomskrise i sør – et utviklingsøkonomisk perspektiv"* (Environment- and poverty crisis in the south in a development economics perspective"), Scandinavian University Press, Norway.

[2] D. W. Pearce (2005), "*Investing in environmental wealth for poverty reduction*"., Paper prepared on behalf of Poverty-Environment Partnership (PEP) of UNDP, UNEP, IIED, IUCN and WRI.

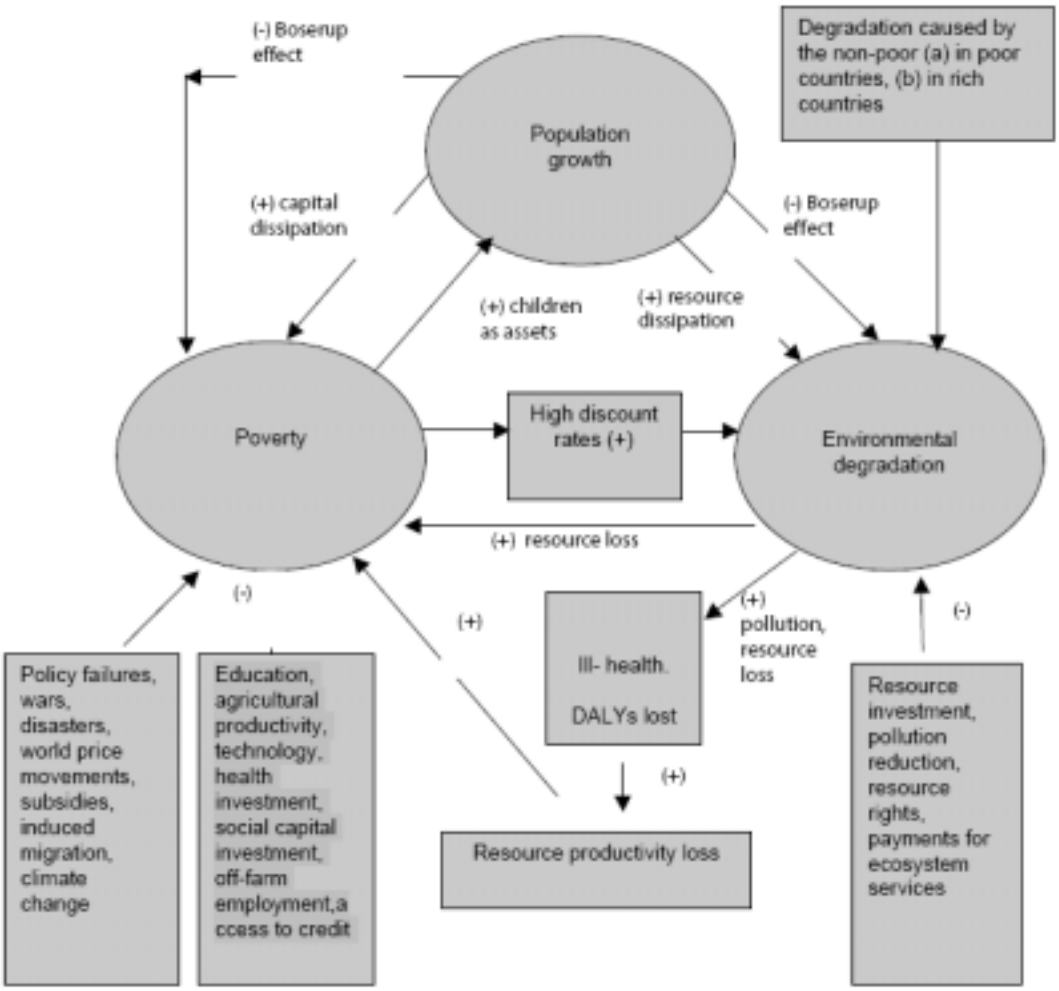
partly because they lack reliable rights to the resources they harvest from and therefore must take advantage of the opportunities while they still have them.

- *The poor tend to end up on marginal and fragile land* and at the same time such *poor land resources constitutes the major portion of their assets*.

- Environmental degradation in the form of *polluted air and water also impacts adversely on health (morbidity and mortality) and labour productivity*, and again the poor are most exposed and particularly vulnerable to losing out.

- Taken jointly, these effects easily combine to induce a vicious circle or nexus of the linkages between population, poverty and environment. *The Millennium Development Goals (MDGs) can only be achieved by breaking this circle.*

**Figure 1. Population, poverty, environment linkages**




Note: (+) indicates a positive feedback, i.e., the source of the arrow reinforces the effect at the target of the arrow.

Source: D. W. Pearce (2005), "*Investing in environmental wealth for poverty reduction*"., Paper prepared on behalf of Poverty-Environment Partnership (PEP) of UNDP, UNEP, IIED, IUCN and WRI., p.65.

State of the art understanding as regards diagnosis and remedies for addressing the poverty environment nexus can thus be summarized as follows[3]:

- Poor people are poor because their assets are few, and often of low quality;
- A significant fraction of those assets comprise natural and environmental resources that provide valuable ecosystem services;
- Environmental assets are highly vulnerable to overuse and external appropriation;
- It is extremely easy for local-, national- and global events and policies to trigger mechanisms that damage environmental assets, forcing the poor into "vicious cycles" of poverty and further environmental asset losses;
- Although rich people can often protect themselves against many of the effects of environmental degradation, the poor usually cannot;
- When carefully managed, the "social rate of return" from investments in environmental assets can be very high and of special benefit to the poor; and
- Such investments need a favourable policy context to make them effective and sustainable.

## 2. Assets: The Basis for Generating Income and Well-being

A crucial condition for increasing average well-being in a society involves raising the per capita endowments of capital assets - or as economists would see it - wealth. Assets in this context are defined as anything that generates a flow of well-being through time, and wealth is the total sum of available assets. Wealth thus adds up the value of the services provided individually and in combination by the range of assets including :

- manufactured implements at a farm or in a household,
- environmental production- and recipient services provided by fertile soils, forest cover, clean water courses and fresh air,
- knowledge acquired through education and work experience,
- good health secured by means of access to clinics, vaccination programs, clean air and –water, and
- the facilitating services provided by a well-functioning public sector and a stable, predictable policy setting, which describes the relationships among individuals and societies' institutions, and serves as a "glue" that hold societies together and provides a setting for division of labour and tasks among it's members so that everyone can benefit from specialization.

Some – especially man-made - assets depreciate rapidly through use, and need replacement at regular intervals, while other assets can be maintained at constant or enhanced levels with marginal but well-targeted human efforts, e.g. educational levels. However, natural resources assets are in many cases such that it takes little effort to maintain their asset value, but at the same time even marginal overuse of some such assets can have devastating and sometimes irreversible adverse asset-depreciating effects.

[3] See Pearce, David W. (2005),op.cit. p.19.

How then can environment and natural resources be seen as capital assets along with man-made implements? The following examples should suffice to illustrate the point:

- Soil fertility and water generates crops and livestock output;
- Clean air and potable water sustain human health and thus ability to study and produce;
- Forests produce timber, many non-timber products, watershed protection, and carbon sequestration;
- Wetlands and coral reefs sustain fisheries, provide storm protection, and recreation;
- The ozone layer of the stratosphere protects human health and other biota by limiting ultraviolet radiation.

The sum of all these assets constitutes key components of overall economic wealth. Sustainable development requires that this overall wealth must not decline over time in per capita terms. Three key factors are identified here

- *Technological progress* that raises productivity of assets enables more well-being to be generated from one unit of wealth. Such technological progress can be observed to take place for all conceivable assets; man-made-, natural- and societal, and implies that (a) more wealth can be distributed over a given population, or (b) a larger population can be supported without per capita wealth declining;
- *Population growth* that reduces assets per capita if there is no technological progress or may result in no per capita asset growth even if there is technological progress.
- *Growth in prosperity* coupled with constant or growing population translates into increased conversion of natural ecosystems to agricultural-, industrial- or residential use, but also to increased demand for ecosystem inputs, such as fresh water, fibre, and soil fertility, as well as increased pressure on the capacity of the natural ecosystems to assimilate our waste, including air and water pollution as well as solid waste.

In short, we are asking more and more from natural ecosystems even as we reduce their capacity to meet our needs. Striving for sustainable development requires focusing on assets management and enhancement as opposed to *conventional income* generation. Income conventionally measured can be increased by increasing the efforts used for extracting services from the asset base, e.g. natural resources. Income thus measured can be achieved by means of excessive harvesting (i.e. depletion) of renewable- natural resources (e.g. forests, fragile soils, fisheries), and non-renewable ones (e.g. minerals, groundwater and species extinction), and overloading the recipient capacities of air, water and soils for purposes of waste treatment. Such resources management strategies implies increasing short-term incomes by depleting the assets base, which again means reducing the scope for sustaining the initial well-being level. Therefore, it has become widely agreed in recent years that *sustainable*

*development strategies requires asset enhancing management practices as the starting point of the analysis, and not income as conventionally measured*[4].

The focus on assets as opposed to conventional income is even more appropriate when the poverty-environment nexus is the focal issue. This is so because poor people in developing countries derive much of the well-being from services extracted from natural resources owned by- or accessible to them for extraction, e.g. by means of subsistence farming or –fisheries, with cash income constituting a relatively modest share of the basis for their well-being. Such natural resources assets are vulnerable because poor people in rural settings with few mechanized implements at their disposal for sowing, weeding, watering and harvesting need manual labour throughout the growing season to tend to the fields they can access, to gather firewood and collect water. In case of unexpected drought or precipitation they have very limited access to compensatory measures to counter the adverse effects of such natural calamities. Children thus become productive assets to the farm household at a very young age, and the incentive to have more children (which also grows with increased infant- and child mortality) grows as the natural asset base is mined and more labour effort is needed to collect the needed quantities of food, fodder, water and fuelwood. This further accelerates the mining of the natural asset base and characterizes the "*evil cycle of poverty, population growth and environment depletion*".

## 3. Poverty, Wealth and the Environment

It is established in development economic research that policies that increase the asset base of the poor have a good chance of encouraging income growth both nationally and among the poor[5]. However, the role of environmental asset formation in this context is another question. The World Bank (2006)[6], tables 1.1 and 1.2, shows the asset-composition of per capita wealth by categories of countries aggregated by income group. This is summarized in table 1. below.

**Table 1. The composition of per capita wealth by country group, 2000 ($2000)**

| Country group by per capita income level | (1) Man-made or "produced" wealth | (2) Residual (social- and human capital, etc) wealth | (3) Environ-mental or "natural" wealth | (4) Overall per capita wealth | (5) Environ-mental wealth as % of total wealth | (6) Renewable resources as % of total "natural" wealth |
|---|---|---|---|---|---|---|
| **Low income** | 1,174 | 4,433 | 1,925 | 7,532 | 26% | 83% |
| **Middle income** | 5,347 | 18,773 | 3,496 | 27,616 | 13% | 69% |
| **High income OECD** | 76,193 | 353,339 | 9,531 | 439,063 | 2% | 60% |

[4] However, income – as originally defined in theoretical economics – is fully compatible with the asset management approach outlined here. Income thus defined is the value of services that can be extracted from the asset base without resulting in a declining stream of such asset-derived services in the future.
[5] See D.W. Pearce (2005), op.cit., p.40.
[6] The World Bank (2006), "*Where is the wealth of nations? Measuring capital for the 21st century.*", Washington D.C.

Source: The World Bank (2006), op.cit. tables 1.1 and 1.2

The many deficiencies and shortcomings in the statistics upon which such estimates are based notwithstanding[7], table 1 shows a striking contrast in the *relative role* of different forms of capital between country income categories. Human capital (along with social capital) dominates across all three country categories, but while it's share is 59% of overall per capita wealth in low income countries, it increases to 80% of the total for the high income OECD countries. At the same time, the table shows that per capita environmental capital increases 5-fold between low income and high income countries, while human and social capital increases 80-fold! While all forms of per capita wealth are many times higher in rich than in low income countries, the ratio is extremely high for human and social capital.

The table further shows that the environmental wealth matter 13 times more in percentage share terms to low income countries than to high income OECD countries (26% of total wealth, versus 2% in the rich countries), and renewable resources are also relatively more important in terms of it's share of total natural wealth (83%) in low income countries compared to that of the rich countries (60%).

It clearly shows that the poor depend disproportionately on environmental assets. Their much larger share of natural resources in total wealth and the composition of these resources make strong argument for the role of environmental resources in development cooperation strategies and programs for reducing poverty, fighting hunger and reducing child mortality. It suggests that when addressing poverty now, one has to focus carefully on the management and enhancement of environmental wealth.

People derive income from their wealth, which is their labour and associated skills, their produced capital, land at their disposal, or from harvesting in forests, fields and waters to which they have regulated or open access. Some of this income is generated in markets and is easily monetized along with the returns from sale of assets, e.g. culling livestock herds as a means to cope with risks related to unexpected crises. A significant share of income from environmental resources is of a non-monetized nature, i.e. in-kind from ecosystem services. Such income can accrue in the form of e.g. collected fuelwood, poles, roots, fruits, nuts and plants used for medicinal and nutrition purposes. Household use of such non-market goods can be valued for estimation purposes by comparison to near substitutes available in markets. In addition, many households receive important ecosystem services that impacts directly on their well-being and livelihood security. Such services include a.o. their adaptation to and reliance on functioning watersheds, wetlands, mangroves, coral reefs and forests, which includes protection from e.g. floods and drought.

The following illustrate that environmental assets plays a crucial and formidable role for poor people's well-being in a global perspective:

- In Africa some 90% of agricultural output comes from small scale producers,

[7] The World Bank (2006) op.cit., explains that the data are incomplete in the sense that they do not have a value for wildlife resources, the value of biodiversity, the amenity value of the environment, and the value of clean air and water.

- Nearly 1.1 poor billion people depend on forests for their livelihoods;
- Some 600 million poor people keep livestock (an important source of wealth);
- Tens of millions of poor people fish coastal and inland fisheries.

Such small-scale farmers, transhumant pastoralists and artisanal fisherfolks are likely to have less opportunity for non-farm-, non-fishery incomes; i.e. they are likely to have a less diversified portfolio of income sources than the less poor[8].

Many poor coastal households generate a substantial part of their fisheries income from unsustainable harvesting methods including poison- and blast fishing. Mining of coral reefs is also found to generate very high short term incomes in many cases, but at a cost which is loss of revenue that these reefs could have generated directly and indirectly in the future. D. W. Pearce (2005). Op.cit. p.46 presents estimates from Indonesia on the income generated per square kilometre of reef area from poisoning and blast fishing to be in the range of USD 15,000 to USD 30,000. However, this income comes at a cost of USD 40,000 to USD 70,000 per square kilometre in foregone income opportunities from sustainable fisheries and tourism, and the value of foregone environment protection from e.g. damages caused by extreme weather events and tsunamis. Likewise, the services of mangroves and wetlands are heavily relied on by the poor by providing breeding grounds for stable fish- and shrimp stocks, and furthermore, for timber, and fuelwood, and such indirect and crucial values as storm protection, erosion control and water filtration.

## 4. Changes in Wealth over Time and Why

Achieving sustainable development is basically the process of maintaining wealth, broadly defined as above, for future generations. All types of capital – produced, human, social/institutional, and natural – are key inputs to sustaining economic growth and the basis for improving well-being.

A country's provision for the future is measured by its *Gross National Savings* (GNS), i.e. the total amount of produced output that is not consumed. However, assets depreciate over time. Therefore a more relevant measure for assessing sustainable development is *Net National Savings* (NNS) calculated as GNS minus assets depreciation. However, the above analysis has clearly identified the need to incorporate human, natural and - if possible – institutional capital assets in a complete national wealth measure. The World Bank (2006) op.cit. has convincingly shown that intangible (raw labour-, human-, social-, institutional-, etc) capital is the dominating asset for the high income OECD countries (80%) with natural capital only accounting for 2%, whereas in low-income countries – where Norway's partner countries are found – intangible capital accounts for 59% and natural capital 26%. "Conventionally" produced capital accounts for less than 20% of the total capital asset value for all country income groups.

This suggest that focusing on policies and investments for sustainable development must pay much attention to the management and enhancement of intangible and natural capital assets. An important basis for such management is information on and appreciation of changes in these "unconventional" capital assets of nations. By incorporating the estimated changes in these assets and adding them to the

[8] See e.g. D. W. Pearce (2005), op.cit. p.44 for more details and references.

depreciation of produced capital assets, one derives what is now termed *Genuine Savings* (GS), which is a much broader and more realistic indicator of sustainability.

The World Bank (2006) op.cit. chapter 3, provides detailed guidance in how GS is defined and calculated. Clearly, not having market-based prices for much of what is included in these GS-calculations requires estimations that imply approximations and uncertainty. Ignoring and excluding such estimates short of exact and accurate numbers, would nevertheless result in much more misleading overall portraits of development trends and diagnosis of the development in the wealth (and health) of nations. Having produced these new and expanded "wealth of nations" estimates thus represents a major step forward towards diagnosing where and when nations need to change their development priorities and how, if sustainable development is a genuine development priority.

From the perspective of the role of environment and the natural resource assets as an integral component in a sustainable development strategy, the focus in the GS-estimation is first on the value of natural resource depletion. This depletion must take into account that some of the natural assets are renewable (rainwater, forests, fisheries, renewable energy), whereas others are non-renewable (e.g fossil fuels, minerals and metals). The value of resource depletion is thus calculated as the total rents on resource extraction and harvest. Rents are here estimated as the difference between the value of production at world prices and total cost of production, including depreciation of fixed capital and return on capital. However, for living renewable resources one needs to calculate the appropriate rent as that portion of e.g. timber extraction or fisheries catch that exceeds natural growth. If for example growth exceeds harvest, this rent is set to zero.

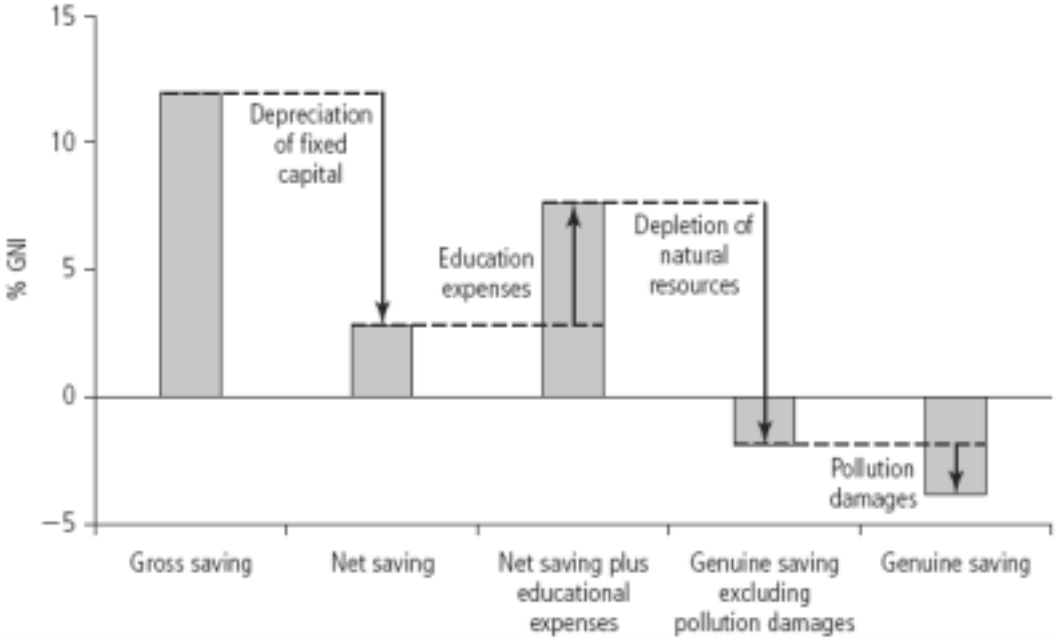
The GS calculation also includes the value of damages from e.g. air and water pollution. Some of these damages e.g. reduced crops due to e.g. acid rain is already captured in the conventional output value of the agricultural sector, whereas e.g. the acid rain impact on buildings and physical structures are rarely included and need to be added explicitly. The same applies to the health effects of pollutants to air and water over and above the indirect health effects in terms of reduced conventional output in production due to reduced labour input caused by poor health. Particulate matter emissions is the damaging component that is so far incorporated in the GS calculations. An estimate of global damages to crops, health and infrastructure from climate gas emissions is also included in the calculations.

This outcome of applying this methodology is illustrated by the World Bank (2006) op.cit. for Bolivia. It clearly shows how misleading the long-term economic "health" of this country is diagnosed if the sustainability calculation stops short of the full GS-calculation. While a 12% GNS is limited cause for alarm, depreciation of fixed capital is significant and brings the NNS to slightly above zero (3%). Then some comfort is added due to education investments, but the shocking basis for policy advice follows from the estimation that genuine savings are strongly negative as a result of excessive extraction (over 9% of Bolivia's Gross National Income(GNI)) of its mineral and metal reserves. Present consumption cannot be sustained simply by tapping the natural resource assets and not investing a much larger share of it in intangible and/or produced capital assets. The long-term policy guidance to decision makers thus depends fundamentally on completing all the steps towards deriving the GS.

This Bolivia case of excessive resource rent consumption is not at all unique among exhaustible resource surplus countries. In fact, the World Bank (2006) fig. 3.4 (reprinted in figure 3 below) shows a clear negative correlation between the percentage share of mineral and energy rents of GNI and the country's genuine savings in percent of GNI.

This observation – clearly displayed in figure 3. - suggests that most natural resource-rich developing countries – especially those with large deposits of non-renewable mineral and metal resources – extract huge resource rents and use most of it for immediate consumption, and spend too little of it on compensatory investments that would sustain or increase national wealth.. In this way they experience negative genuine savings and their national wealth is reduced, thus reducing consumption- and investment options of future generations.

**Figure 2. The Genuine Savings Calculation for Bolivia (2003)**



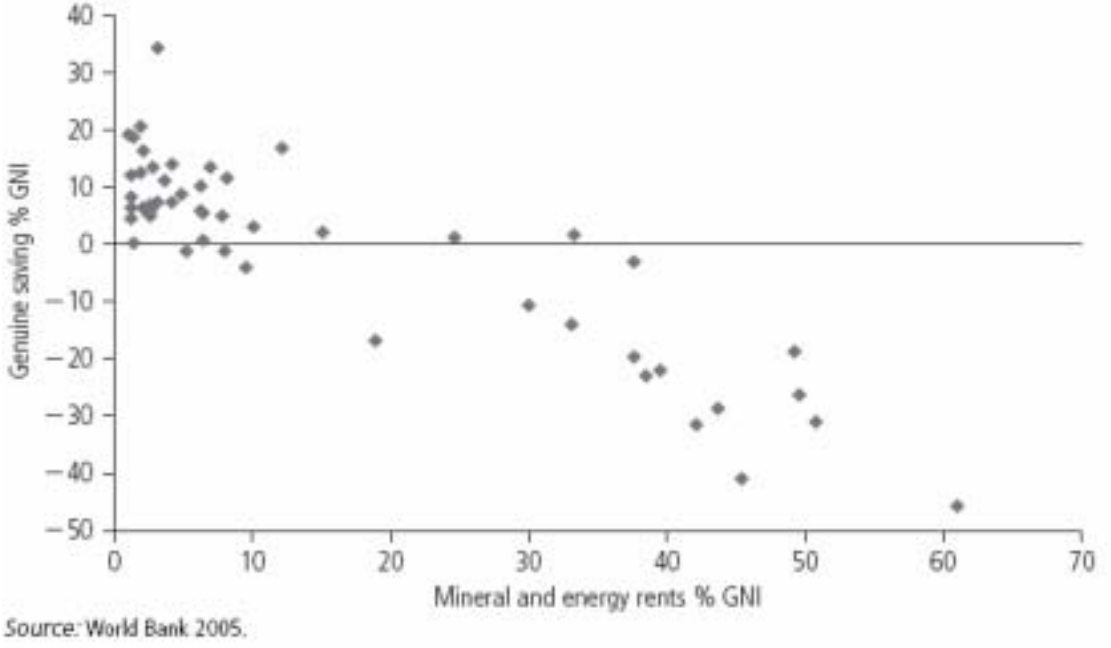

Source: The World Bank (2006), op.cit. figure 3.2., p.40

Countries that have followed such a policy for many years are found among the mineral-rich developing countries in all regions, but particularly in Africa and Latin America. These countries have spent their resource rents in such ways that per capita GDP has grown slower – if at all growing – compared to countries with much less abundance of such exhaustible natural resources at their disposal. The paradox is that resource-rich countries should enjoy an advantage in the development process, but in reality these countries have experienced lower GDP growth rates since 1970 than less well-endowed developing countries, some of which have even "graduated" into the "OECD Club", e.g. South Korea.

In order to complete the overall assessment of countries with respect to their being on or off an economically sustainable development track, the World Bank (2006) figure

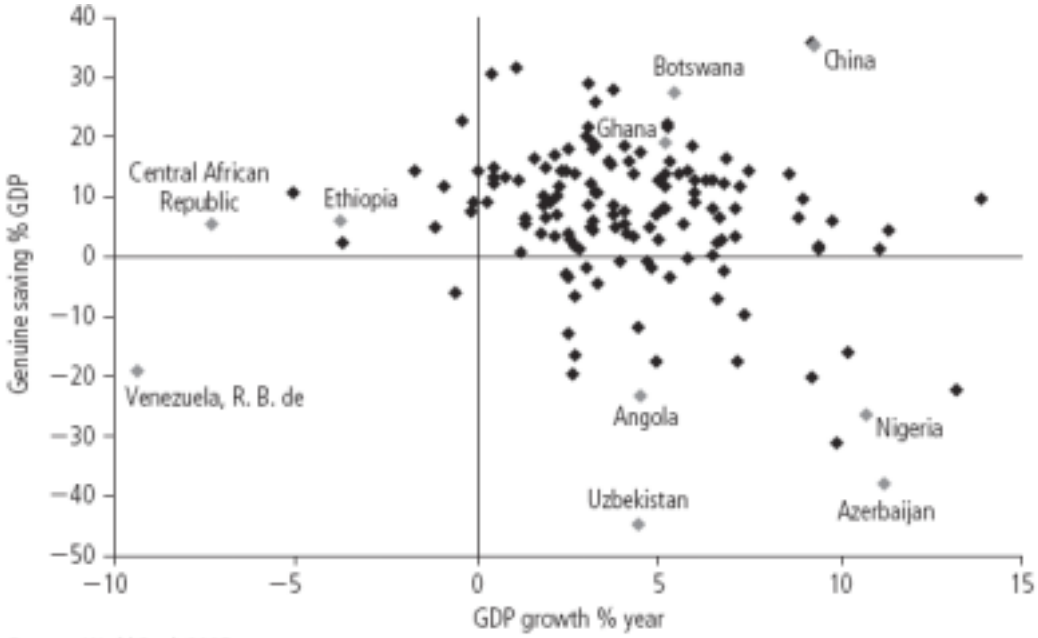
3.6 presents the scatter of countries along two axes: GDP growth (%) per year and Genuine Savings in % of GDP. This figure is reproduced in figure 4 below:

**Figure 3, Genuine Savings and Exhaustible Resource Shares in 2003**




Source: World Bank 2005.

**Figure 4. Genuine Saving Rates against Economic Growth (2003)**




Source: World Bank 2005.

It is the location of a country in figure 4 that tells whether there a reasons for immediate concern to change the present economic and environmental policies. The

majority of countries are located in the top right quadrant and this means they experienced both positive GDP and GS growth in 2003. To the extent that these GS measures are reliable and relevant, this observation means that these countries are not presently consuming at the expense of future generations. For these countries the new way of calculating sustainability has not meant all that much in terms of changing economic policy recommendations. The countries in the top left quadrant are experiencing negative GDP development – and some of them quite significant decline when measured in per capita terms – but at the same time, they have positive genuine savings, which means that they are investing for the future. These countries need to improve their conventional economic policies to secure stability and scope for taking advantage of the genuine savings they are accumulating.

The main concern is with the countries located in the lower two quadrants. These countries – but for a couple of really poorly performing economies – appear to fare well if one myopically focuses on GDP growth, but when adding the GS information, it reveals that the GDP growth is non-sustainable. The minerals- and natural resource rich countries that have rested their economic growth on exhaustion of their resource base tend to fall in this category (Nigeria and Angola being two prime examples) while Venezuela faces the biggest challenge of them all.

While there would be many reasons for these observed dismal developments and management of the rents from extraction of non-renewable resources - some of the reasons being outside of the control of the governments of these countries - it is nevertheless of interest to use a counterfactual analysis to show what could have been the development if these countries had invested all their resource rents rather than consuming or wasting most of it. The World Bank (2006), op.cit., chapter 4, has conducted such an experiment, where they assume for simplicity that all resource rents are reinvested in production capital over the 30 years from 1970 to 2000. However, theoretically, there is no reason why these investments should not also be in environment, human capital, or intangible capital more generally. In a simplified way, such analysis shows how rich these countries could have been had they followed such a growth-inducing investment policy for the spending of extracted resource rents.

Figure 5 (reproduced from figure 4.1. in World Bank (2006), p.53) presents the results of this hypothetical comparison and provides intuitive understanding of why the concepts of the "*resource curse*" and "*paradox of plenty*" have emerged in the resource economics literature. It shows on the one axis the percentage difference between actual 1970-2000 capital accumulation and counterfactual capital accumulation during the same time period, and on the horizontal axis the average percentage share of resource rents in the country's GDP over the 1970-2000 period.

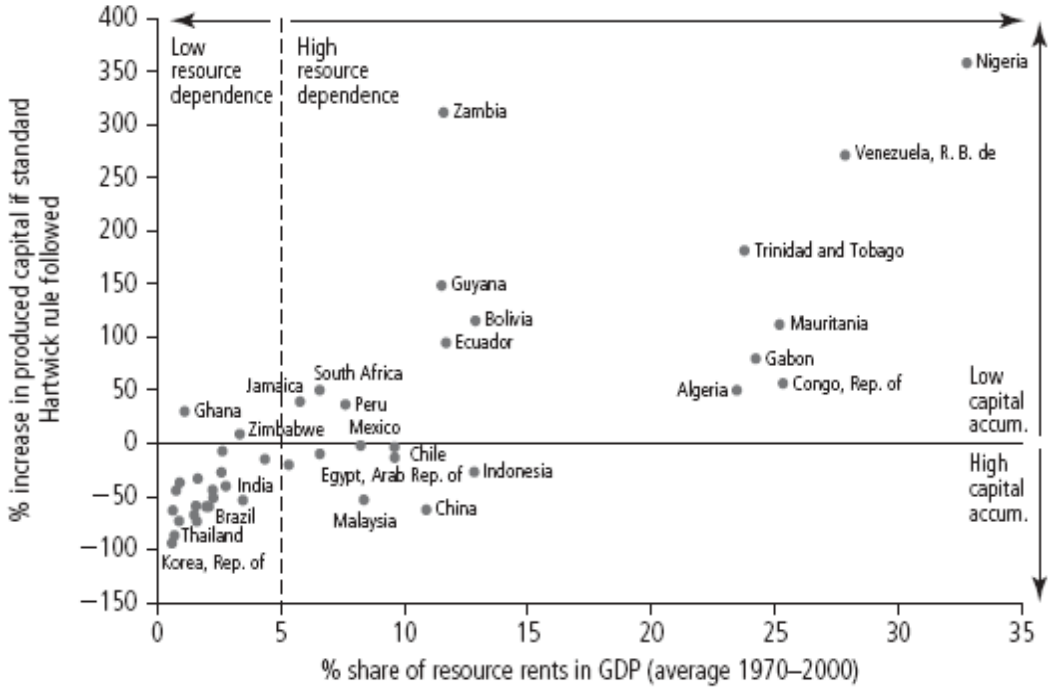
In short, the story emerging from this counterfactual analysis is that there is a tendency for the counterfactual capital stock to be the higher relative to the actual capital stock, the more resource abundant the country in question. Nigeria, Venezuela, Trinidad and Tobago, Zambia, Bolivia, Gabon, Congo, Rep. of, Algeria, Mauritania, Guyana are all found in the top right quadrant of the figure. In the extreme cases of wasteful resource endowment management, resource rich Nigeria, Zambia and Venezuela stand out with an estimated counterfactual wealth 4-5 times higher than what was actually created. In sharp contrast, the bottom left quadrant of figure 5 shows those countries that are classified as having a low resource dependence. The

large majority of these countries (including the Republic of Korea, Thailand, Brazil, India and some high income countries) display the exact opposite performance outcome; i.e. an even higher baseline capital stock than what would have resulted from following the counterfactual sustainable development investment path. Since the majority of countries for which data have provided the opportunity for such counterfactual analysis are located in either of these two quadrants of the figure, one can safely conclude that there is a *high negative correlation between resource abundance and the difference between baseline and counterfactual capital accumulation.*

However, natural resource-endowed countries are not "forced" by "economic laws" to perform in such wasteful ways. In lower right quadrant of figure 5 one finds several resource abundant countries that have constrained their consumptions and invested more than their extracted resource rents in produced capital. China and Malaysia stand out as the most successful such countries, and they have sustained a considerable rate of per capita economic growth and poverty reduction during this 30 year period. However, Indonesia, Egypt, Mexico and Chile also deserve mention for being resource abundant and at the same time managing to invest an equivalent of the extracted resource rents.

This praise notwithstanding, the analysis says nothing about actual sustainability from the perspective of how these countries have invested to maintain biodiversity, clean air, safe water and sanitation and preservation of forest cover, wetlands, coastal zones and top soils.

**Figure 5. Resource Abundance and Capital Accumulation 1970-2000**




Source: World Bank (2006), op.cit., figure 4.1., p.53

When calculating changes in wealth on a per capita basis to detect whether countries appear to be on a sustainable development path, the estimates are based on tangible wealth only (justified by assuming that much of the intangible wealth is embodied in

the population). For a sample of past and present Norwegian developing partner countries, the results for year 2000 are summarized in table 2.

With the unsurprising exceptions of Botswana and Namibia (both former partner countries that have now "graduated"), all the other African partner developing countries and the two Latin American ones are experiencing a loss of their national wealth as a result of internal and external policies and enabling environments for the economies to perform effectively and efficiently. In contrast, the estimated change in per capita wealth is positive or close to zero in all Asian partner countries for which data are available. The savings gaps in the right hand column indicates a degree of severity and a dimension of unsustainability of the development path the country is on, and at the same time provides an indication of the extent to which achievement of the ambitious MDGs are within reach.

**Table 2. Norwegian Partner Countries: Change in Wealth per Capita, 2000**

| Country* | GNI per capita USD | Population growth rate % | Adjusted net savings per capita | Change in wealth per capita | Savings gap (% of GNI) |
|---|---|---|---|---|---|
| Botswana | 2,925 | 2,6% | 1,021 | 814 | - |
| South Africa | 2,837 | 2.5 | 246 | -2 | 0.1 |
| Namibia | 1,820 | 3.2 | 392 | 140 | - |
| Bolivia | 969 | 2.0 | 9 | -127 | 13.1 |
| Sri Lanka | 868 | 1.4 | 166 | 116 | - |
| P.R. China | 844 | 0.7 | 236 | 200 | - |
| Nicaragua | 739 | 2.6 | 81 | -18 | 2.4 |
| Cameroon | 548 | 2.2 | -8 | -152 | 27.7 |
| Pakistan | 517 | 2.4 | 54 | -2 | 0.4 |
| India | 466 | 1.7 | 67 | 16 | - |
| Bangladesh | 373 | 1.7 | 71 | 41 | - |
| Kenya | 343 | 2.3 | 40 | -11 | 3.2 |
| Zambia | 312 | 2.0 | -13 | -63 | 20.4 |
| Nigeria | 297 | 2.4 | -97 | -210 | 70.6 |
| Ghana | 255 | 1.7 | 16 | -18 | 7.2 |
| Madagascar | 245 | 3.1 | 9 | -56 | 22.7 |
| Nepal | 239 | 2.4 | 46 | 2 | - |
| Rwanda | 233 | 2.9 | 14 | -60 | 26.0 |
| Mali | 221 | 2.4 | 20 | -47 | 21.2 |
| Mozambique | 195 | 2.2 | 15 | -20 | 10.0 |
| Malawi | 162 | 2.1 | -2 | -29 | 18.2 |
| Ethiopia | 101 | 2.4 | -4 | -27 | 27.1 |
| Burundi | 97 | 1.9 | -10 | -37 | 37.7 |

*****No data available for Afghanistan, Palestine, Sudan, Tanzania, Uganda and Viet Nam
Source: World Bank (2006), Appendix 4.

The above analysis can only tell something about a country's resource management choices and how that has impacted on its national wealth. With increasing per capita wealth a country expands its options for addressing pressing threats that endanger the resource base upon which large parts of its population depend for its well being. Countries that have wasted their resource rents rather than investing it in produced-, institutional-, human-, social- or natural capital, which in turn could have generated new jobs and improved well-being, today face more limited opportunities to achieve

the MDGs than they did a decade or three ago. Since these economies remain largely dependent on their renewable (soils, forests, ecosystems, water) and non-renewable natural resource base, and have been depleting these for decades, it is reasonable to assume that they have underinvested severely in maintaining their natural resource stocks that forms such an important basis for sustained economic and social development.

## 5. The Investment Impact of Policy Interventions

Policy interventions reflecting stated priorities regarding poverty reduction and sustainable environmental resource management and the political climate (e.g. degree of stability, governance, incentive structures and various barriers to investments) will impact on both investment areas, investment volumes, the attractiveness of such investments to foreign investors, and the incidence of benefits and costs resulting from such investments.

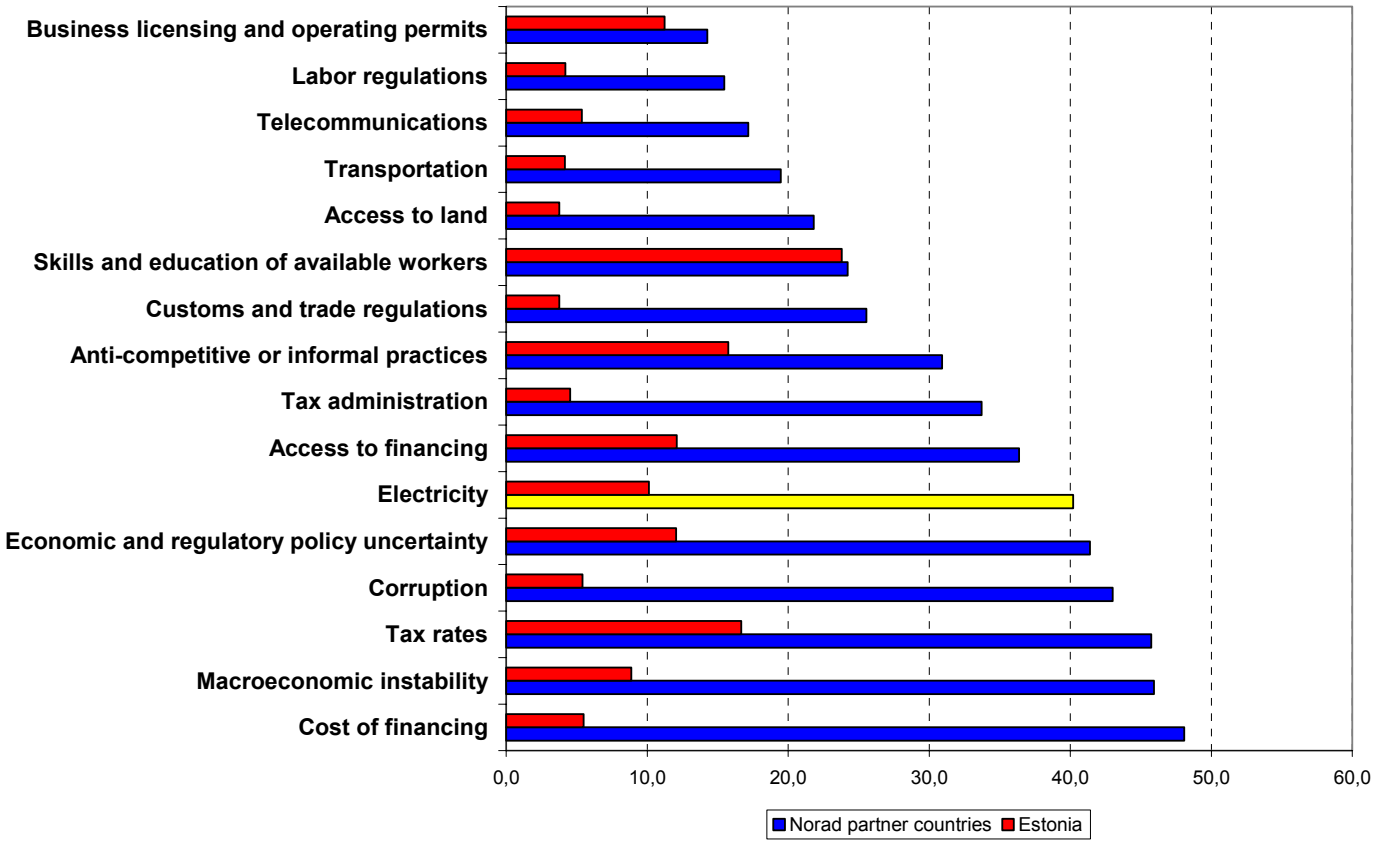
Typical of the majority of Norwegian partner developing countries (and why they have been chosen as partner countries) is widespread poverty, low level of governance, and an adverse investment climate, regardless of what area or sector the investments are needed for. Figure 6 sets out the main barriers to investment in a selection of Norad partner countries[9] where data is available. The score is benchmarked against the barriers to investment in Estonia, a star pupil in the emerging market class.

Macroeconomic instability and a dysfunctional financial system, which makes the cost of lending prohibitively expensive, represent the most significant challenges along with high tax rates and complex tax codes together with corruption, which is often fed by a complex and unpredictable regulatory environment . These factors are closely correlated with the quality of governance, and the better the governance the better the scope for facilitating environmentally benign investments and investments in environment assets. Against this background the investment barrier illustrations in figure 6 are shown as proxies for barriers to environmental investments as well.

The barriers to investment vary greatly between the countries surveyed. Some countries have a reasonably benign investment climate while the majority need to reduce barriers to investment substantially in order to attract more domestic and foreign investment capital. Mozambique and Kenya are the two countries with the most restrictive investment climate while a country like Sri Lanka had improved its investment climate significantly in recent years and had been awarded with a growing inflow of foreign direct investment and a lower country risk rating, until the armed conflict recently escalated all over again. Estonia which is used as the benchmark case has one of the best investment climates among any emerging market and has received in total foreign direct investments amounting to close to 100% of GDP over the last decade. This has contributed substantially to productivity growth which has accelerates economic growth and reduced poverty.

[9] Bangladesh, Ethiopia, Kenya, Tanzania, Uganda, Mozambique, Sri Lanka,

**Figure 6. Main barriers to investment Norad partner countries.**




Source: World Bank Investment Climate Database 2002

A key point is that a "successful" natural resources management regime from the point of view of primary stakeholders will not necessarily imply either preservation of the resource or its sustainable use. Resource depletion need not be the result of a "tragedy" of institutional failure to control the use of the renewable natural resource (RNR), but may reflect the successful implementation of the desires of (the most influential) stakeholders to deplete the resource and to transform it into other forms of capital. Factors such as changes in the relative returns to different forms of capital, the balance of power between stakeholders, interest rates and discount rates can therefore be expected to influence institutional arrangements and whether they provide for RNR sustainability.

In relation to the policy context that will favour successful investment in environmental assets for poverty reduction, D. W. Pearce (2005) op.cit identifies the following factors and priorities:

- The existence of social capital is essential for successful Common Property Resources (CPR) management by communities, but social capital tends to break down under conditions of environmental degradation, and direct policy interventions aimed at building social capital are likely to be counterproductive.
- Clear definition and enforcement of the resource rights of the poor.

- Access to credit that is directed to pro-poor asset formation rather than current consumption.
- Insurance to enable poor people to cope with vulnerabilities to environmental hazards.
- The removal of environmentally damaging subsidies.
- There may be some scope for market-based instruments (like local fisheries quotas and trading in water rights) but institutional capacity constraints are likely to limit this scope.
- Payments for environmental services (such as for the protection of vulnerable ecosystems) may, if well-designed, have significant potential to yield pro-poor benefits.

It is now theoretically and empirically well established what are the main causes of the gaps between how environmental resources such as biodiversity, conditionally renewable natural resources (such as comprehensive watershed functions, groundwater reservoirs, cultivable soils, forest cover, etc) and depository sinks for pollutants are valued in the market versus by society at large. Such gaps are known as external costs of using these resources and sinks, i.e. costs that the polluting - or resource using - individual or firm imposes on other members of society or on the world at large.

Together, market- and policy failures are the main underlying causes of environmental investment failures leading to biodiversity loss, excessive use of non-renewable resources, depletion of conditionally renewable resources, and overloading of depository sink capacity of the various pollutants generated by our various production and consumption activities. The components of such failures that need to be diagnosed and corrected as a basis for prescribing corrective policy responses that eventually would lead to optimal environment investments are as follows;

(1) the public goods characteristics of many natural resources and depository sinks;
(2) the ignorance or uncertainty about the social consequences of private actions, leading to socially inappropriate allowances made by individuals for irreversibility of resource use and uncertainty;
(3) the use by individuals of an excessively high rate of interest or discount of the future from a social point of view;
(4) the "tragedy of the commons"; i.e. that the insecurity of the established structure of tenure encourages people to ignore the known social consequences of their actions;
(5) government policies in production oriented sectors and related to consumption that not only fail to rectify externalities, but in many cases magnifies the problems by means of subsidies to natural resource extraction, use and waste disposal, and by issuing special privileges, e.g. short term logging and harvesting concessions to powerful interest groups;
(6) the presence and execution of monopoly rights.

Without government intervention, firms and individuals may have no reason to take such external costs into account when making investment decisions affecting the environment and natural resource base. Their decisions about production and consumption activities which give rise to waste, pollution, resource extraction and biodiversity loss, about choice of technology, the use of pollution abatement

measures, and about the disposal of waste, will then all be taken purely on the basis of the "private" costs and benefits to the individual or the firm. In many such cases the atmosphere, the local air, water systems, soils and coastline may be treated as free with open unrestricted access for disposing of unwanted waste products. This is so despite the fact that unrestricted extraction from, and pollution of these sources and sinks may impose costs on other firms or individuals today and in the future. It is against this background environmental policy calls for corrective measures constituting public intervention in some form to internalize the externalities arising from market and policy failures caused by the above factors.

## 6. Debt Relief, Investments and Environment Impacts[10]

It is widely believed in political and ideological circles that large foreign debt is a major cause of much poverty, suffering, injustice, environmental damage, and lack of environmental investments to prevent such damage, in indebted developing countries. Reducing developing country foreign debt is thus perceived to be an effective way of halting and perhaps reversing such adverse development trends.

There is no doubt that having a debt erased from the accounts is advantageous for the debtor, since such debt forgiveness is the same as a grant which makes it possible for the recipient of such a favour to buy more goods and services than what the recipient could have bought if part of the income and revenue stream had to be set aside for servicing the debt. However, it does not follow from this that debt relief is an effective instrument for improving environmental management and reducing poverty.

Since the above myth about the environmental virtues of debt relief are so strongly cemented in influential political circles, it may be useful to explain why such policies may not contribute effectively to such benign outcomes.

First of all, one has to *understand why one would want to borrow* money in the first place. Fundamentally, a loan makes it possible for the borrower to finance an activity (investment or consumption) at an earlier point in time than what would be possible without the loan. It is important from the very outset to distinguish between on the one hand, borrowing for the purpose of an investment expected to yield a return to the economy larger than what would have happened without the loan, and on the other, borrowing for consumption or "white elephants", and where the servicing costs of the debt perhaps is transferred to stakeholders not benefiting from that consumption.

The widespread scepticism to and criticism of loans to developing countries appears to be related to loans that have been (mis)used primarily for environmentally damaging investments or consumption, benefiting a few favoured rent-seeking groups at the cost of the less endowed majority of the population. However, one should strive to adopt a balanced perspective on the impact of developing country loans, since much of this borrowing is indeed for financing infrastructure and job-creating investments, and as such is an integral component of a country's long term growth strategy.

[10] This section is based on S. Hansen (1989), "*Debt for nature swaps: Overview and discussion of key issues*", Ecological Economics, Vol. 1.

At the outset, *one must be careful and not assume that a debt burden is the same as a debt crisis*. A large debt burden measured in terms of the amounts to be paid to service a loan relative to e.g. the country's export revenue does not have to be sign of crisis. On the contrary, it could just as well be an observation of a well-functioning economy based in a portfolio of profitable (and perhaps environmentally benign) projects that create for sustained economic and social development, political stability and confidence in international credit markets . Debt crisis arises once the country is unable to, or faces severe difficulties in servicing it's debt obligations, and such a crisis may well arise even if the foreign debt is small.

The environmentally most serious consequence of confusing debt burden and debt crisis, is that influential decision makers may decide to write off debt as a means to reduce the pressure on natural resources and the environment in the country in question. The rationale behind such reasoning is that with reduced debt burden, the country can allow itself to reduce the rate of extraction/depletion of its natural resource base that generates export revenue, which is needed to finance imports, since a smaller share of this export revenue now is needed to service the foreign debt.

While this static line of reasoning may seems logical at first sight, closer scrutiny shows that it does not hold. The reality of the matter is that when the debt servicing obligation is reduced (regardless of how it is achieved) a larger share of the country's export revenue become available for domestic investments and consumption, than what was with the larger debt burden to be serviced. This will inevitably increase the pressures on the domestic resource base, including natural resources and the environment. Given that relative prices and charges remain as before the debt burden was reduced, it will now be more profitable to invest in public infrastructure, which will facilitate private sector investments that provides better access for increased extraction of the country's natural renewable and non-renewable resource base.

However, it is also possible – at least in theory - that with growing income and education, people will become more environmentally aware, and their government decide to set aside some of the surplus caused by the debt relief for the purpose of better environmental management.

Historical observations from several countries that have experienced debt crisis show that during such crisis the access to foreign loans has been limited – the increased political risks have kept lenders away – and many planned infrastructure projects, which in many cases would have caused severe irreversible environmental damage in fragile ecosystems (roads, power plants and processing industries in tropical forests in e.g. Brazil and Mexico) are shelved or postponed, thus reducing the pressure on the environment. One has also observed that during periods without debt crisis, such environment damaging investments do indeed go ahead. The high rate of resource extraction accompanied by devastating damage to the rain forests in the Philippines took place before the debt crisis struck, and in Indonesia the environmentally damaging Transmigrasi programme designed to relieve the population pressure on Java culminated before the debt-crisis struck in the mid-1980s.

The main point here is that debt relief for a poor developing country (in most cases characterized by a significant potential for improved governance) without any attached covenants regarding how the freed up "manna from heaven" funds shall be

used, creates temptations for non-sustainable spending on consumption and investments. The well-documented "natural resource curse" provides overwhelming evidence that disciplined spending of "manna from heaven" is the exception rather than the rule.

Irrespective of the sovereignty of national states, it is always a lenders privilege to state conditions for the loan with the borrower. And in the case of debt relief the same principle and practice applies. Such "green conditionality" imposed by the lenders in order to channel the freed up funds into sustainable environment investments (sustainable use or preservation of tropical forests, mangroves, coral reefs, etc) have met with massive opposition from environmental NGOs and borrowing governments claiming that this is a form of "neo-imperialism". However, these same NGOs are at the same time strong supporters of "Debt of Nature Swaps" (DNS) which clearly impose such conditionalities on borrowers as a basis for granting the discounted terms at which a debt obligation is bought and written off. However, DNS requires even more stringent preparations and monitoring than straight forward debt relief because the attractiveness of the DNS to the debtor lies in the debt discount that can be negotiated. The discount is higher the worse the outlook for repayment of the debt. In other words, DNS encourages a debtor to display irresponsible economic management policies and unstable policy climate in order to maximize the discount granted by the lender!

The net effect of debt relief (whether by means of direct write-off or by means of a "Debt of nature swap") thus remains an empirical question to which the answer can only be established by means of a proper counter-factual comparison on a case-by-case basis. In the end the outcome is decided by how the authorities and the economic sectors of the country manage the freed up resources. Economic theory alone cannot provide a uni-directional answer.

## 7. Making the Case for Investing in the Environment

The poor invariably cannot provide collateral, and as a result lack access to capital, credit markets and insurance. The poor are thus captive to a very limited number of resource use options, and very often the available options imply extraction and depletion of the natural resources nearest to them for use. Natural capital assets are relatively more important to the poor than elsewhere. An yet, since the poor have no choice but to be more concerned with day-to-day survival than with longer run well-being, they are more likely to under-invest in resource conservation and enhancement; e.g. tree planting, soil conservation and sustainable management of mangroves and coral reefs. The poor thus tend to discount the future very heavily; they apply a very high discount rate to the investment propositions they face compared to what the less poor apply, and as a result they prioritize their limited investments and resource use choices differently and more in response to their immediate needs.

In short, these circumstances contribute to explain why environmental investments – especially those of relevance from a poverty reduction perspective – do not just happen. Most of the return accruing to environment investments does not show up in the marketplace, unless markets are created for the benefits in question. As a consequence, the free market will tend to underinvest in such environmental assets. This means that governments, global agencies and NGOs must enter the scene and finance many of the required environmental investments in cases where the social and

economic rate of return is high while the financial rate of return is below the free market cut-off point, to compensate for the lack of such investments coming from the free market. This discrepancy is enlarged in cases with a dominance of poor households, -individuals and –producers who all have very high discount rates as a basis for their investment decisions. In addition, many such investments have significant "public good" characteristics. This means that private interests are even less likely to result in the right amount of investment.

It was shown in table 1 above that for all countries – including the least developed ones – human-, social- and institutional capital constitute the most important assets for enhanced well-being and economic growth. However, the different assets interact, and important in this context is the fact that access to natural resources and environmental quality are vital ingrediences of human health and labour productivity, and hence, human capital, via (1) it's direct impact on morbidity and mortality, and (2) via the quality of land resources and access to fuelwood and potable water,. since the amount of time and family labour needed for such basic needs activities depend crucially on access to and quality of these vital resources. Environmental assets thus clearly influence the human capital formation.

When in the following examples the returns to environmental investments are presented, one should note that the analysis is myopically focusing on environmental investments. It does not take account of the fact that some of the goals of such investments could also be achieved by investing in e.g. human capital (i.e. education and direct health measures) in order to raise awareness of how to guard oneself and family members against the most obvious health hazards resulting from the environmental deficiencies that they are exposed to in their day-to-day life and work. Complementarity between investing in environment resources and in human and institutional capital is found to mutually enhance their rates of return to stakeholders and society.

In 1990, the estimated annual fiscal burden due to subsidies incurred from inefficient pricing of water resources constituted almost USD 20 billion or 40% of overall foreign aid. In addition came USD 55 billion of annual savings to infrastructure service providers from raising technical efficiency to best practice levels. This amounted to a quarter of annual infrastructure investments, and twice annual development finance for infrastructure. Purely, for illustration, if these technical infrastructure losses could be redirected for three years, at current costs in 1990 of roughly USD 150 per person for water systems, the one billion poor people without safe water could be served and the MDG targets met.

It is now well established (S. Hansen and R. Bhatia (2004)) that not only do the poor have the least reliable and accessible service of public water, they also end up paying much more than the rich and the not-so-poor. The reason is simply that public water supplies do not reach the poor. This is typical in many poor urban areas and squatter areas in metropolitan areas in developing countries where public water is so heavily subsidized that there is no revenue for the expansion and maintenance of a reliable supply network to poor areas. Short of cheap public water, the poor end up captive to water vendors who charge as much as ten or twenty times or more than the heavily subsidized public charges available to the non-poor with public connections. Studies

have found these excess cost ratios hurting the poor to be as high as 20 in Ecuador, 16 in Peru, 10 in Columbia and Turkey and 5 in Ivory Coast.

Several field studies have contributed to removing the resilient myth that poor people cannot afford or are unwilling to pay for safe and reliable public water to meet their daily needs[11]. Poor urban African households are willing to pay a considerable share of their income for reliable access to safe water, enough to finance the necessary investments, if the authorities would let it happen[12]. If there is political will to remove free- or subsidized water and sanitation from the privileged few and to invest to provide it at user tariffs that cover investments and operating costs, then a major barrier to achieving the water and sanitation MDG has been removed. In short, the benefit-cost ratios for investments in safe water and sanitation reveal very high rates of economic return.

It is therefore fundamentally untrue to claim that the urban poor cannot afford to pay the costs of public water supply if it were to be extended to their residential areas. The main obstacle to extending such networks is often that the residents are squatters or others without formal ownership or lease rights to the land they live on, or that real estate owners have plans to remove the poor and develop the land for other more profitable purposes. The main excuse, however, has often been that for social and welfare reasons one cannot afford to extend the public networks to where the poor live, because it is assumed that they cannot afford to pay the cost of water supply. Given the alternative these residents actually face and have to adapt to, they would be more than happy to pay the full cost of the water they need. The relevant authorities should seek out modes of financing and paying for water to residents in such areas so as to simultaneously secure both equity and efficiency in the water market. In fact, if already connected consumers in the richer parts of the community were to pay the full cost of their water, experience from many developing country cities has shown that overall water for consumption could drop by as much as 20%, and waste of freshwater would also be significantly reduced. Both effects would free up public resources which could be reallocated in accordance with the country's PRSP and at the same time it would be an environmentally benign measure.

By achieving such efficiency, service provision would adjust more in response to demand. It would enhance overall economic growth and competitiveness of the economies. Clearly, such results would not occur unless good governance and substantial capacity building takes place in government and public utilities, which again shows the importance of linking reforms, investments and management of operations closely in the PRSPs. Creating a conducive policy environment should be the dominating way of mobilizing higher revenues for new investments and for attracting inflow of new and additional resources for investments.

By the same logic, well designed and implemented investments and management plans for water resources will have significant positive impacts that are measurable in macro-economic terms and at the same time facilitate implementation of the national PRSPs. A study by J. Sachs (2001)[13] suggest that countries with per capita incomes

[11] Hansen, Stein and Ramesh Bhatia (2004),op.cit
[12] See e.g. Hansen. Stein (1993), op.cit., Box 19.2, p.136.
[13] Sachs, Jeffrey (2001), "*Macroeconomic and health: Investing in health for developing countries*". Copenhagen, World Health Organization.

below USD 750 per year and with access to safe water and sanitation grew on average 3.7% per year, as compared to only 0.1% annual per capita income growth in countries with similar per capita income, but where access to safe water and sanitation was limited.

WHO has estimated the returns to water and sanitation investments for different levels of investments in developing countries, see Hutton and Haller (2004)[14]. The benefits accrue as:

- Time savings from avoided collection of water and visits to sanitation facilities. These benefits comprise some 75% of the total benefits from achieving the MDG7 target. Time savings will show up in increased output and productivity, and in higher school attendance (obviously, the overall benefit estimate is very sensitive to the estimated value of time used in these calculations);
- Health sector savings account for just under 10% of total benefits;
- Increased working- and school days from reduced illnesses account for the rest.

The MDG target relating to safe water is to halve the proportion of population without sustainable access to safe drinking water from the 1990 baseline[15]. Martin-Hurtado (2002) has estimated that the world would benefit tremendously from achieving this target because it could save the lives of up to 1 billion children under 5 years of age over the 2015-2020 period. The cost of achieving this MDG target is estimated to some USD 26 billion per year, but since the benefits as described above would amount to USD 84.4 billion, the benefit/cost ratio would be an impressive 3.2 : 1. It is noted that WHO – using the Hotton and Haller (2004) approach - concludes with less than half the costs for meeting the MDG target, and therefore a more than twice as high a benefit/cost ratio.

As for investments to **provide electricity and reduce harmful indoor air pollution**, would it be worth while to extend electricity to more than 500 million more people by the MDG year of 2015, and would it be worth while to provide modern heating fuels and cooking to perhaps 700 million depending on indoor-polluting fuelwood by that same date? D. W. Pearce (2005), table 5.7, finds that the annual investment needed to achieve this is USD 28 billion.

In order to justify such investments one would need to document benefits amounting to USD 40 – 56 per capita per year just to offset such costs. In order to illustrate what this would mean for the budgets of the poor, D. W .Pearce (2005) finds that for the very poor with USD 1 per day income, this would amount to 10%-15% of it. For those at USD 2 per day income, it would tap them of 5% – 8% of their per capita income, in both cases assuming that getting access to the many conveniences (e.g.

[14] D.W. Pearce (2005) op.cit. cautions against methodological weaknesses and uncertainties in the data, but both he and WHO nevertheless uses this are the primary source of aggregate justification for such investments.

[15] Access to safe water in the MDG context refers to the proportion of population dependent on piped water, public tap, borehole, protected well, protected spring, and rainwater, with the availability of at least 20 liters/capita/day. This definition does not caputure service quality dimensions such water quality, reliability of supply and service delivery.

freeing up of time for more productive activities, much reduced exposure to indoor air pollution, improved health and more time for kids to study and do homework) that follow with access to electricity and modern fuels does not increase their income earning opportunities (which in fact such conveniences will indeed do). Since the costs of such energy improvement programs is less than 10% of actual average rural energy expenditures in developing countries and less than 50% even in rural Nepal, one can conclude that such investments would very probably have significant positive benefit-cost ratios.

Also for some stove improvement programs (e.g. in Kenya and Guatemala) D. W. Pearce (2005) finds documentation that suggests very high benefit-cost ratios due to the improved indoor air quality and subsequent improved health conditions of women and children. In addition to this come the savings in time for collecting biomass fuels and the possible reduced pressure on e.g. forest resources from the reduced demand for fuelwood (although this latter factor is no longer considered a major threat, since what is collected is usually fallen twigs and branches[16]). Studies in Nepal by Kumar and Hotchkiss (1988)[17], found that poor rural households that were constrained to have family members fetch fuelwood and water, had available 24% less labour for farming activities. As a result, a comparison to a control group showed that they also suffered from poor nourishment.

Environment investments designed to **slow land degradation and conserve soils** have been assessed in D.W.Pearce (2005), pp.89-90. His findings suggest that the economic attractiveness varies considerably between the different measures. Whereas a survey of a dozen studies of agronomic measures such as tied ridges, contour planting, intercropping, no till, etc generally concluded with a positive net present value, i.e. that benefits exceeded costs, only half of the vegetative measures examined (alley cropping, farm forestry, gum Arabic, shelter belts, etc), structural measures such as rock dams, bunds, terraces, and management measures such as animal traction, fodder banks etc, passed the same welfare-economic test. The net economic benefits from such investments also depend on the initial soil conditions, and the local context. Typically, if top soils are thin initially, the benefits from preventing further soil erosion can be highly significant, while preventing even high rates of erosion may yield inadequate benefits to justify the investment in case where the top soil is so deep that no traceable adverse yield impacts are found within the time horizon for which effects are measured with the given discount rate. However, it should be noted that slowing land degradation is likely to have many other benefits, including halting biodiversity losses and reduced global warming.

R. Martin-Hurtado (2002) of the World Bank estimated the annual costs of a 15 year program for reducing desertification to between USD 16 and 36 billion, and the annual on-site benefits in the form of avoided productivity losses, to USD 52.5 billion per year[18]. This yields a benefit-cost ratio in the range of 1.5 – 3.3, and suggests that such investments are economically justified. Since poor people are over-represented

[16] See Hansen, Stein (1993) op.cit., pp. 118-126.
[17] Kumar, S. K and D. Hotchkiss (1988), "*Consequences of deforestation for women's time allocation, agricultural production and nutrition in hill areas of Nepal.*" IFPRI Research ReportNo 69, Washington D.C.
[18] Social-, off-site- and global benefits from reducing desertification are not included in the Martin-Hurtado (2002) benefit estimates.

in fragile areas exposed to the threats of "desertification" the incidence of the benefits from such investments would also be favourable and MDG/PRSP enhancing.

A key challenge when establishing and managing **protected areas** (PAs) in developing countries is how to compensate displaced people in the PA proper, or those living in buffer zones, but who have traditionally depended on hunting, fishing, harvesting and gathering of non-timber products in the PA for their living. Securing a non-declining asset base for the affected vulnerable stakeholders in and around PAs and the compensation needed for this to be guaranteed, must be included as part of the costs of such area protection against unsustainable use. In practice, however, such compensation (if at all provided) tends to be based on estimated foregone income rather than foregone assets, see e.g. D.W. Pearce and T. Swanson (2005). Experience from PA development has shown that[19]:

- It is relatively easy to get funds for physical construction, but much harder to get funding for maintenance, basic operations, and in particular for investments for protection of those ecosystem functions that makes the PA worth protecting from a natural asset value perspective.
- As a result, PA managements are allowed and encouraged to set up their own sources of funding through a number of economic venture – hotels, ecotourism developments, museums, zoos, sale of specimens etc.
- The sources of funding available to the PAs only capture individual user values of PAs. Ecosystem services to society and the services of biological diversity/heritage for the country and the global community cannot be captured by the individual PAs.
- The net result is a systematic tendency to overexploit user values by means of economic ventures, while ecosystem services and preservation of biological values do not get sufficient attention. This leads to a variety of undesirable management conflicts between local stakeholders and national authorities and entrepreneurial developers.
- Some PAs are in a more difficult position than others. In particular, PAs with low immediate user value but significant value in terms of ecosystem services and biological preservation are facing a difficult situation and a funding gap.

Several cases from Norway's partner countries (e.g. Lake Mburo National Park in Uganda, Serengeti National Park in Tanzania, Bhadra Tiger Reserve in India, and Marovoay Protected Area in Madagascar) illustrate the shortcomings of what has been practiced by national authorities and how this has deteriorated the well-being of (especially poor) affected stakeholders in- or adjacent to areas that are converted into PAs, even when the PAs have generated sufficient revenue to compensate fully for the losses incurred.

In all these cases it would have been possible to offset the damages to the poor either from cash revenue collected from tourist entrants to these PAs or by compensatory investments in the assets of the poor affected stakeholders, such as by tree planting, provision of credit to facilitate investments in soils management to provide for

[19] Stein Hansen and Haakon Vennemo 82004), *"Protected area task force report to CCICED 2004"*.Report to CCICED's Protected Areas Task Force, Oslo.

improved yields, better livestock management, and/or by creating local PA-related workplaces for these stakeholders. By so doing, the authorities would have created allies for the protection and sustainable management, instead of creating sabotaging enemies of the PAs.

B. Aylward et al (1996), provide a good case nature tourism example from Costa Rica's Monteverde Cloud Forest Biological Preserve. The local community with two neighbouring towns had over 30 well-established hotels in the 1990s, with more than 90% of the visitors to the Cloud Forest Preserve staying on the average two nights, and they patronize local shops and restaurants, gasoline stations and use local tour guides, and they pay to visit local galleries, factories and a butterfly farm. Tourism based on the local human and natural resource assets thus have a substantial positive impact on the local community, since virtually all these enterprises are locally owned, and it is in their interest to maintain the preserve in pristine condition so that the visitors are attracted.

A carefully conducted "with-without" analysis of a conservation program of the benefits of protecting the forest remnants of the severely deforested Haiti, the poorest country in the western hemisphere[20] focused on whether it would make sense for such a poor and mismanaged country to devote resources to protect it's remaining forest areas. By means of order-of-magnitude estimates the study predicted the impacts of continued forest degradation upstream of the irrigated agricultural land in the form of lost irrigated agricultural output, and damages to infrastructure resulting from deforestation. The estimated benefits from such action were then compared to the expected costs of protecting the targeted protected areas, including the investments in conservation and the management of it, and the foregone income from not logging the area and converting it to cultivated land. The results of these alternative scenarios suggested that the avoided losses to downstream irrigated agriculture would far exceed the foregone gains from converting upstream forested areas to agriculture, even if the project were to succeed only in halting degradation at current levels.

In a case study of Costa Rica, the following estimated annual environmental values per hectare from sustaining primary forests were estimated (in 1989-US$):

| | **Range in $-value per hectare**: |
|---|---|
| 1. Hydrological benefits | $ 16.55 - $ 35.60 |
| 2. Carbon Sequestration | $ 60.00 - $ 120.00 |
| 3. Ecotourism | $ 12.56 - $ 25.12 |
| 4. Future pharmaceuticals | $ 0.15 |
| 5. Transfer of funds | $ 12.80 - $ 32.00 |
| Annual total | $ 102.20 - $ 213.70 |
| Net present value per hectare (at 8% discount rate) | $ 1277.50 - $ 2671.30 |

Perhaps most surprising to some in this context is the very low value attached to future pharmaceuticals. This result is, however, fully in line with most economic research on the biodiversity value for use in pharmaceutical research[21]. Even with a value of $10,000

[20] World Bank (1996), "*Haiti forest and parks protection technical assistance Project: Staff appraisal report.*" Report No T.-6948-HA, Washington D.C.

[21] Simpson, R. David, Roger A Sedjo and John W. Reid (1995), "*Valuing Biodiversity for Use in Pharmaceutical Research.*" Journal of Political Economy

for a marginal species, and an expected cost of US$ 3,600 for assessing the pharmaceutical value of a sample, this translates into no more that at most $20 per hectare of maximum willingness to pay by pharmaceutical companies for the conservation of the most attractive tropical biodiversity "hot spots", and in most other places it would immediately drop to less than one dollar. This is of course not to say that we should not be concerned with loss of biodiversity. The point to be learnt from this economic analysis is that if the international community values biological diversity so highly that it is prepared to fund land owners and land users to conserve the tropical forests or manage them as sustainable forestry, then there is limited financial support to get for it from a myopic profit-seeking pharmaceutical industry.

Investing in wildlife is a very real option for generating revenue and tourism servicing jobs for sustainable area management in many places. Several alternative wildlife management schemes have proven beneficial, ranging from wildlife ranching providing for sustainable game and trophy hunting where there is substantial willingness to pay for such action, e.g. the Pakistan Trophy Hunting Programme, the Zimbabwe CAMFIRE program, and similar programs in Southern Africa, and non-hunting safari-tourism in e.g. Nepal (Chitwan), Kruger National Park in South Africa, and the revealed willingness to pay among visitors to China for sustainable management of the Panda Reserves in the Sichuan Province.

A major challenge facing **coral reef conservation** programs that are economically beneficial to the country, is the fact that those benefiting from conservation are not the same as those perform destructive reef mining, fish blasting etc, and who are also often poor people with few alternative income earning opportunities. A crucial integral part of any such project is thus to secure a distribution of the costs and benefits that will be favourable and acceptable to the different stakeholder groups.

Studies referred to by D. W. Pearce (2005), p.101 suggest that existing annual revenues from use of reefs are substantial, and that sustainable harvesting of coral reef-related fish, shore protection and dive tourism in the Caribbean amounts to billions of USD. This benefit and revenue is, however, threatened by the annual degradation causing losses amounting to several hundreds of million of USD.

In Malaysia a study of the services from a coral reef marine reserve area showed considerable willingness to pay for sustainable use, and that price discrimination between foreign and local tourists would yield the optimal revenue from sustainable management. Such revenue would suffice to manage and police the reef reserve and a sewage disposal system[22].

A study by H. Cesar (1996) of conservation versus damaging activities on Indonesian coral reefs showed that reef conservation was a much better economic option that overfishing, poison fishing, blast fishing, reef mining, and upstream logging when losses due to sedimentation damaging the reefs were the considered alternatives.

Similarly, empirical evidence from several studies reviewed by D. W. Pearce (2005) op. cit. suggests that the net benefits of **wetland- and mangroves conservation**

[22] B.H. Yeo (2002), "*Valuing a marine park in Malaysia*." in D. W. Pearce et al (2002), "Valuing the environment in developing countries: Case studies". Cheltenham: Edward Elgar: 311-326.

exceeds the benefits of conversion to other uses. His review of 6 Asian, 5 African and one Central American wetland- and mangrove conservation projects find benefit-cost ratios ranging from 0.3 (conservation is not an attractive option) to above 5 in three of the African cases studied, see his table 6.11, p. 102. The cases where conservation yield larger net benefits than conversion include conversion to aquaculture including shrimp farming, to agriculture, and woodchip production from mangroves. Wetland conservation case studies in Cameroon, Uganda and Sri lanka undertaken by IUCN, see L. Emerton editor) (2005), consistently show that such conservation is valuable to society, even in case of substantial urban development pressures.

Poor people living on marginal, and often sloping, land tend to be most vulnerable to **the impacts of natural disasters such as floods and drought**, or more generally; climate variability. The land on which they live tends to be more erosion exposed, and they often live on or adjacent to flood plains that are severely hit when large floods arise. Such weather variability vulnerability is observed in a large number of poor countries in Asia and Africa, and the benefit-cost studies of investing in water management for flood and drought protection in Mozambique, and investing to improve the natural resource assets climate variability resilience, reveal the severity of the problem and show that investing in enhancing the resilience of the natural asset resource base is likely to be a preferred development cooperation area in order to improve the likelihood of sustaining a growth process towards achievement of the MDGs, as opposed to repeated frequent returns to emergency relief actions to repair damages caused by extreme weather events, and then starting the growth process all over again.

Studies of the value of forest ecosystems suggest that **the dominant economic value of forests lies in their carbon storage and sequestration**[23]. Annual emissions from deforestation account for more than 18% of global greenhouse gas emissions, more than is produced by the whole of the global transport sector[24].

The Stern (2006) report op.cit also argues that this is an area where in principle rapid reductions in emissions could be achieved, because progress is not dependent on the development of new technology, with benefits from protecting existing forests (especially tropical forests with high carbon stocks per hectare) greater than those from the creation of new forests. The opportunity cost of forest protection in the eight countries responsible for 70% of the emissions from land use are relatively modest – currently around $5 billion per annum, although this would be likely to rise over time. These calculations suggest that the potential global gains from forest protection (measured just in terms of reduced carbon emissions) substantially exceed the opportunity cost of exploitation and conversion to agricultural land.

The role of carbon payments in raising the returns to conservation is time and again shown to be crucial, and often in excess of the discounted economic value of the more conventional forest goods and service values (i.e. from logging, fuelwood, non-timber forest products, genetic information, recreation, watershed benefits, and existence values), see e.g. D. W. Pearce (2005) pp.91-92, who concludes that a present value of carbon storage between USD 360 and USD 2,200 per hectare would more than

[23] J. Smith and S. Scherr (2002), "*Forest carbon and local livelihoods: Assessment of opportunities and policy recommendations*." Occasional Paper 37, Bogor: CIFOR
[24] N. Stern (2006), "*The economics of climate change*", Report to HM treasury, UK

compensate for many conservation values of tropical forests and thus pass a conventional benefit-cost test, but the amounts are very site specific. Smith and Scherr (2002), op.cit. show the minimum amounts of payments per ton of carbon to local communities needed to convince the stakeholders to refrain from land conversion to other land uses (e.g. land clearing for agriculture).varies from USD 3 to USD 31 based on a number of studies of tropical agro-forestry – and PA farm cases in South America, Sub-Sahara Africa and Indonesia.

## 8. Integrating Environment in Poverty Reduction Strategies

Poverty Reduction Strategy Papers (PRSP) describe a country's macroeconomic, structural and social policies and programs to promote growth and reduce poverty, as well as associated external financing needs. PRSPs are prepared by governments through a participatory process involving civil society and development partners, including the World Bank and the International Monetary Fund (IMF).

Progress in member countries' completion of their PRSPs is monitored yearly by the World Bank. PRSP is a donor-invented concept that is not expected to be immediately maintstreamed into long-term economic planning and budgetting by developing country governments.

Evidence so far show that mainstreaming of the MDG7 environment issues into PRSP is far short of target rates. However, year by year, new PRSPs are published with explicit environment issues being addressed, in most cases related to water and sanitation. Water and Sanitation have been identified in this review as the most important environment policy reform- and investment area from the perspective of reducing DALYs lost and meeting the MDG targets. The other MDG environment indicators (related to area under forest, -solid fuels/traditional energy and -secure tenure) are even more poorly covered in the PRSPs, as seen from table 3 which shows PRSP reporting progress from 2003 to 2004.

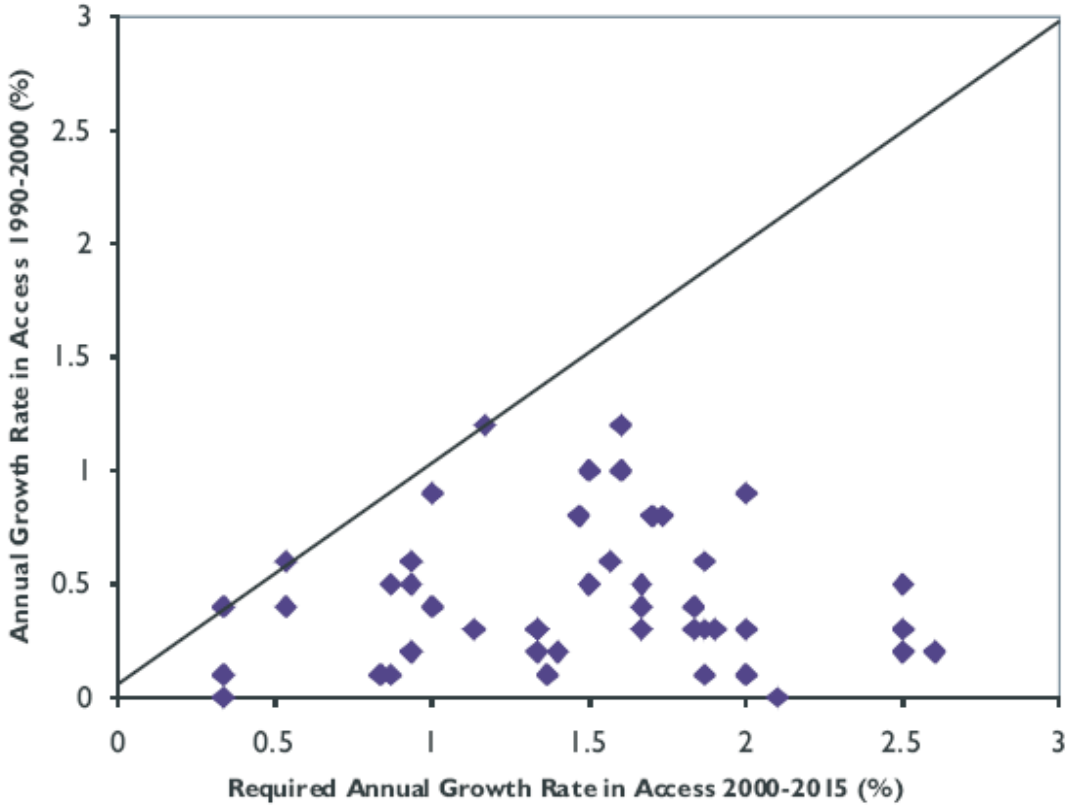
**Table 3. Change in Coverage of the MDG Environmental Indicators in full PRSPs from 2003 to 2004 (No. of PRSPs with such coverage)**

| Variable | Area under forest | Solid fuels/traditional energy | Access to safe water | Access to adequate sanitation | Secure tenure |
|---|---|---|---|---|---|
| **Baseline** | 10 > 11 | 7 > 8 | 24 > 32 | 18 > 24 | 0 > 0 |
| **Targets for 2015-MDG horizon** | 1 > 1 | 0 > 0 | 12 > 14 | 5 > 6 | 0 > 0 |
| **Targets for 2004-06-PRSP horizon** | 3 > 3 | 1 > 2 | 14 > 21 | 9 > 15 | 2 > 2 |
| **Capacity, finance and monitoring** | 7 > 10 | 6 > 8 | 8 > 12 | 6 > 9 | 5 > 6 |

Source: Bojø et al (2004), op. cit. , p.18, and Bojø and Reddy (2003), op.cit., p.10

However, achieved water and sanitation access rates are far short of the required ones, as evidenced by the analysis of Bojø and Reddy (2003). As a basis for assessing the actual progress on water supply over its 1990 baseline, they constructed country specific targets for the MDG end year of 2015 as halving the proportion of the population without access to improved water source at 1990 level for the sample of 44 countries that had prepared interim or full Poverty Reduction Strategy Papers having data on water supply. They converted the estimated access rates between 1990 and 2000 into annual growth rates of access. Next, they compared the estimated year 2000 access rates for each country to it's targets for 2015, and converted the gaps into annual average growth rates for each country needed to reach the MDG target access rates. Figure 7 illustrates the outcome of this analysis. It clearly shows that progress towards achieving the MDG improved water access target has been very slow

**Figure 7: Achieved and required access rates in reaching water supply target**




Source: Bojø, J. and R. C. Reddy (2003), "*Poverty reduction strategies and the Millennium Development Goal on environmental sustainability – opportunities for alignment".* Environment Economic series paper No. 92, the World Bank, Environment Department, Washington D.C. Calculation based on WHO (2000), "*Tools for assessing the O&M status of water supply and sanitation in developing countries.*" World Health Organization, Geneva, and WHO and UNICEF (2000), "*Global water supply and sanitation assessment report 2000."* WHO, Geneva.

Only 3 out of the 44 PRSP countries examined are in line with the required water access growth rates, and two more are close to the required growth rate. However, not one PRSP-country is *above* the required growth rate and 39 are significantly below,

many of them being so far below that access coverage is likely to worsen by 2015. For these countries this MDG will be even more remote than it is today.

This suggests a significant under-investment in improved water supply relative to what would be optimal from a societal perspective. Considerable increase in investment, policy support and private sector interventions are required to enable these countries to be on track and to proceed towards the targets. So far – and one is now half way from 2000 to 2015 – there are very few signs that the required changes in investments and policy commitment that would facilitate such investments are forthcoming.

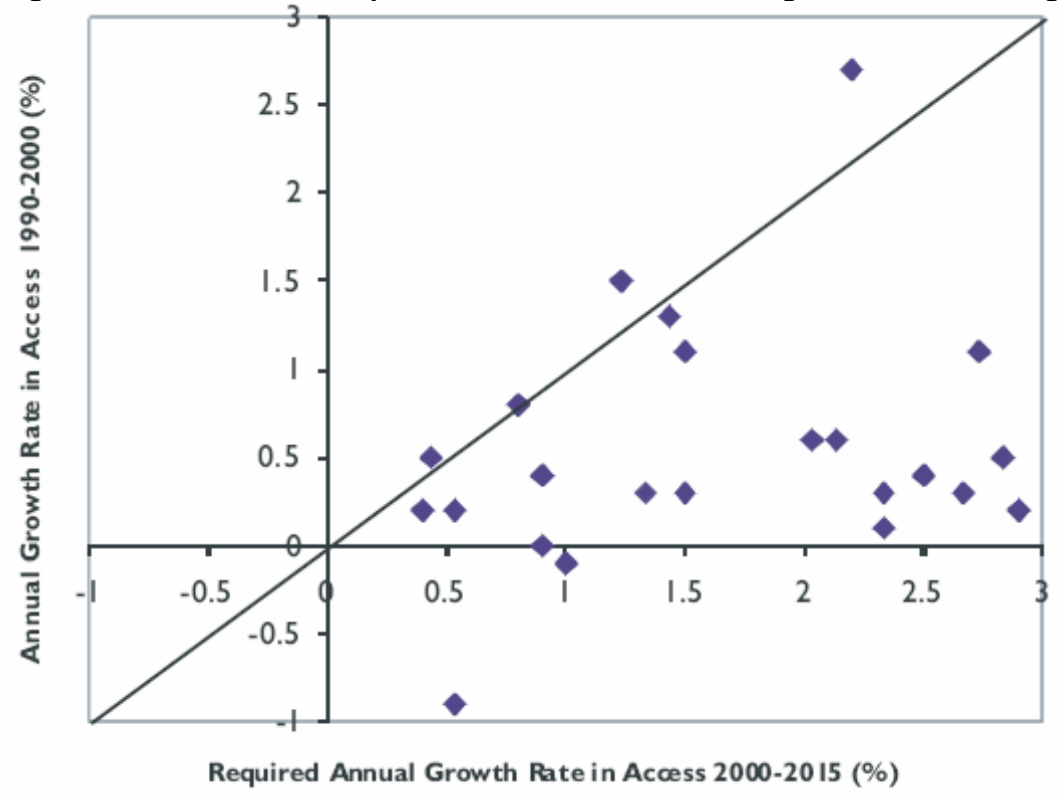
Access to improved sanitation refers to the proportion of the population disposing human waste through facilities such as flush latrines, sewer, septic tank, and simple pit or improved pit latrines properly constructed, maintained and used, see WHO (2000). Both in isolation and jointly with safe water supply, improved sanitation confers significant benefits, as seen from the references above. And yet, empirical observation and access data suggests that such investments and maintenance is accorded low priority and often extreme neglect in low income countries where the net benefits could be very substantial. Unawareness of the importance of hygiene is clearly part of the explanation for the low sanitation coverage in most PRSP countries, and the poor quality of such services is compounded by inadequate water supply, improper designs, - maintenance and -operation of sanitation systems.

In spite of the low baselines (for those few PRSP-countries that have such 1990 baseline data) and unimpressive MDG7 targets for sanitation access, the large majority of PRSP countries are about to severely underachieve relative to the MDG7 sanitation target. Six such countries had an annual growth rate in sanitation facility improvements in the 1990s that – if sustained – would lead to MDG7 target achievement in 2015, but the remaining 17 such countries would not reach this goal, and 14 of these would be far from it, and the population without sanitation coverage is expected to increase sharply, see figure 8.

In conclusion, even if an increasing number of PRSP countries have included data on improved access to water and sanitation in their PRSP, it does not follow that their investments are increased, and that sector policy reforms are initiated and instituted in ways that will contribute towards reaching the stated MDG7 targets. So far there is very little evidence to suggest that preparing and completing a PRSP has lead to any measurable increase in such investments and maintenance activities, or to policies that would promote and facilitate such initiatives. *There is no significant correlation between a well mainstreamed PRSP and implementation and monitoring of poverty reduction measures.*

In fact, statements in PRSPs and actual commitments and budget allocations to meet the MDG7 target do not at all match. V*ery few national PRSPs prepared so far actually identify, target and make significantly increased commitments to environment management actions as priority issues.* Furthermore, *the local capacity to undertake and implement the PRSPs is not at all in place, and the PRSPs do not explicitly make commitments to appropriately deal with this shortcoming. As a result, the likelihood of achieving the MDGs becomes small. Clearly, the politicians bear the responsibility for the outcome.*

**Figure 8: Achieved and required access rates in reaching the sanitation target**




Source: Bojø, J. and R. C. Reddy (2003), op.cit.

The poor seldom have much say in such development debates. In fact, the poor are rather invisible and often end up with empty promises, such as provision of water free of charge, which always turn out to be a non-performing promise.

The above review has shown that there should be no shortage of information and "good practice" example to convince politicians of what works and what does not in different settings. However, politicians know that re-election depends in many cases on their having "delivered" something to their constituents in general, or interest groups they are aligned with. Consequently, there is enormous immediate political value in keeping water prices and the direct fees associated with other water services (e.g. sewer connection fees) as low as possible. This political setting with its practical "no reform" outcome are at the core of the obstacles to reaching the MDGs, and has to be addressed in the open if such societies are to find a way to solve the problem of under-funded and under-performing water and sanitation systems, see Moss et al (2003).

*In the case of Norwegian partner developing countries, the performance from this perspective is not at all impressive, since they all are found to perform significantly poorer on implementation than on promises, reflecting the unsurprising tendency to be overly ambitious when presenting plans to donors, knowing that there is hardly any penalty for not performing.*

# 1. The Poverty – Environment Nexus

## 1.1 The Nature of the Nexus

Figure 1.1. below sums up as simply as possible the present understanding of the complex population-, poverty-, environment nexus[25]. In the figure a (+) denotes a compounding effect, e.g. environment degradation increases poverty, or high discount rates as a result of poverty leads to environment degradation. Likewise, a (-) denotes an amelioration effect, e.g. a so-called "Boserup effect" (named after studies conducted by Ester Boserup (1965), well-known agricultural development economist) which claims that population growth enhances the likelihood that new technologies are developed and brought into use with more people around, and this helps to reduce poverty and environmental damage. In short, what D. W. Pearce's[26] analysis presented in figure 1.1 suggests is as follows:

- *Population growth is likely to have a compounding effect on poverty* because existing limited assets become dissipated as they are shared among more people. This will be especially true for land, but it will also apply to open access resources such as fisheries. Communal management can be effective in limiting access to such resources, but often the capacity and power to enforce is lacking. Besides, with such limitation of access, the focus shifts to the fate of those excluded.

- However, some have argued along the lines of Ester Boserup (1965) that there may be *ameliorating effects from population growth* if population growth triggers technological change which materializes in the form of improved productivity of labour and capital.

- The *net population growth effect* is thus for empirical analysis to determine on a case by case basis.

- At the same time, *poverty increases population growth*, in part because children of poor families become assets that can carry out important productive tasks at an early age for the family economy when overall family productivity is low and access to technical implements is extremely limited.

- *Poor people* are forced to think about "tomorrow", i.e. they apply very high discount rates as basis for their resource use decisions. This stimulates *resource mining*, partly out of subsistence necessity, partly because their technological options for harvesting marginal and vulnerable land and forest resources may be limited to those that result in erosion and soil depletion, and partly because they lack reliable rights to the resources they harvest from and therefore must take advantage of the opportunities while they still have them.

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[25] For an early analysis and figure presentation of this nexus, see also Stein Hansen (1993), "*Miljø- og fattigdomskrise i sør – et utviklingsøkonomisk perspektiv"* (Environment- and poverty crisis in the south in a development economics perspective"), Scandinavian University Press, Norway.

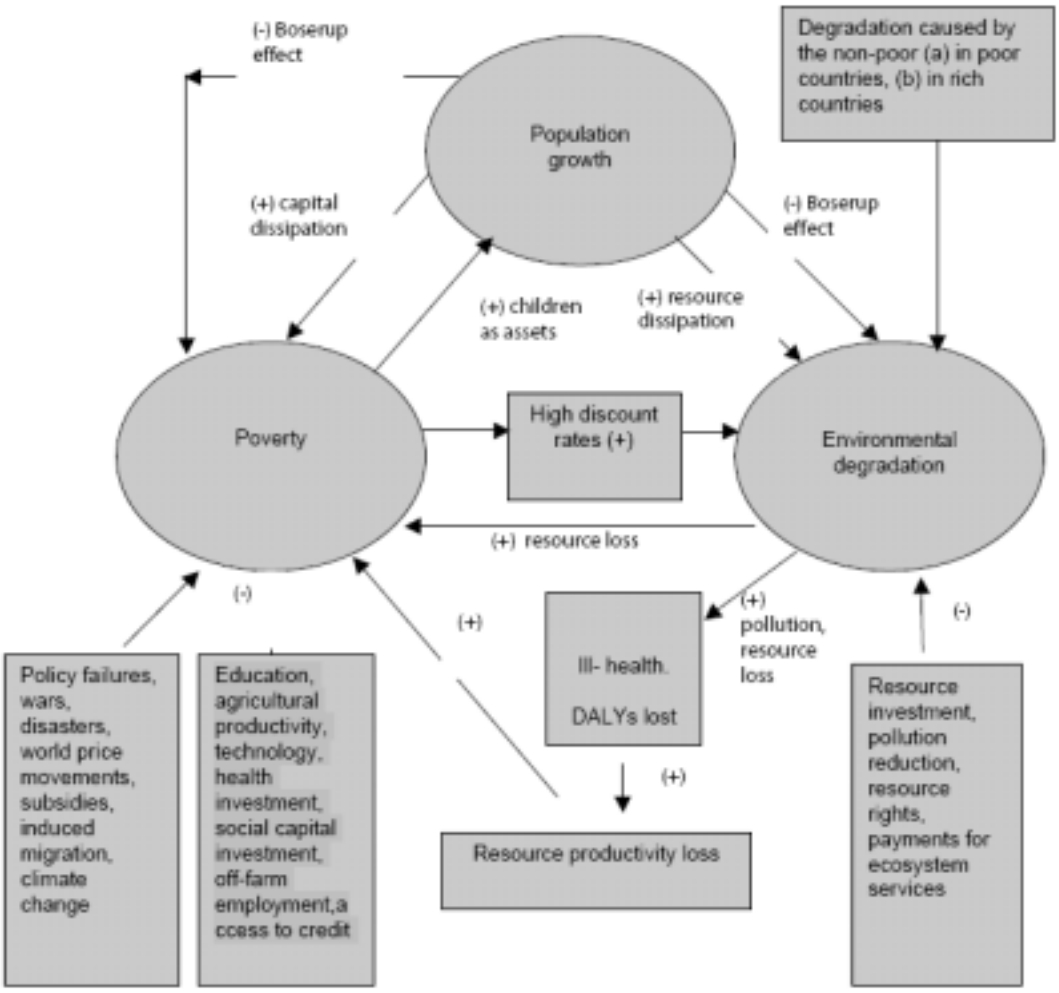
[26] D. W. Pearce (2005), "*Investing in environmental wealth for poverty reduction*"., Paper prepared on behalf of Poverty-Environment Partnership (PEP) of UNDP, UNEP, IIED, IUCN and WRI.

- *The poor tend to end up on marginal and fragile land* and at the same time such *poor land resources constitutes the major portion of their assets*.

- Environmental degradation in the form of *polluted air and water also impacts adversely on health (morbidity and mortality) and labour productivity*, and again the poor are most exposed and particularly vulnerable to losing out.

- Taken jointly, these effects easily combine to induce a vicious circle or nexus of the linkages between population, poverty and environment. *The Millennium Development Goals (MDGs) can only be achieved by breaking this circle.*

**Figure 1.1 Population, poverty, environment linkages**




Note: (+) indicates a positive feedback, i.e., the source of the arrow reinforces the effect at the target of the arrow.

Source: D. W. Pearce (2005), "*Investing in environmental wealth for poverty reduction*"., Paper prepared on behalf of Poverty-Environment Partnership (PEP) of UNDP, UNEP, IIED, IUCN and WRI., p.65.

State of the art understanding as regards diagnosis and remedies for addressing the poverty environment nexus can thus be summarized as follows[27]:

- Poor people are poor because their assets are few, and often of low quality;
- A significant fraction of those assets comprise natural and environmental resources that provide valuable ecosystem services;
- Environmental assets are highly vulnerable to overuse and external appropriation;
- It is extremely easy for local, national and global events and policies to trigger mechanisms that damage environmental assets, forcing the poor into "vicious cycles" of poverty and further environmental loss;
- Although rich people can often protect themselves against many of the effects of environmental degradation, the poorest usually cannot;
- When carefully managed, the "social rate of return" from investments in environmental assets can be very high and of special benefit to the poor; and
- Such investments need a favourable policy context to make them effective and sustainable.

The last two bullets form the focus of this review. By means of examples from, among others, Norwegian developing partner countries this review sets out to confirm the validity of the sixth bullet point above, and at the same time show how crucial a favourable policy context is for achieving such returns.

## 1.2 Assets versus Income

A crucial condition for increasing average well-being in a society involves raising the per capita endowments of capital assets - or as economists would see it - wealth. Assets in this context is defined as anything that generates a flow of well-being through time, and wealth is the total sum of available assets. Wealth thus adds up the value of the services provided by a wide range of assets. These include, individually and in combination:

- Manufactured implements at a farm or in a household,
- Environmental production- and recipient services provided by fertile soils, forest cover, clean water courses and fresh air,
- Knowledge acquired through education and practical work,
- Good health secured by means of access to clinics and vaccination programs,
- Access to the facilitating services provided by a well-functioning public sector, and
- A policy setting which describes the relationships among individuals and society's institutions, and serves as a "glue" that hold societies together, and provides a setting for division of labour and tasks among it's members so that everyone can benefit from specialization and cooperation/trade.

Some – especially man-made - assets depreciate rapidly through use and need replacement at regular intervals, while other assets can be maintained with marginal but well-targeted human efforts. Natural resources assets are in many cases such that it takes little effort to maintain their asset value, but at the same time even marginal

[27] See Pearce, David W. (2005),op.cit. p.19.

overuse of some such assets can have devastating and sometimes irreversible adverse asset-depreciating effects.

How then can environment and natural resources be seen as capital assets along with man-made implements? The following examples should suffice to illustrate the point:

- Soil fertility generates crops and livestock output;
- Clean air and potable water sustain human health and thus ability to study and produce effectively;
- Forests produce timber, many non-timber products, watershed protection, and carbon sequestration;
- Wetlands and coral reefs sustain fisheries, provide storm protection, and recreation;
- The ozone layer of the stratosphere protects human health and other biota by limiting ultraviolet radiation.

The sum of all these assets constitutes key components of overall economic wealth. Sustainable development requires that this overall wealth must not decline over time in per capita terms. Three key factors are identified here:

- *Technological progress* that raises productivity of assets enables more well-being to be generated from one unit of wealth. Such technological progress can be observed to take place for all conceivable assets; man-made-, natural- and societal, and imply that (a) more wealth can be distributed over a given population, or (b) a larger population can be supported without per capita wealth declining;
- *Population growth* that reduces assets per capita if there is no technological progress or may result in no per capita asset growth even if there is technological progress.
- *Growth in prosperity* coupled with constant or growing population translates into increased conversion of natural ecosystems to agricultural, industrial or residential use, but also to increased demand for ecosystem inputs, such as fresh water, fibre, and soil fertility, as well as increased pressure on the capacity of the natural ecosystems to assimilate our waste, including air- and water pollution as well as solid waste.

In short, we are asking more and more from natural ecosystems even as we reduce their capacity to meet our needs. Striving for sustainable development requires focusing on assets management and enhancement as opposed to *conventional income* generation. Income conventionally measured can be increased by increasing the efforts used for extracting services from the asset base, e.g. natural resources. Income thus measured can be achieved by means of excessive harvesting (i.e. depletion) of renewable- natural resources (forests, fragile soils, fisheries), and non-renewable ones (minerals, groundwater and species extinction), and overloading the recipient capacities of air and water for purposes of waste disposal. Such resources management strategies implies increasing short-term incomes by depleting the assets base, which again means reducing the scope for sustaining the initial well-being level. Therefore, it has become widely agreed in recent years that sustainable development

strategies requires asset enhancing management practices as the starting point of the analysis, and not income as conventionally measured[28].

The focus on assets as opposed to conventional income is even more appropriate when the poverty-environment nexus is the focal issue. This is so because poor people in developing countries derive much of the well-being from services extracted from natural resources owned by- or accessible to them for extraction, e.g. by means of subsistence farming or –fisheries, with cash income constituting a relatively modest share of the basis for their well-being. Such natural resources assets are vulnerable because poor people in rural settings with few mechanized implements at their disposal for sowing, weeding, watering and harvesting, need manual labour throughout the growing season to tend to the fields they can access, to gather firewood and collect water. In case of unexpected drought or precipitation they have very limited access to compensatory measures to counter the adverse effects of such natural calamities. Children thus become productive assets to the farm household at a very young age, and the incentive to have more children (which also grows with increased infant- and child mortality) grows as the natural asset base is mined and more labour effort is needed to collect the needed quantities of food, fodder, water and fuelwood. This again accelerates the mining of the natural asset base and characterizes the "*evil cycle of poverty, population growth and environment depletion*".

## 1.3 Valuing Environmental Assets

This paper is concerned with environmental services. e.g. ecosystem benefits, from the perspective of their contribution to human welfare. Clearly, this does not mean that one should disregard intrinsic values of ecosystems reflecting their ethical, philosophical or cultural importance, irrespective of whether they contribute to human welfare. Focusing on the economic benefits and how to value these is thus only one of many inputs to the decision making process when alternative ways of achieving sustainable use and avoiding unsustainable uses of environmental resources/ecosystems is being considered.

The benefits provided by natural resources and ecosystems are both widely recognized and poorly understood. However, devoting more effort to conservation of the environment and natural resource bases may mean having fewer resources available for addressing other pressing needs, e.g. improving health services, education and/or infrastructure that again would facilitate access to health and education. Conserving ecosystems and the goods and services they provide may also involve foregoing certain uses of these ecosystems, and the benefits that would have been derived from those uses[29]. A case in point to illustrate this dilemma or balancing act would be that not converting a forest ecosystem to agriculture preserves certain valuable ecosystem services that forests may provide better than farmland, but at the same time it also prevents us from enjoying the benefits that agricultural production can provide. Societies are generally organized so that the benefits derived from conversion of ecosystems into man-made systems (e.g. agriculture, urban areas) are

[28] However, income – as defined in theoretical economics – is fully compatible with the asset management approach outlined here. Income thus defined is the value of services that can be extracted from the asset base without resulting in a declining stream of such asset-derived services in the future.

[29] See e.g. S. Pagiola et al (2004), "*Assessing the economic value of ecosystem conservation*", World Bank Environment Department Paper No 101, the world Bank, Washington D.C.

captured in monetary terms by the markets we have established for trading goods and services, whereas a serious asymmetry exists in that similar markets that value ecosystem services, which we also appreciate highly, are not traded in formalized markets. As a result of not being valued and compared in market terms, little attention is paid to ecosystem services which are not captured by such plan- and budget indicators as e.g. the national income accounts used by all governments in their national planning procedures. Perversely, GDP often identifies activities that destroy ecosystems as benefits by omitting the lost ecosystem benefits from the calculation.

There is, however, not a straight forward answer to the question of what is the economic value of environmental assets such as ecosystems. One has to be precise because the answer to such a question depends crucially on the context in which it is being asked. Pagiola et al (2004) op.cit. makes a distinction between the following four complementary aspects of the value of ecosystems (or environment assets more generally):

- In a *national accounts context* one would be concerned with the value of the total flow of benefits from ecosystems; i.e. how much these systems contribute to economic activity.

- In a *policy or project contex*t the concern would be to determine the net benefits of interventions (e.g. policy reforms, regulations or investments) that alter ecosystem conditions. This means comparing the benefits of the intervention to the costs. In other words, the issue here is about changes in flows of costs and benefits.

- The *incidence of costs and benefits* of from ecosystem interventions can be critical to whether an intervention is approved for implementation or not, since different stakeholder groups often perceive very different costs and benefits from ecosystems. Identifying losers and winners from an ecosystem intervention and reaching agreement on compensatory measures could prove critical for project approval and implementation.

- Establishing that an ecosystem provides a net positive value to the economy is of little help if it does not lead to *mobilization of the financial resources* needed to undertake the investment and the operation and maintenance of it. The first two of the above valuation questions can help convince decision makers that the intervention is worth while to society, and the third one could help identify stakeholders that could be approached as potential contributors financially since they have been identified as “winners”.

## 1.4 Poverty, Wealth and the Environment

It is established in development economic research that policies that increase the asset base of the poor have a good chance of encouraging income growth both nationally and among the poor[30]. However, the role of environmental asset formation in this

[30] See D.W. Pearce (2005), op.cit., p.40.

context is another question. The World Bank (2006)[31], tables 1.1 and 1.2, show the composition of per capita wealth by categories of countries aggregated by income group, and the composition of natural wealth for the same country categories. This is summarized in table 1.1. below.

**Table 1.1. The composition of per capita wealth by country group, 2000 ($2000)**

| Country group by per capita income level | (1) Man-made or "produced" wealth | (2) Residual (social- and human capital, etc) wealth | (3) Environ-ment or "natural" wealth | (4) Total per capita wealth | (5) Environ-ment wealth as % of total wealth | (6) Renewable resources as % of environment wealth |
|---|---|---|---|---|---|---|
| **Low income** | 1,174 | 4,433 | 1,925 | 7,532 | 26% | 83% |
| **Middle income** | 5,347 | 18,773 | 3,496 | 27,616 | 13% | 69% |
| **High income OECD** | 76,193 | 353,339 | 9,531 | 439,063 | 2% | 60% |

Source: The World Bank (2006), op.cit. tables 1.1 and 1.2

The many deficiencies and shortcomings in the statistics upon which such estimates are based notwithstanding[32], table 1.1 shows a striking contrast in the *relative role* of different forms of capital between country income categories. Human capital (along with social capital) dominates across all three country categories, but while it's share is 59% of overall per capita wealth in low income countries, it increases to 80% of the total for the high income OECD countries. At the same time, the table shows that while per capita environmental capital increases 5-fold between low income and high income countries, human and social capital increases 80-fold! While all forms of per capita wealth are many times higher in rich- than in low-income countries, the ratio is extremely high for human and social capital.

The table further shows that the environmental wealth matter 13 times more in percentage share terms to low income countries than to high income OECD countries (26% of total wealth, versus 2% in the rich countries), and renewable resources are also relatively more important in terms of it's share of total natural wealth (83%) in low income countries compared to that of the rich countries (60%).

Table 1.1. clearly shows that the poor depend disproportionately on environmental assets. The much larger share of natural resources in total wealth and the composition of these resources make strong argument for the role of environmental resources in reducing poverty, fighting hunger and reducing child mortality. It suggests that when

[31] The World Bank (2006), "*Where is the wealth of nations? Measuring capital for the 21st century.*", Washington D.C.

[32] The World Bank (2006) op.cit., explains that the data are incomplete in the sense that they do not have a value for wildlife resources, the value of biodiversity, the amenity value of the environment, and the value of clean air and water.

addressing poverty now one has to focus carefully on the management and enhancement of environmental wealth.

People derive income from their wealth, which consists of their labour and associated skills, their produced capital, the land at their disposal, including for harvesting in forests, fields and waters to which they have regulated or open access. Some of this income is generated in markets and is easily monetized along with the returns from sale of assets, e.g. culling livestock herds as a means to cope with risks related to unexpected crises. A significant share of income from environmental resources is of a non-monetized nature, i.e. in-kind from ecosystem services. Such income can accrue in the form of e.g. collected fuelwood, poles, roots, fruits, nuts and plants used for medicinal and nutrition purposes. Household use of such non-market goods can be valued for estimation purposes by comparison to near substitutes available in markets. In addition, many households receive important ecosystem services that impacts directly on their well-being and livelihood security. Such services include a.o. their adaptation to and reliance on functioning watersheds, wetlands and forests, which includes protection from e.g. floods and drought.

The following illustrate that environmental capital plays a crucial and formidable role for poor people's well-being in a global perspective:

- In Africa some 90% of agricultural output comes from small scale producers,
- Nearly 1.1 poor billion people depend on forests for their livelihoods;
- Some 600 million poor people keep livestock (an important source of wealth);
- Tens of millions of poor people fish coastal and inland fisheries.

Such small-scale farmers, transhumant pastoralists and artisanal fisherfolks are likely to have less opportunity for non-farm-, non-fishery incomes; i.e. they are likely to have a less diversified portfolio of income sources than the less poor[33].

P. Vedeld et al (2004) have estimated that the annual average forest environmental income in 54 cases studied was USD 678 per household, equivalent to 22% total household income with fuelwood and wild foods dominating and making up some 70% of all forest environmental income. However, very little is at present known with regard to the sustainability of how such poor people harvest and cater to these assets.

Many poor coastal households generate a substantial part of their fisheries income from unsustainable harvesting methods including poison- and blast fishing. Mining of coral reefs is also found to generate very high short term incomes in many cases, but at a cost which is loss of revenue that these reefs could have generated directly and indirectly in the future. D. W. Pearce (2005). p.46 presents estimates from Indonesia on the income generated per square kilometre of reef area from poisoning and blast fishing to be in the range of USD 15,000 to USD 30,000. However, this income comes at a cost of USD 40,000 to USD 70,000 per square kilometre in foregone income opportunities from sustainable fisheries and tourism, and the value of foregone environment protection from e.g. damages caused by extreme weather events and tsunamis. Likewise, the services of mangroves and wetlands are heavily relied on by the poor by providing breeding grounds for stable fish- and shrimp

[33] See e.g. D. W. Pearce (2005), p.44 for more details and references.

stocks, and furthermore, for timber, and fuelwood, and such indirect and crucial values as storm protection, erosion control and water filtration.

## 1.5 Changes in Wealth over Time and Why

Achieving sustainable development is basically the process of maintaining wealth, broadly defined as above, for future generations. All types of capital – produced, human, social/institutional, and natural – are key inputs to sustaining economic growth and the basis for improving well-being.

A country's provision for the future is measured by its *Gross National Savings* (GNS), i.e. the total amount of produced output that is not consumed. However, assets depreciate over time. Therefore a more relevant measure for assessing sustainable development is *Net National Savings* (NNS) calculated as GNS minus assets depreciation. However, the above analysis has clearly identified the need to incorporate human, natural and - if possible – institutional capital assets in a complete national wealth measure. The World Bank (2006) op.cit. has convincingly shown that intangible (raw labour-, human-, social-, institutional-, etc) capital is the dominating asset for the high income OECD countries (80%) with natural capital only accounting for 2%, whereas in low-income countries – where Norway's partner countries are found – intangible capital accounts for 59% and natural capital 26%. "Conventional" produced capital accounts for less than 20% of the total capital asset value for all country income groups.

This suggest that focusing on policies and investments for sustainable development must pay much attention to the management and enhancement of intangible and natural capital assets. An important basis for such management is information on and appreciation of changes in these "unconventional" capital assets of nations. By incorporating the estimated changes in these assets and adding them to the depreciation of produced capital assets, one derives what is now termed *Genuine Savings* (GS), which is a much broader and more realistic indicator of sustainability.

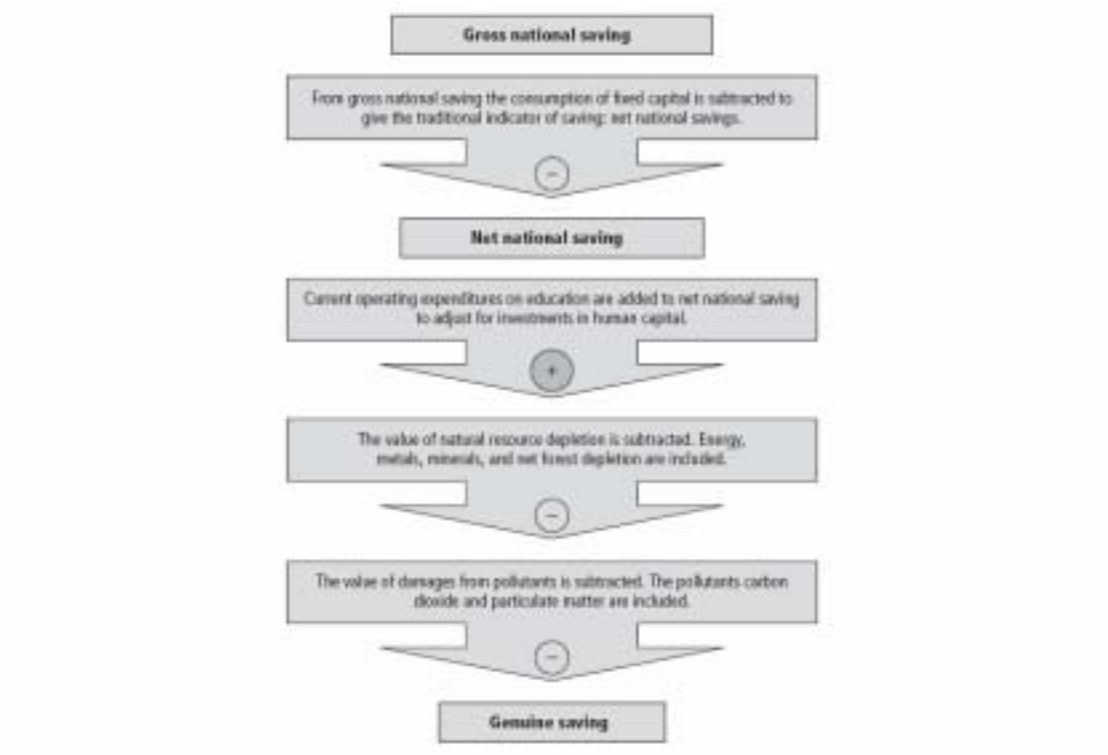
The World Bank (2006) op.cit. chapter 3, provides detailed guidance in how GS is defined and calculated. Clearly, not having market-based prices for much of what is included in these calculations requires estimations that imply approximations and uncertainty. Ignoring and excluding such estimates short of exact and accurate numbers would nevertheless result in much more misleading overall portraits of development trends and diagnosis of the development in the wealth (and health) of nations. Having produced these new and expanded wealth of nations estimates thus represents a major step forward towards diagnosing where and when nations need to change their development priorities and how, if sustainable development is a genuine development priority.

Figure 1.2 (extracted from the World Bank (2006) op.cit. figure 3.1) displays step-by-step how to arrive at a country's Genuine Savings. From the perspective of the role of environment and the natural resource assets as integral components in a sustainable development strategy, the focus in the GS-flow chart is first on the value of natural resource depletion. This depletion must take into account that some of the natural assets are renewable (rainwater, forests, fisheries, renewable energy), whereas others are non-renewable (e.g fossil fuels, minerals and metals). The value of resource

depletion is thus calculated as the total rents on resource extraction and harvest. Rents are here estimated as the difference between the value of production at world prices and total cost of production, including depreciation of fixed capital and return on capital. However, for living renewable resources one needs to calculate the appropriate rent as that portion of e.g. timber extraction or fisheries catch that exceeds natural growth. If for example growth exceeds harvest, this rent is set to zero.

The GS calculation also includes the value of damages from e.g. air- and water pollution. Some of these damages, such as reduced crops due to e.g. acid rain is already captured in the conventional output value of the agricultural sector, whereas e.g. the acid rain impact on buildings are rarely included and need to be added explicitly as illustrated in figure 1.2. The same applies to the health effects of pollutants to air and water in terms of reduced conventional output in production due to reduced labour input. Particulate matter emissions is the damaging component that is so far incorporated in the GS calculations. An estimate of global damages to crops, health and infrastructure from climate gas emissions is also included in the calculations.

**Figure 1.2 Flow Chart of Genuine Saving Calculation**

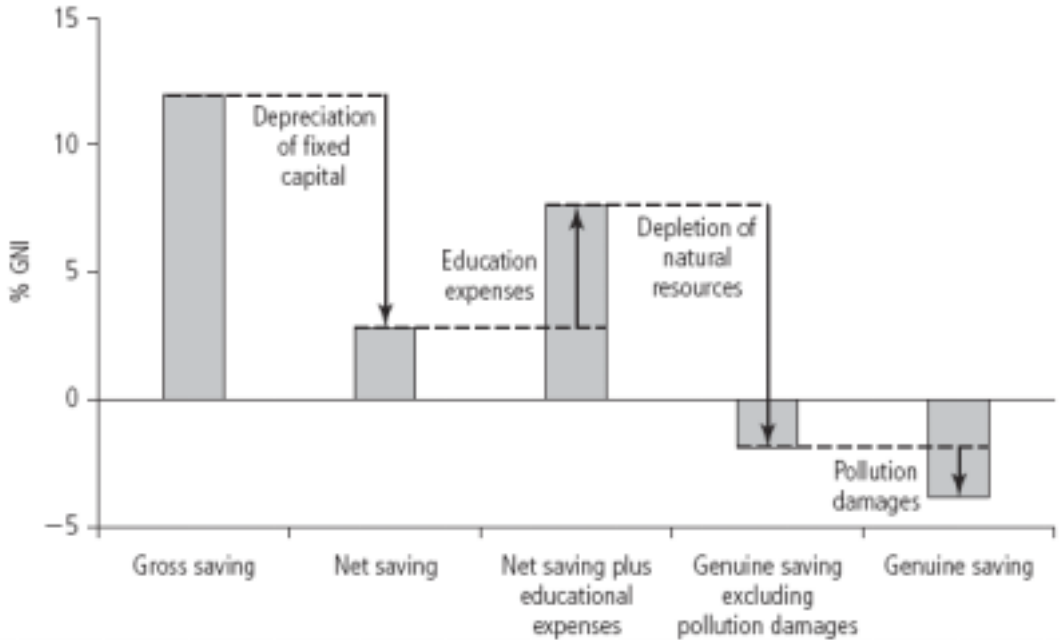



Source: The World Bank (2006), op.cit. Figure 3.1, p.37.

This outcome of applying this methodology is illustrated by the World Bank (2006) op.cit. for Bolivia in South America. It clearly shows how misleading the long-term economic "health" of this country is diagnosed if the sustainability calculation stops short of the full GS-calculation. While a 12% GNS is limited cause for alarm, depreciation of fixed capital is significant and brings the NNS to slightly above zero (3%). Then some comfort is added due to education investments, but the shocking

basis for policy advice follows from the estimation that genuine savings are strongly negative as a result of excessive extraction (over 9% of Bolivia's Gross National Income(GNI)) of its mineral and metal reserves. Present consumption cannot be sustained simply by tapping the natural resource assets and not investing a much larger share of it in intangible and/or produced capital assets. The long-term policy guidance to decision makers thus depends fundamentally on completing all the steps outlined in figure 1.2 above.

**Figure 1.3 Adjusting the Genuine Savings Calculation for Bolivia (2003)**




Source: The World Bank (2006), op.cit. figure 3.2., p.40

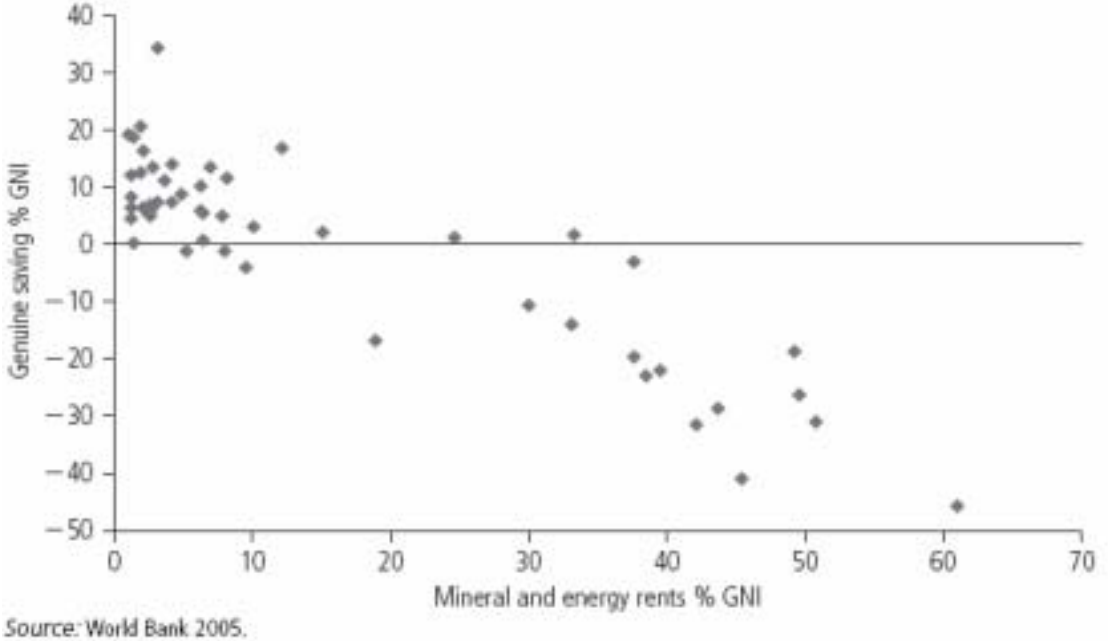
This Bolivia case of excessive resource rent consumption is not at all unique among exhaustible resource surplus countries. In fact, the World Bank (2006) fig. 3.4 (reprinted in figure 1.4 below) shows a clear negative correlation between the percentage share of mineral and energy rents of GNI and the country's genuine savings in percent of GNI.

This observation – clearly displayed in figure 1.4. - suggests that most natural resource-rich developing countries – especially those with large deposits of non-renewable mineral and metal resources – extract huge resource rents and use most of it for immediate consumption, and spend too little of it on compensatory investments that would sustain or increase national wealth.. In this way they experience negative genuine savings and their national wealth is reduced, thus reducing consumption- and investment options of future generations.

Countries that have followed such a policy for many years are found among the mineral-rich developing countries in all regions, but particularly in Africa and Latin America. These countries have spent their resource rents in such ways that per capita GDP has grown slower – if at all – compared to countries with much less abundance of such exhaustible natural resources at their disposal. The paradox is that resource-rich countries should enjoy an advantage in the development process, but in reality

these countries have experienced lower GDP growth rates since 1970 than less well-endowed developing countries, some of which have "graduated" into the "OECD Club".

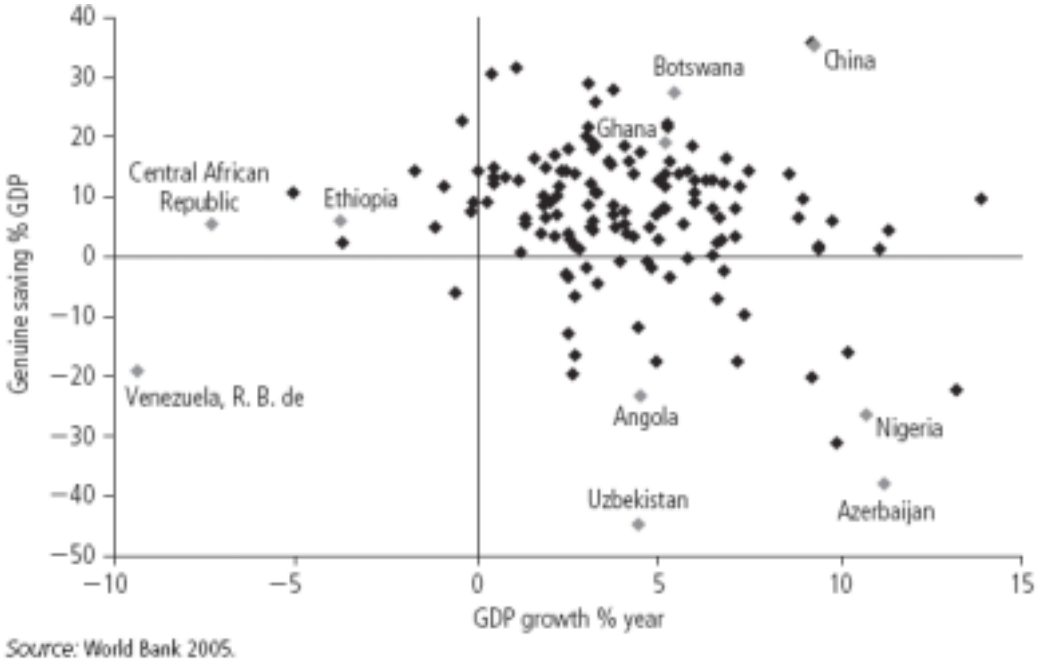
**Figure 1.4 Genuine Savings and Exhaustible Resource Shares in 2003**




Source: World Bank 2005.

In order to complete the overall assessment of countries with respect to their being on or off an economically sustainable development track, the World Bank (2006), op.cit. figure 3.6, presents the scatter of countries along two axes: GDP growth (%) per year and Genuine Savings in % of GDP. This figure is reproduced in figure 1.5 below:

**Figure 1.5 Genuine Saving Rates against Economic Growth (2003)**




Source: World Bank 2005.

It is the location of a country in figure 1.5 that tells whether there are reasons for immediate concern to change the present economic and environmental policies. The majority of countries are located in the top right quadrant and this means they experienced both positive GDP and GS growth in 2003. To the extent that these GS measures are reliable and relevant, this observation means that these countries are not presently consuming at the expense of future generations. For these countries the new way of calculating sustainability has not meant all that much in terms of changing economic policy recommendations.

The countries in the top left quadrant are experiencing negative GDP development – and some of them quite significant decline when measured in per capita terms – but at the same time, they have positive genuine savings, which means that they are investing for the future. These countries need to improve their conventional economic policies to secure stability and scope for taking advantage of the genuine savings they are accumulating.

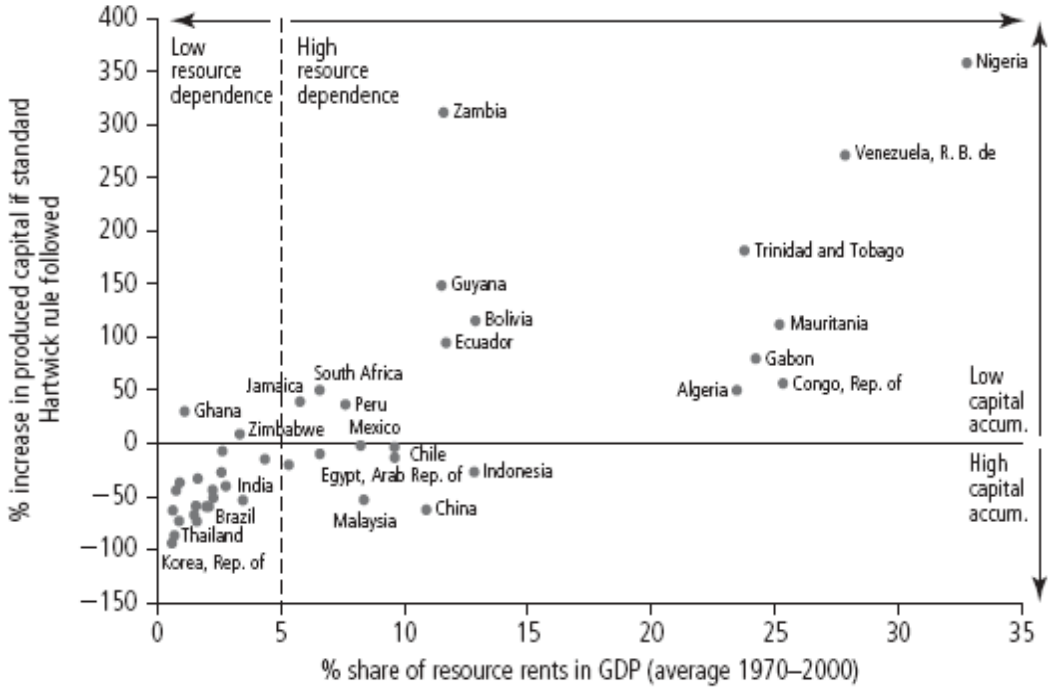
The main concern is with the countries located in the lower two quadrants. These countries – but for a couple of really poorly based economies – appear to fare well if one myopically focuses on GDP growth, but when adding the GS information, it is revealed that the GDP growth is non-sustainable. The minerals- and natural resource rich countries that have rested their economic growth on exhaustion of their resource base tend to fall in this category (Nigeria and Angola being two prime examples) while Venezuela faces the biggest challenge of them all.

While there would be many reasons for these observed dismal developments and management of the rents from extraction of non-renewable resources - some of the reasons being outside of the control of the governments of these countries - it is nevertheless of interest to show a counterfactual analysis of what would have been the development if these countries had invested all their resource rents rather than consuming or wasting most of it. The World Bank (2006), op.cit., chapter 4, has conducted such an experiment, where they assume, for simplicity, that all resource rents are reinvested in production capital over an extended time period, in this case the 30 years from 1970 to 2000. However, theoretically, there is no reason why these investments should not be in environment, human capital, or intangible capital more generally. In a simplified way, such analyses test how rich these countries would be if they had followed such an investment policy (called the Hartwick rule in the economics literature) compared to the World Bank estimates of actual produced capital stocks for the year 2000. The approach is to accumulate resource rents starting from the base-year produced capital stock in 1970 and assume that all extracted rents were invested in produced capital.

Figure 1.6 (reproduced from figure 4.1. in World Bank (2006) op.cit., p.53) presents the results of this hypothetical comparison and provides intuitive understanding of why the concepts of the "*resource curse*" and "*paradox of plenty*" have emerged in the resource economics literature. It shows on the one axis the percentage difference between actual 1970-2000 capital accumulation and counterfactual capital accumulation during the same time period, and on the horizontal axis the average percentage share of resource rents in the country's GDP over the 1970-2000 period.

In short, the story emerging from this counterfactual analysis is that there is an tendency for the counterfactual capital stock to be higher, relative to the actual capital stock, the higher the resource abundance of the country in question. Nigeria, Venezuela, Trinidad and Tobago, Zambia, Bolivia, Gabon, Congo, Rep. of, Algeria, Mauritania, Guyana are all found in the top right quadrant of the figure. In the extreme cases of wasteful resource endowment management, resource rich Nigeria, Zambia and Venezuela stand out with an estimated counterfactual wealth 4-5 times higher than what was actually created. In sharp contrast, the bottom left quadrant of figure 1.6 shows those countries that are classified as having a low resource dependence. The large majority of these countries (including the Republic of Korea, Thailand, Brazil, India and some high income countries) display the exact opposite performance outcome; i.e. an even higher baseline capital stock than what would have resulted from following the counterfactual sustainable development investment path. Since the majority of countries for which data have provided the opportunity for such counterfactual analysis are located in either of these two quadrants of the figure, one can safely conclude that there is a *high negative correlation between resource abundance and the difference between baseline and counterfactual capital accumulation.*

**Figure 1.6 Resource Abundance and Capital Accumulation 1970-2000**




Source: World Bank (2006), op.cit., figure 4.1., p.53

However, resource endowed countries are not "forced" by "economic laws" to perform in such wasteful ways. In the lower right quadrant of figure 1.6 one finds several resource abundant countries that have constrained their consumptions and invested more than their extracted resource rents in produced capital. China, Malaysia stand out as the most successful such countries, and they have sustained a considerable rate of per capita economic growth and poverty reduction during this 30 year period. However, Indonesia, Egypt, Mexico and Chile also deserve mention for

being resource abundant and at the same time managing to invest an equivalent of the extracted resource rents, see chapter 3 below for attempts to better understand the "*natural resource curse paradox"* in a political and policy context.

This praise notwithstanding, the analysis says nothing about actual sustainability from the perspective of how these countries have invested to maintain biodiversity, clean air, safe water and sanitation and preserve forest cover and top soils.

When calculating changes in wealth on a per capita basis to detect whether countries appear to be on a sustainable development path, the estimates are based on tangible wealth only (justified by assuming that much of the intangible wealth is embodied in the population). For a sample of developing countries receiving or having received Norwegian aid, the results for year 2000 are summarized in table 1.2.

**Table 1.2 Norwegian Partner Countries: Change in Wealth per Capita, 2000**

| Country* | GNI per capita USD | Population growth rate % | Adjusted net savings per capita | Change in wealth per capita | Savings gap (% of GNI) |
|---|---|---|---|---|---|
| Botswana | 2,925 | 2,6% | 1,021 | 814 | - |
| South Africa | 2,837 | 2.5 | 246 | -2 | 0.1 |
| Namibia | 1,820 | 3.2 | 392 | 140 | - |
| Bolivia | 969 | 2.0 | 9 | -127 | 13.1 |
| Sri Lanka | 868 | 1.4 | 166 | 116 | - |
| P.R. China | 844 | 0.7 | 236 | 200 | - |
| Nicaragua | 739 | 2.6 | 81 | -18 | 2.4 |
| Cameroon | 548 | 2.2 | -8 | -152 | 27.7 |
| Pakistan | 517 | 2.4 | 54 | -2 | 0.4 |
| India | 466 | 1.7 | 67 | 16 | - |
| Bangladesh | 373 | 1.7 | 71 | 41 | - |
| Kenya | 343 | 2.3 | 40 | -11 | 3.2 |
| Zambia | 312 | 2.0 | -13 | -63 | 20.4 |
| Nigeria | 297 | 2.4 | -97 | -210 | 70.6 |
| Ghana | 255 | 1.7 | 16 | -18 | 7.2 |
| Madagascar | 245 | 3.1 | 9 | -56 | 22.7 |
| Nepal | 239 | 2.4 | 46 | 2 | - |
| Rwanda | 233 | 2.9 | 14 | -60 | 26.0 |
| Mali | 221 | 2.4 | 20 | -47 | 21.2 |
| Mozambique | 195 | 2.2 | 15 | -20 | 10.0 |
| Malawi | 162 | 2.1 | -2 | -29 | 18.2 |
| Ethiopia | 101 | 2.4 | -4 | -27 | 27.1 |
| Burundi | 97 | 1.9 | -10 | -37 | 37.7 |

*****No data available for Afghanistan, Palestine, Sudan, Tanzania, Uganda and Viet Nam
Source: World Bank (2006), Appendix 4.

With the unsurprising exceptions of Botswana and Namibia (both former partner countries that have now "graduated"), all the other African partner developing countries and the two Latin American ones are experiencing a loss of their national wealth as a result of internal and external policies and lack of enabling environments for the economies to perform effectively and efficiently. In contrast, the estimated change in per capita wealth is positive or close to zero in all Asian partner countries for which data are available. The savings gaps in the right hand column indicates a

degree of severity and a dimension of unsustainability of the development path the country is on, and at the same time provides an indication of the extent to which achievement of the ambitious MDGs are within reach.

The above analysis can only tell something about a country's resource management choices and how that has impacted on its national wealth. With increasing per capita wealth a country expands its options for addressing pressing threats that endanger the resource base upon which large parts of its population depend for its well being. Countries that have wasted their resource rents rather than investing it in produced-, institutional-, human-, social- or natural capital, which in turn could have generated new jobs and improved well-being, today face more limited opportunities to achieve the MDGs than they did a decade or three ago. Since these economies remain largely dependent on their renewable (soils, forests, ecosystems, water) and non-renewable natural resource base, and have been depleting these for decades, it is reasonable to assume that they have underinvested severely in maintaining their natural resource stocks that forms such an important basis for sustained economic and social development.

How do the above components of wealth contribute to production when analysing the data for the sample of countries in World Bank (2006) op.cit., chapter 8. Econometric analysis applying different production functions (Cobb Douglas and nested Constant Elasticity of Substitution) with different ways of nesting together the different wealth variables, suggests that the natural resource variable comprising land resources (which is an aggregate of cropland, pastureland, and protected areas) and valued in terms of the present value of the flow of income it generates (but in the case of protected areas and ecosystems, no estimated value for the non-monetary ecosystems services such areas provide, such as flood control, resilience to drought, biodiversity protection, and scenic values) has an elasticity of substitution equal to or greater than one. This means that there is a fairly high degree of substitutability between the land wealth as measured here, and other wealth components. Such a degree of substitutability may not prevail if the ecosystem characteristics of protected lands were to be taken fully into account, but no attempts at such valuation has taken place.

# 2. The Investment Impacts of Policy Interventions

## 2.1 Degree of Sustainability and Poverty Impact

Ensuring environmentally sustainable use of a natural resource is only one criterion by which the effectiveness of resource management arrangements should be judged. Within the category of environmental sustainability, an important distinction is drawn between "*weak sustainability*" which refers to natural capital being optimally exploited (i.e. sufficient investments are being made to provide compensation for the natural capital used up) and "*strong sustainability*", which focuses strictly on the preservation of natural capital.

A key point is that a "successful" natural resources management regime from the point of view of primary stakeholders will not necessarily imply either preservation of the resource or its sustainable use. Resource depletion need not be the result of a "tragedy" of institutional failure to control the use of the renewable natural resource (RNR), but may reflect the successful implementation of the desires of (the most influential) stakeholders to deplete the resource, and to transform it into other forms of capital or use it to pay for consumption. Factors such as changes in the relative returns to different forms of capital, the balance of power between stakeholders, interest rates and discount rates can therefore be expected to influence institutional arrangements and whether they provide for RNR sustainability.

Policy interventions reflecting stated priorities regarding poverty reduction and sustainable environmental resource management and the political climate (e.g. stability, governance, incentive structures and various barriers to investments) will impact on both investment areas, investment volumes and the incidence of benefits and costs among stakeholders resulting from such investments.

Further criteria for assessing natural resource management arrangements that are relevant to the wider development objectives include:

- Economic growth impact (for example, a well-managed forestry concession to a multinational company might potentially maximise the revenue and national growth impact of logging (implying at least weak sustainability), compared to traditional local management arrangements)
- Impact on poverty and inequality, including for example the impact of alternative management arrangements on access to resources for women or historically disadvantaged social or ethnic groups, (for example, the above growth maximizing well-managed forest concession may also result in adverse impacts both on the livelihoods of some poor people and judged against a strong sustainability criterion);
- Impact on the risk of conflict (for instance, whether disputes over management arrangements could trigger wider conflicts between groups or nations).

In relation to the policy context that will favour successful investment in environmental assets for poverty reduction, D. W. Pearce (2005) op.cit identifies the following factors and priorities:

- The existence of social capital is essential for successful CPR management by communities, but social capital tends to break down under conditions of environmental degradation, and direct policy interventions aimed at building social capital are likely to be counterproductive.
- Clear definition and enforcement of the resource rights of the poor.
- Access to credit that is directed to pro-poor asset formation rather than current consumption.
- Insurance to enable poor people to cope with vulnerabilities to environmental hazards.
- The removal of environmentally damaging subsidies.
- There may be some scope for market-based instruments (like local fisheries quotas and trading in water rights) but institutional capacity constraints are likely to limit this scope.
- Payments for environmental services (such as for the protection of vulnerable ecosystems) may, if well-designed, have significant potential to yield pro-poor benefits.

## 2.2 Economic Policy and Environment Investment Impacts[34]

### 2.2.1. Characteristics of Market Failure and Policy Failure

It is now theoretically and empirically well established what are the main causes of the gaps between how environmental resources such as biodiversity, conditionally renewable natural resources (such at comprehensive watershed functions, groundwater reservoirs, cultivable soils, forest cover, etc) and depository sinks for pollutants, are valued in the market versus by society at large. Such gaps are known as external costs of using these resources and sinks, i.e. costs that the polluting - or resource using individual or -firm imposes on other members of society or on the world at large.

Together, market- and policy failures are the main underlying causes of environmental investment failures leading to biodiversity loss, excessive use of non-renewable resources, depletion of conditionally renewable resources, and overloading of depository sink capacity of the various pollutants generated by our various production and consumption activities. The components of such failures that need to be diagnosed as a basis for prescribing corrective policy responses that eventually would lead to optimal environment investments are as follows;

(1) the public goods characteristics of many natural resources and depository sinks;

(2) the ignorance or uncertainty about the social consequences of private actions, leading to socially inappropriate allowances made by individuals for irreversibility of resource use and uncertainty;

(3) the use by individuals of an excessively high rate of interest or discount of the future from a social point of view;

[34] See S. Hansen (1997), "*Financial mechanisms for sustainable development*", Lecture Notes for EDI (World Bank) Course in Environmental Economics, San Jose, Costa Rica, 02-07. February 1997.

(4) the "tragedy of the commons"; i.e. that the insecurity of the established structure of tenure encourages people to ignore the known social consequences of their actions;

(5) government policies in production oriented sectors and related to consumption that not only fail to rectify externalities, but in many cases magnifies the problems by means of subsidies to natural resource extraction, -use and waste disposal, and by issuing special privileges, e.g. short term logging and harvesting concessions, to powerful interest groups;

(6) the presence and execution of monopoly rights.

Without government intervention, firms and individuals may have no reason to take such external costs into account when making investment decisions affecting the environment and natural resource base. Their decisions about production and consumption activities which give rise to waste, pollution, resource extraction and biodiversity loss, about choice of technology, the use of pollution abatement measures, and about the disposal of waste, will then all be taken purely on the basis of the "private" costs and benefits to the individual or the firm. In many such cases the atmosphere, the local air, water systems, soils and coastline may be treated as free with open unrestricted access for disposing of unwanted waste products. This is so despite the fact that unrestricted extraction from, and pollution of these sources and sinks may impose costs on other firms or individuals today and in the future. It is against this background environmental policy calls for corrective measures constituting public intervention in some form to internalize the externalities arising from market and policy failures caused by the above factors.

### 2.2.2. Market Mechanisms versus Regulations

Environmental policy options can be thought of along a centralized/decentralized continuum. Whereas a centralized policy requires that some central administrative agency determine what to do and how, a decentralized policy derives the results from the interaction of many individual decision makers (i.e. producers and consumers), each of whom is essentially making his or her own decision based on his or her assessment of the situation. The classic case of the former system is the use of environmental standards, established and enforced by a central authority, whereas at the opposite end of the policy spectrum are private property rights approaches (which of course also requires well-functioning laws and enforcement mechanisms) where individual decisions determine the outcome, See e.g. B. Fields (1994).

Environmental policy needs to draw a balance between the costs of the externalities referred to above and the costs of restricting such externalities. Environmental externalities should ideally be controlled up to the point where the marginal costs of further abatement-, control- or prevention measures just outweighs the gains from reduced emissions, reduced biodiversity loss, reduced erosion, -silting etc.

The marginal cost of abatement will generally rise with more stringent control, while the marginal damage cost will rise with emissions or extraction intensity. The optimal level of pollution or extraction is therefore achieved when the marginal abatement cost and marginal damage costs are equal. In most cases the investment costs of

complete elimination of polluting emissions or complete preservation of all forested lands from human use will exceed the benefits from such extreme actions. Therefore, the general policy recommendation is to reduce emissions and extractive uses up to the point at which the associated costs can be justified in terms of benefits.

Such policy goals could in principle be reached either by means of strict regulations, such as ambient-, emission-, technology-, performance-, or product standards, or by use of pollution taxes/charges to provide an appropriate incentive for investments or other changes to reduce emissions to the same prescribed level, or perhaps a combination involving marketable pollution permits. The real world is one in which deviations from the perfect market assumptions of economic textbooks are the norm. Due to prevailing uncertainties, lack of documentation of dose-response relationships and of peoples valuation of risks and expected damages, it therefore become virtually impossible to determine the socially optimal level of pollution or use of a fragile ecosystem. An easier and more practical approach to environmental policy decision making is therefore often to select a target level of environmental quality and then use the appropriate mix of policy instruments (including environmental investments) to reach the target. Which mix of policy instruments is cost efficient, depends on the particular regulatory setting. Even though it is unlikely to result in an optimal allocation of resources, it will at least provide a least cost method of realizing the target levels. In cases where external effects impose high costs, this technique offers some assurance of reducing the level of these damages. The different policy mixes to achieving a given environmental policy goal have important and significant differences in outcomes that are well documented in the economic literature, see e.g. Russel, Harrington, and Vaughn (1986), Baumol and Oates (1988), Pearce and Turner (1990), OECD (1993), Fields (1994), Hansen (1995) and most recently in the comprehensive survey by Th. Sterner (2003).

In developing countries, as in the OECD- countries, regulatory command and control measures have traditionally been the most common for environmental policy. But market-based instruments are now being increasingly considered. This growing emphasis on economic instruments has been supported by a number of regional reports and meetings, e.g. two comprehensive regional studies undertaken by the Asian Development Bank, ADB (1990) and (1994), the ESCAP/UNDP Workshop on Economic Issues and the Environment (Bombay, September 1991), and the ESCAP/UNDP High Level Meeting on Environmentally Sound and Sustainable Development in Asia and the Pacific (Kuala Lumpur, 1993). A more recent global overview is found in Sterner (2003) op.cit. The specific criteria for evaluating environmental policies which will be referred to in this study are:

*Their ability to achieve efficient and cost-effective reductions in pollution;
*Their fairness;
*The incentives they offer to people to search for better solutions;
*Their enforceability; and
*The extent to which they agree with certain moral precepts.

The literature on environmental policy assessment has reached the following verdict on market-based approaches (i.e. environmental charges, taxes, deposit refund systems, tradable pollution permits, tradable harvesting permits etc.) when compared

to direct regulations (i.e. ambient-, emission-, and technological standards), see OECD (1993), Fields (1994) op.cit. and Sterner (2003) op.cit.:

* Market-based approaches to e.g. pollution control are more likely to achieve an efficient allocation of pollution abatement across the economy than is a policy based on regulation. Perhaps the most fundamental aspect of standards is their all-or-nothing quality. Either the standard is met or it is not. If it is not, the implication is that it should be, regardless of the cost of doing so. If it is being met, the implication is that it is not necessary to do any better, even though the cost of doing so may be quite low.

* The information requirements of an environmental policy based on market instruments are less in certain key respects such as that needed about the costs of abatement of different polluters, than those of an equivalent policy based on regulation. For a public agency to set individual company standards in accordance with an efficiency-oriented principle, it would have to know the marginal abatement cost relationship for each of these sources. Since such information would have to come from the polluters themselves, there is every reason to believe that an understaffed and poorly trained regulatory authority of a developing country would have a hard time getting unbiased information that would provide for efficient standard setting.

* Regulatory policies will have an overwhelming tendency to apply uniform abatement requirements or processing requirements to all polluters, thus implying that some incur much higher abatement costs than others. This may have serious efficiency implications, unless one faces the unlikely situation that all polluters have the same marginal abatement costs. The more the environment authority tries to tailor a policy so that it applies to different and heterogeneous situations, the more efficient it will be in terms of its environmental impacts, but also the more costly it will be in terms of getting the information needed to set the diverse standards and enforcing them once they have been established.

* If marginal abatement costs vary across sources, as they usually do, the equal-standards approach to environmental control will produce less reductions in total emissions for the total compliance costs of the program than would be achieved with an approach that satisfied the marginal cost/benefit-based efficiency principle. The greater the differences in marginal abatement costs among sources, the worse will be the performance of the equal-standards approach, see Fields (1994) op. cit., p. 216.

* Market-based instruments provide an incentive for "dynamic efficiency" and innovation in order to reduce pollution. This occurs because polluters continue to pay the tax or charge on any unit of pollution they cause. The very essence of the tax approach is to provide an incentive for the polluters themselves to find the best way to reduce emissions or other damage to the environment, rather than having a central authority determine how it should be done. The use of standards, on the other hand, may completely undermine the incentive of the polluter to produce and invest in new pollution control- or biodiversity-saving technology. On the other hand, standards may in this way create a

separate market for research and development of pollution technology, but these incentives are weaker than those of market-based instruments.

* Market-based instruments are less vulnerable to "regulatory capture" than a policy based on regulation where there is a tendency for the regulators to become too closely identified with the interests of the industry to be regulated, rather than operating for the general interest of the nation. Taxes and charges may be more resistant to lobby group pressures.

* Market-based instruments can -- depending on the supply and demand responses of the market -- generate revenue which may be used to offset other and more distorting taxes in the economy. This may provide for improved overall efficiency in the economy, but a comprehensive impact assessment is needed to avoid unforeseen adverse distributional effects.

* However, market-based instruments may not have the desired dynamic efficiency effects in the case of state enterprises subject to a soft budget constraint. In such cases properly enforced regulatory measures may prove more efficient.

* In cases of monopoly producers, an environmental tax may reduce output to an even lower level than that resulting from monopolistic behaviour alone. This welfare loss effect is likely to be minor in real world situations.

* There are cases where the spatial concentration of pollution, or its concentration during limited time periods, is of importance to the design of the policy measure due the pollution level approaching or exceeding the critical value of the assimilative capacity of the environment resource in demand. In such cases, direct regulation may prove more efficient than regulation by means of straightforward taxes or charges per unit of pollutant emitted.

* It is important to note that both market-based instruments and regulations require enforcement, which in turn requires effective monitoring activity and clear criteria for identifying violators. Both policy options also require a framework of administrative and legal processes to take appropriate action to ensure compliance.

## 2.3 Economic Instruments for Environment Policy

### 2.3.1 Definitions and Clarifications

Today there exists a large number of economic instruments for monitoring the behaviour of producers and consumers as well as for generating public revenue. Many of these are of direct relevance to environmental policy and investment because they were designed with the objective of affecting natural resource allocation and use among producers and consumers. However, the linkage between the economic instruments and the environment varies substantially, not just because of the issue targeted by the instrument, but also as a function of the dosage when the instrument is applied, and the formula by which the dosage is prescribed.

Other economic instruments were not designed with environmental considerations in mind at all, and yet, they may have vast indirect environmental impacts via both prices and income effects. The primary focus of this study is those taxes and excises that were meant to somehow address environmental issues, or at least were recognized to have environmental impacts that needed to be taken into account.

There are many different authorities that may have the right to apply economic instruments for environmental purposes. Several national authorities at ministerial or directorate level may do so for different purposes. Ministries of finance are primarily concerned with fiscal issues and revenue collection in their use of these instruments, but their concern includes resource allocation and equity issues as well. Line ministries and their implementing agencies (directorates) tend to have responsibilities for collecting revenues that meet administrative and control/monitoring purposes related to resources management, but at the same time their role can be to impact on investments, the choice of technologies, commodities, input factors, use, waste disposal and recycling. Similar concerns apply to the local administrations in their management of local resources such as water, sewage, waste collection and disposal, power supply, parking spaces and street space, and tourist attractions. Authorities at all levels may be authorized to issue penalties and fines for violators of environmental laws and regulations.

Whereas a legal distinction exists between the concepts of taxes and charges in that a charge is a payment for something in return (e.g. for the opportunity to emitting something into the environment, i.e. for using the environment as a sink, or for the right to use a public road), a tax is a compulsory payment that is made to the national state or local authority irrespective of getting anything in return (e.g. an income tax, a value added tax, etc). Therefore, charges are often earmarked to cover the costs of managing the resources for which the charge is a payment for use, whereas genuine taxes normally are not earmarked, and certainly are not recommended for earmarking on economic efficiency grounds in an otherwise well-governed economy. This study will not address what is labelled taxes in this legal sense, even if they may have a considerable environmental impact via the changes in incomes and prices that they cause. The use of penalties and fines will also be dealt with only marginally.

### 2.3.2 Relevant Categories of Environment-Economic Instruments[35]

Within the broad heading of economic instruments of relevance for environmental investments and resources management, the following classification can be used:

a. Charges, which constitute a "price" to be paid for e.g. pollution, so that the social cost of the demands which polluters cause on environmental "services" are internalized in private calculations of costs and benefits. Among the types of charges, the following are typically identified:

   a1. Effluent charges; paid on discharges into the environment, based on the quantity and/or quality of discharged pollutants;

   a2. User charges; for the costs of collective or public treatment of effluents;

[35] See Sterner (2003) op.cit. for a comprehensive overview and analysis of impacts

a3. Product charges; levied on the sale of products which pollute in manufacture or consumption, or for which a disposal system has been organized;

a4. Administrative charges; for the control and administration services of the regulatory authority, e.g. for implementation of a regulation;

a5. Tax differentiation; positive and negative product charges designed to encourage or discourage the pattern of goods and services associated with environmental effects.

b. Subsidies, which constitute various forms of financial assistance, intended either to encourage reductions in pollution, or to finance measures (e.g. environmental investments) necessary to reduce pollution. Subsidies include:

b1. Grants;

b2. Soft loans; i.e. loan conditions that are more attractive than what the market can offer (lower interest rate, longer payback time, longer grace period, cheaper guarantee premiums);

b3. Tax allowances; provisions for accelerated depreciation on pollution control equipment, or exemptions or rebates on equipment purchases and technical assistance, conditional on certain measures being undertaken.

c. Deposit refund systems, designed for a life-cycle approach to choice of inputs and production technology, where a surcharge is placed on the sale of potentially polluting products, which is subsequently refunded (perhaps even with interest) when certain conditions are met, e.g. when pollution is avoided by returning used or wasted items to a collection system. It can be initiated on a voluntary basis by industry, but for many products it may have a statutory backing.

c1. Deposit refund schemes; for empty containers/packaging, old cars, old computers, electric appliances, oil products, chemicals, batteries, etc.

c2. Environmental Guarantee Funds; designed so that a potential polluter must guarantee for an amount estimated to be equal to the potential damages the activity may cause. The size of such guarantees will depend on the liability regime in the country. The guarantee is no longer needed once the producer can document that the guarantee will no longer be needed, and the other parties to the agreement concur.

c3. Performance Bonds; somewhat similar to environmental guarantee funds, but depends less on the liability regime and is therefore more likely to be feasible and acceptable by industry and serves as an enforcement incentive; see under e2 below.

d. Market creation; measures to create markets for environmental services where such markets traditionally have not existed.

d1. Emission trading; a system of pollution permits within a given ceiling which can be traded; therefore often referred to as polluting "rights", "credits", "allowances" or "marketable pollution permits", which will have a price if the regulating authority has reduced the total volume of pollution permits to less than the initial level of pollution. Then a scarcity price per permit arises, and discourages pollution because polluters will have to pay for the right to pollute. This system may therefore encourage environmental investments if the costs avoided as a result of the investment more than offsets the actual investment. Such emission trading can take on a number of forms, such as bubbles, offsets and production quotas. Trade can be between different enterprises, or between different plants within the same enterprise;

d2. Liability insurance; creation of a market for transferring the risks for bearing liability for uncertain environmental damage to insurance companies. This system can be developed as a substitute for environmental guarantee funds to help many producers overcome the potentially high up-front expenditures of guarantee fund deposit;

d3. Market interventions to maintain or stabilize the prices of certain commodities such as recyclable effluents;

e. Enforcement incentives; can be in the form of financial punishment for non-compliance with environmental standards or regulations.

e1. Non-compliance fees; charges or fines levied on the non-compliant polluters.

e2. Performance bonds; these are payments to the relevant authority which may or may not reflect the expected environmental costs reflected in an environmental guarantee fund. The main purpose is to establish its level sufficiently high so that the polluter has every incentive to comply with the standards and regulations, e.g. by undertaking environmental investments that will reduce environmental damage. The bond will be refunded once satisfactory compliance is documented.

Some crude characteristics of the strength and weaknesses of some of the above policy instruments with potential for application in environmental policy in a developing country are loosely ranked in table 2.1. below, focussing on their ability to meet goals such as:

- Environmental effectiveness
- Economic efficiency
- Equity (who benefits and who loses)
- Conformity to the Polluter Pay Principle
- Administrative practicability
- Political considerations

## Table 2.1. Summary Characteristics of Some Economic and Financial Instruments for Environmental Policy implementation

| Policy Instrument | Environ. Effect.ness | Economic Efficiency | Equity | Conformity to PPP | Adm. Practicab. | Political Consider. |
|---|---|---|---|---|---|---|
| **Charges:** | | | | | | |
| User charges | ++ | +/- | ++ | ++ | +/- | +/- |
| Pollution charges | ++ | ++ | ++ | ++ | +/- | +/- |
| Product charges | + | +/- | + | ++ | +/- | +/- |
| Specific taxes | + | - | + | ++ | +/- | + |
| **Local and national taxation** | | | | | | |
| Direct funding | + | - | - | -- | ++ | + |
| Grants & subsidies | + | - | - | 0 +/- | + | + |
| Earmarked funds | ++ | 0 | 0 | +/- | +/- | +/- |

Source: Environmental Resources Limited (1988)

Symbols in the table:

| | |
|---|---|
| Strongly positive: | ++ |
| Positive: | + |
| Neutral: | 0 |
| Negative: | - |
| Strongly negative: | -- |
| Positive or negative in different cases: | +/- |
| Not applicable: | n..a. |

The above ranking provides an initial and very tentative indicative basis for a more selective and detailed analysis of the applicability of the various policy instruments to be selected for more in-depth analysis. Such in depth analysis must also pose a series of factors to be considered for each and every policy instrument with emphasis on the actual country context for which it is being considered.

Obviously, choosing a policy instrument depends on many factors. A fairly robust conclusion from the accumulated theoretical and empirical knowledge over the years is that marked-based mechanisms are generally more efficient than other instruments when pollution or environmental damage is uniformly mixed and marginal abatement costs are heterogeneous, i.e. when pollution the pollution and damages are the same, but the ease with which firms can reduce emissions differs. It has been convincingly documented (see e.g Sterner (2003) op.cit. chapter 12) that when inter-company differences in abatement costs or in resource management efficiency are large, the companies that can abate at a lower cost should be responsible for the larger share of the reparation, and the market is the best policy instrument to allocate the appropriate tasks.

Clearly, the exact savings from applying market-based instruments over direct regulation to achieve the desired reduction in emissions will depend on both the number of firms emitting the substance in question, their geographic location, meteorological conditions or recipients absorptive capacities, and the form of the

abatement functions. For a given emitted substance into a recipient, a general principle illustrating the relative merits of market based instruments (MBIs) over direct regulation is illustrated by Sterner (2003) op.cit., table 12-1 as follows.

The degree of heterogeneity is an indicator that equals one when all firms face the same marginal abatement costs and the greater the marginal abatement cost variation between firms the greater the heterogeneity indicator. A large heterogeneity indicator is expected when the emitting firms cover a wide range of vintages (some old and outdated firms and some new with the latest emission reduction technologies already installed).

**Table 2.2 Cost Heterogeneity and Savings due to Efficiency**

| Degree of heterogeneity | Costs with equal reduction (by regulation) | Costs with efficient reduction (by use of MBI) | Cost Savings by using MBI (%) |
|---|---|---|---|
| 1 | 2 | 2 | 0 |
| 1.5 | 2.5 | 2.4 | 4 |
| 2 | 3 | 2.67 | 11 |
| 3 | 4 | 3 | 25 |
| 4 | 5 | 3.2 | 36 |
| 9 | 10 | 3.6 | 64 |
| 99 | 100 | 3.96 | 96 |

Source: T. Sterner (2003), op. cit, table 12-1

The table shows that with a completely homogenous set of emitting firms, the degree of heterogeneity is ONE, and there is no cost savings by switching from regulation to MBI-based emission controls. The example shows that the larger the variation between firms in marginal abatement costs, the greater the savings by applying MBIs compared to direct regulation. Empirical evidence from US industry, see e.g. Hartman, Wheeler and Singh (1994) suggests that variations in actual abatement costs for various classes of air pollutants vary by a factor of at least 5-10.

It would follow from the above that for poor developing countries that claim they are too poor to implement environmental improvement measures when faced with an emission challenge as described above, they should immediately be encouraged and assisted in adopting the more cost-effective MBIs for emission abatement control, instead of the costly direct regulations that they in many cases have instituted, but cannot afford to implement and monitor.

The design of an optimal pollution reduction policy instruments is severely complicated when damage costs are heterogeneous, because in such cases (i.e. most real world cases) the damage of a certain pollutant varies depending on the timing, location, or other circumstances of its emission. Both characteristics of the pollutant and of the recipient ecosystem may vary significantly. In the extreme case where each pollutant is unique and emitting into two isolated but adjacent watersheds (mercury from mining into one river, and pesticides from agriculture into another), then the argument that one enterprise may be better at abatement than the other is no longer relevant. When damage costs vary between emitters in time and space, there is a strong case for rather detailed and flexible emission charge schedules so that the variations in the marginal damage costs can be reflected in emission charges to be

paid polluters at all times. Obviously, it would be difficult to design and implement such differentiated taxes in poor developing countries with very limited technical and professional capacity to institute and monitor such sophisticated charging schemes.

## 2.4 A Scope for Active Environment Economic Policy[36]

The main environmental policy failure that improved pricing policy can correct in developing countries is that of governments providing environmental and natural resources at below their true marginal social costs, see Steele and Pearce (1994). Such under-pricing arises when the economic rent earned from natural resource extraction and harvesting by private concessionaires is not sufficiently captured by governments through taxation. This rent is the difference between the costs of extracting the resource, inclusive of a reasonable profit margin and a possible risk premium, and its price. Such rent arises for non-renewable resources such as minerals, but also for slowly replenished stocks such as tropical timber, fisheries, and for nature tourism sites, and represents the scarcity value of a natural resource.

Even if the rent is taxed so that none of it accrues to the extractor, harvesting will remain profitable, and rent taxation provides a unique form of taxation in that it creates none of the allocation distortions that result from most other conventional taxes in use. Short of such rent taxation, resource extractors are given incentives for excessive extraction of these scarce natural resources, e.g. excessive deforestation where low royalties are charged to timber concessionaires, such as has been the practice in *the Philippines, Indonesia, Papua New Guinea, the Mekong Region, Malaysia*, *and the Central African countries with abundant tropical timber resources,* and which should be addressed by policy makers as a policy failure problem. However, it is not sufficient to simply charge a high entry fee for a concession. Without a complementing regulatory control measure or a complementary tenure arrangement that secures a long lasting management interest from the concessionaire, the incentive will be to mine the resource to extinction once the entry fee has been paid. This may call for strictly enforced limits on the total annual catch or harvest and a system of tradable quotas within this limit.

Failure to charge for the full marginal social cost from those demanding environmental goods and services has also been commonly observed in developing countries world wide where many governments have tended to supply water, energy and electricity, wood, pesticides, fertilizers and scarce urban street space to resource users at prices/charges well below their marginal costs of supply. Such policies have led to excessive demands on these resources, which in turn has lead to too many and/or too early investments in new supply facilities, while at the same time eroding the revenue base for public utilities so that their ability to maintain efficient operations are undermined. Thus two market forces resulting from the policy failure combine to promote capital intensive and wasteful investments; the excess demand and the loss of supply capacity due to operational breakdowns and failures.

[36] Most of the documented experience providing real world examples of potentials and obstacles worth considering for possible transfer and use to stimulate environment investments in Norwegian partner countries are identified in Asia.

Inefficiencies and loss of environmental assets are further magnified when the below-cost prices for public utility services result in operational deficits, because investors shy away from investments that cannot provide attractive and reliable returns on their capital. As a result, highly inefficient emergency solutions are adopted such as rationing and "brown-outs" which in the case of an increasing number of developing countries have resulted in excess individual investments in small costly, noisy and polluting additional diesel generating capacity and substantial loss of industrial output (1-2% of GNP), jobs, and tax revenue that could otherwise have strengthened the public budget balance.

Policy failure resulting from massive subsidies to certain extractive activities, e.g irrigation subsidies, have led to investments for excessive water use for mechanized farming with severe environmental damages (salination and water logging) as a result. These adverse impacts are additional to the public revenue drain and excessive investments diversion this has caused. In a similar way, in several Asian countries pesticide subsidies have led to too heavy loads of pesticides on fertile soils and watersheds with wide-reaching long term damages we are only now beginning to realize (P. Teng et al (2006)). In a similar way, government economic incentives for land conversion and land clearance have often led to the loss of wetlands and forests. There are also numerous examples from developing countries of government subsidies being instrumental in supporting uneconomic investments in ecologically damaging fish trawlers, inefficient sawmills, and for replacing mangroves with aquaculture, without considering the full benefits of alternative uses of the mangroves. There are now signs of changing attitudes to such policies; the Transmigrasi program in *Indonesia* is being revisited, subsidized credits for trawlers are being phased out in the *Republic of Korea*, and subsidies for aquaculture are being phased out in the *Philippines*.

Market failure in the environmental context is observed when environmental externalities are excluded from the existing price mechanism. Economic instruments can correct for such distortions by taxing the environmentally damaging behaviour, and subsidizing environmentally benign actions of individuals and firms. *Singapore* taxes driving during peak periods, *Indonesia* has a tax on deforestation and *China* has instituted a tax on water pollution. Equally important can be the role of subsidies to encourage socially benign behaviour. Examples of subsidies to internalize positive externalities are the subsidies by the *Thai and Chinese* governments to curb population pressures that could exert pressures on fragile environmental habitats and thus endanger the natural capital to be passed on to future generations as an integral part of implementing a policy for sustainable development.

Economic policy instrument have proven efficient in correcting market- and policy failures in several developing countries, particularly in Asia, or have indicated a considerable potential to have that effect. Such improvements are first of all focussed on static efficiency (also called X efficiency or allocative efficiency). The wastages observed in *China* during periods of centrally determined prices way below the marginal social costs of providing natural resources services are devastating, and have discouraged environmental investments in recycling and resources recovery. Integrated pest management has been shelved since pesticides were subsidized and therefore cheaper to the farmers. The FAO Integrated Pest Management program is

trying to remedy this, see P. Teng et al (2006) op.cit. Investments in soil conservation were discouraged because chemical fertilizer was subsidized. Wastewater was not worth reusing so long as clean water was provided virtually free. With high water prices reflecting the marginal social costs of water supply, *Japan and Singapore* have invested so that they now use reclaimed water for a number of purposes, including the flushing of toilets, and in *China* the demand for irrigation water has been drastically reduced with no loss in yields. However, whereas economic instruments in many cases are necessary for achieving efficiency goals, they are far from sufficient. In *China*, pollution taxes have traditionally been set so low that it is worth paying the tax and the fines and go on polluting, see e g. S. Hansen et al (2002). This policy is in the process of being changed.

In addition to the static efficiency gains, economic instruments can also yield what is referred to as dynamic efficiency. This is the resulting change in operating procedures, organization and innovation that reduces costs. Actual experience in this area is established for environmental tax introductions in *Sweden,* see e.g. S. Hansen (1997). Such dynamic efficiency gains are contrasted by the lack of incentives for such behaviour by the regulatory command and control measures that tend to stop encouraging innovation once the firm has met the physically determined target. In the *Chinese city of Tianjin* a sharp increase in water charge penalties resulted in massive innovations to use water more efficiently, and a 250% increase in the value of output per unit of water resulted from 1981 to 1988, see Steele and Pearce (1994), p.146.

In countries were the monitoring capacity for command and control measures is weak, economic instruments can provide for adequate conservation without the need for an expensive regulatory framework, and internalize the monitoring costs. Where the use of economic instruments also raises public revenue, it may be possible to finance the necessary capacity building for environmental administration and monitoring. On the other hand, many economic instruments aimed at curbing pollution or excessive extraction are successful at precisely that and therefore eliminate the very revenue base.

Economic textbooks often present the efficiency gains from economic instruments as if there are no costs associated with their use. This is not the case in the real world. Some subsidies may be both inefficient, public budget-eroding, and administratively costly, and most environmental taxes have transaction costs. In many developing countries with weak administrations and long traditions of bribes and unpenalized tax evasion, the administrative costs of some economic instruments may exceed the proceeds generated. Threats of evasion arise when there are close substitutes not covered by the tax; e.g. fuel-wood can replace kerosene or oil, and illegal grid connections substitute for subscriptions. In such cases high transaction costs associated with the economic instruments arises.

There are a number of ways of lowering such transaction costs. In many developing countries where public enterprises have faced soft budget constraints, there has been little or no incentives to pay charges and taxes, and pollution and excessive resource use have continued at very high levels. By altering the ownership and control regimes by means of privatization or corporatization so that hard budget constraints replace soft ones, incentives to innovate and save arise, and if revenue collection is privatized the collection rates go up considerably.

Equally important it is to incorporate the price mechanism into existing social and cultural structures where it has been assumed that there has been no scope for applying economic instruments. Several developing country examples of women's-, farmers-', or communal cooperative management of water supplies, grazing land, forests, and micro-finance institutions serve to document this. This is an area where use of economic instruments have traditionally been widespread outside the market economy in the context of communal ownership, e.g. in the form of payments for shepherds, forest guardians, and repair services for water supply systems. After the Second World War, new ownership regimes such as the "Panchayat" systems in *India*, have replaced such traditional local systems based on economic instruments. This has many places undermined the communal property rights and control of communal lands. However, in many other cases there are very sophisticated incentive structures where the structure of sanctions and rewards may prove most effective for economically rational and ecologically sustainable behaviour in the traditional communal structures. One must therefore be careful not to undermine it by artificially forcing upon them market-based instrument mechanisms to which they cannot adapt with their cultural habits, religions, and norms, see Steele and Pearce (1994), p. 151.

One may alter the policy climate and public awareness by employing mass media and the NGO community to create environmental awareness so that polluting firms agree to change their production processes, install and use abatement measures, or move to a location where damages are less due to a greater absorptive capacity to handle emissions. The press and NGOs often take an aggressive environmental stand to mobilize local communities and consumer interest groups against polluting or exploiting enterprises in particular in many Asian countries.

Financial incentives can be employed to improve both collection and improved payment of environmental charges. Penalties for late payments can be a very effective deterrent and make people pay on time, as practiced on polluters in *China* and in *the Republic of Korea* for irrigation charges, where prizes are provided for those villages that are the first to achieve full payments. They can be even more effective if the penalty increases with the length of the delay of payment. A similar mechanism is to provide a discount for those paying the charges on time, as is done by irrigation farmers in the *Philippines*. But such economic incentives and penalties need to be supplemented by access to strong regulatory penalties such as cancellation of concessions or closing down of mills and plants. In some places economic incentives are used to improve the performance of the environmental economic instruments, e.g. by allowing the fee collectors to keep a percentage of the collected fees themselves or for their village. Such incentives are increasingly applied to encourage people to report on illegal loggers in several countries.

One way of reducing the administrative collection costs on economic instruments is to collect from the input use as a proxy for the pollution or extraction one wants to internalize, rather than on emissions themselves or on the polluting outputs. In many cases this blunt approach involves controlling the activities of only a few actors, and this reduces administrative costs. By differentiating the tax according to environmental quality (e.g. of the coal being supplied) one may also score on environmental terms. The efficiency loss should not be ignored, however, since this removes the incentive to reduce pollution from the actual polluters. However, this

incentive problem can be reduced if the input tax is combined with a tax refund scheme for those producers that adopt processing methods or invest in abatement equipment that actually reduces the environmental problem, as has been done in the Swedish cases of a $NO_x$ tax, their tax rebate system for diesel fuels, and their deposit refund schemes for leaded batteries and motorized vehicles, see e.g. Hansen (1997). Deposit refund or performance bond schemes can provide this incentive. Such schemes would be well suited for CFC, toxic containing electronic equipment, household appliances and for beverage containers, as is already in place in *Thailand and the Republic of Korea*. In fact, *Korea* has extended this incentive system to tires, lubricants, batteries, pesticide containers and plastics. In a similar way a performance guarantee bond of US$ 400 per hectare of forest land is deposited with the Forestry Department and returned to the concessionaire provided the forest was harvested sustainably. *Malaysian* mining concessionaires have to pay a performance bond of over US$ 1000 per hectare to ensure land rehabilitation after exhaustion of the mine. *Such performance bond schemes provide incentives for careful planning the investments of the extractive activities so as to minimize the costs of rehabilitation after the mining activity has ended. Nepal* increased substantially the cleanliness deposits paid by mountaineering teams to discourage them from littering the fragile high mountain ecosystems in the 1990s. With such economic instruments the punishment of non-compliance is certain, whereas a regulatory punishment would imply uncertainty of being caught and punished. However, it is crucial that the deposit is large enough to make violation hurt.

The scope for introducing market based instruments for environmental and resources management purposes has perhaps been greater in the ASEAN-Region than elsewhere, because of the political and public acceptance of economic policy reforms towards corporatization and privatization of many utilities that have traditionally been public enterprises, or simply public services without any enterprise structure at all, see e.g. Hansen (1994a) and (1994b), and Kasipillai and Shanmugam (1995). Such efficiency driven reforms provide for the removal of subsidies and soft budget constraints, and introduce market oriented rate of return demands on owners and investors. As a result, full cost pricing -- albeit not necessarily including the externality cost components -- is becoming the accepted norm in areas and sectors where this used to be the exception.

## 2.5 Obstacles to Environment Economic Policies

From an economic efficiency perspective there can be little doubt that economic instruments in many cases have great potential as environmental policy instruments facilitating the process leading to benign environment investments and their use. Why then have they not been applied more widely, and why are there still so many obstacles to adopting them?

The answer is more than anything to be found in the sphere of political economy. Individuals and groups have acquired, or try to acquire, claims to scarce resources that have an economic rent, i.e. provide for a profit from extraction that exceeds "normal" returns to capital. Such rent-seeking behaviour provides a very strong motive to fight the introduction and use of economic instruments When those possessing, or in the process of acquiring, these claims are well organized and/or have political power or -

connections, their ability to stop the implementation of such policies is strong. Not surprisingly, people and corporations with such claims are more powerful and have stronger political links than ordinary citizens. Threats to remove a subsidy such as cheap or free logging concessions and replace them with market-based concession fees, result in mobilization of efforts by the concessionaires in the form of various kinds of payments up to the value of the subsidy to keep these subsidies in place. Clearly, there would be cases where it could prove very rewarding for administrators and decision makers to support such interest group efforts to prevent rent taxation from being introduced.

Examples from developing countries are plentiful. In e.g. *the Central African jungle-covered countries, Indonesia, Malaysia and the Philippines*, many of the forestry concessionaires have considerable political and economic power. In *Thailand*, ecotourism development has been permitted virtually without taxation, and has as a result provided big profits from land speculation with a handsome share going to members of the political elite that could have secured the land rent for the local people by means of land rent taxes.

Powerful industrial lobby groups have time and again -- all over the world -- succeeded in preventing taxation of harmful inputs, emissions and waste treatment by threatening to close down or move to a country where such restrictions are more lenient. Such threats work effectively in political assemblies in spite of a growing evidence to the fact that even the most stringent environmental abatement measures or process modifications to meet WHO-health standards are available at modest costs even in the most pollution intensive industrial sectors. If and when industrial enterprises decide to relocate, it is usually because of more important relative cost factors than the marginal impacts of environmental taxes and regulations, see Low (1992). Where there is a lack of transparency and suppression of the freedom of the press, it is easier to exercise such powers to prevent resource rents to become the property of the people.

But it would be unfair to put the blame on domestic concession holding power elites alone. Rent seeking may also be a combination of various groups at home and abroad. An illustration is the opposition to *Indonesian* plywood export taxes from *Japanese* and *Taiwanese* buyers. A more subtle, but nevertheless substantial obstacle to removal of the enormous budget draining and environmentally devastating irrigation water subsidies, has been foreign suppliers of engineering consulting services, contracting, and equipment supplies, often backed by foreign aid donors who are pressured by the industrial and labour union lobby groups at home for assisting in the creation of new markets for their export industries. Independent environmental economic consultants often meet tougher resistance to demand management proposals from the industrial engineering lobbies working closely with their own aid donor community at home than what they encounter in the recipient country.

The introduction of economic instruments for environmental policy making also creates horizontal power controversies between ministries at the national level, and vertically between national, provincial and local authorities. The latter type of rivalry should be well known in *Malaysia'*s forestry sector from the policy debate over export taxes between the central government and the states of *Sabah and Sarawak*. In other countries in the region the central government has determined fuel subsidies a long

time ago, and is now in the process of seeking to have them removed as part of the structural adjustment processes that are intended to strengthen the economy by means of a more efficient resources allocation. The resistance to such subsidy removal is, however, very strong at the local level in many places, and the power to prevent the subsidy removal from being implemented rests in practice with Provincial Councils that are empowered to regulate e.g. bus fares. These councils are primarily concerned with the short term goals of re-election, and as a result will not increase bus fares as required by an increase in diesel prices. Thus the central government is unable to remove the diesel subsidies, see Steele and Pearce (1994), p. 156.

The industrial sector in many developing countries suffers great losses and competitive power on the export markets because of under-pricing of e.g. power and water that was meant to protect and improve their competitiveness. The resulting supply shortages and accompanying outages have turned out to be very costly indeed in terms of static efficiency losses, as discussed above. But dynamic efficiency losses may turn out to be expensive as well, especially when infant industry subsidies that were justified as a transitional support to derive dynamic efficiency gains, are increased rather than removed as the infant is growing and becomes very large. This policy failure is well known from the massive subsidies over the years to the timber processing industries in *Malaysia and Indonesia*.

It would appear that the only way to overcome such political resistance to more widespread use of economic instruments in environmental policy is to mobilize those who stand to gain from their introduction to provide a countervailing force.

- Firs, ministries of finance are always on the look out for new revenue sources to meet the growing demands for social, health and educational services, defence expenses or capital intensive infrastructure investments.
- Second, provincial and local authorities may seek autonomy to tax the use of scarce urban space and resource-endowed land as a substitute for or supplement to transfers from the central government.
- Third, new alliances are forming between former competitors/rivals that foreign exploiters used to be able to put up against each other so that they could extract the rent. One prime example of the latter is the Anapurna Conservation Area Project (ACAP) in *Nepal*, where competing lodge owners now operate like a cartel and agree on much higher prices rather than undercutting each other. Another is the formation of the Forum Fisheries Association (FFA) which has formed a united front comprising the small South Pacific island states with a much stronger bargaining power for fisheries rental taxes against the powerful foreign fishing fleets of *Japan, Taiwan, China, Korea, United States and Australia*. As a result, fishery access fees are now much higher and monitoring of the agreement is shared between all the island states, see Steele and Pearce (1994), pp. 156.

With the rapid introduction of economic and institutional reforms that have been part of the transformation of the ASEAN economies, including not the least *Malaysia*, many of the obstacles that have existed as barriers to the introduction of many economic instruments in the management and monitoring of natural resources and the environment, may be vanishing, or at least losing strength, see e.g. Hansen (1994a) and (1994b).

## 2.6 Adverse Incentives to Environment Asset Management

### 2.6.1 Debt Relief and Environment Impacts[37]

It is widely believed in political and ideological circles that large foreign debt is a major cause of much poverty, suffering, injustice, environmental damage, and lack of environmental investments to prevent such damage, in indebted developing countries. Reducing developing country foreign debt is thus perceived to be an effective way of halting and perhaps reversing such adverse environmental development trends.

There is no doubt that having a debt erased from the accounts is advantageous for the debtor, since such debt forgiveness is the same as a grant/gift It makes it possible for the recipient of such a favour to buy more goods and services than what the recipient could have bought if part of the income and revenue stream had to be set aside for servicing the debt. However, it does not follow from this that debt relief is an effective instrument for improving environmental management and reducing poverty.

Since the above belief about the environmental virtues of debt relief are so strongly cemented in influential political circles, it may be useful to explain why such policies may not contribute effectively to such benign outcomes.

First of all one has to *understand why one would want to borrow* money in the first place. Fundamentally, a loan makes it possible for the borrower to finance an activity (investment or consumption) at an earlier point in time than what would be possible without the loan. It is important from the very outset to distinguish between on the one hand, borrowing for the purpose of an investment expected to yield a return to the economy larger than what would have happened without the loan, and on the other, borrowing for consumption, and where the servicing costs of the debt perhaps is transferred to stakeholders not benefiting from that consumption.

The widespread scepticism to and criticism of loans to developing countries appears to be related to loans that have been used primarily for environmentally damaging investments or consumption benefiting a few favoured rent-seeking groups at the cost of the less endowed majority of the population. However, one should strive to adopt a balanced perspective on the impact of developing country lending, since much of this borrowing is indeed for financing infrastructure and job-creating investments, and as such is an integral component of a country's long term growth strategy.

At the outset, *one must be careful and not assume that a debt burden is the same as a debt crisis.* A large debt burden measured in terms of the amounts to be paid to service a loan relative to e.g. the country's export revenue does not have to be a sign of crisis. On the contrary, it could just as well be an observation of a well-functioning economy based in a portfolio of profitable (and perhaps environmentally benign) projects that create for sustained economic and social development, political stability and confidence in international credit markets . Debt crisis arises once the country is unable to, or faces severe difficulties in servicing it's debt obligations, and such a crisis may well arise even if the foreign debt is small.

[37] This section is based on S. Hansen (1989), "*Debt for nature swaps: Overview and discussion of key issues*", Ecological Economics, Vol. 1.

The environmentally most serious consequence of confusing debt burden and debt crisis, is that influential decision makers may decide to write off debt as a means to reduce the pressure on natural resources and the environment in the country in question. The rationale behind such reasoning is that with reduced debt burden, the country can allow itself to reduce the rate of extraction/depletion of its natural resource base that generates export revenue, which is needed to finance imports, since a smaller share of this export revenue now is needed to service the foreign debt.

While this static line of reasoning may seems logical at first sight, closer scrutiny shows that it does not hold. The reality of the matter is that when the debt servicing obligation is reduced (regardless of how it is achieved) a larger share of the country's export revenue become available for domestic investments and consumption, than what was with the larger debt burden to be serviced. This will inevitably increase the pressures on the domestic resource base, including natural resources and the environment. Given that relative prices and charges remain as before the debt burden was reduced, it will now be more profitable to invest in public infrastructure, which will facilitate private sector investments, including increased extraction of the country's natural renewable and non-renewable resource base.

However, it is also possible – at least in theory - that with growing income and education, people will become more environmentally aware, and their government decide to set aside some of the surplus resulting from the debt relief for the purpose of better environmental management.

Historical observations from several countries that have experienced debt crisis show that during such crisis the access to foreign loans has been limited – the increased political risks have kept lenders away. In practice, planned infrastructure projects, which in many cases would have caused severe irreversible environmental damage in fragile ecosystems (roads, power plants and processing industries in tropical forests in e.g. Brazil and Mexico) have been shelved or postponed, thus reducing the pressure on the environment. One has also observed that during periods without debt crisis, such environment damaging investments do indeed go ahead. The high rate of resource extraction accompanied by devastating damage to the rain forests in the Philippines took place before the debt crisis struck, and in Indonesia the environmentally damaging Transmigrasi programme designed to relieve the population pressure on Java culminated before the debt-crisis struck in the mid-1980s.

The main point here is that debt relief for a poor developing country (in most cases characterized by a significant potential for improved governance) without any attached covenants regarding how the freed up "manna from heaven" funds shall be used, creates temptations for non-sustainable spending on consumption and investments. The well-documented "natural resource curse" discussed in more detail below provides overwhelming evidence that disciplined spending of "manna from heaven" is the exception rather than the rule.

Irrespective of the sovereignty of national states, it is always a lenders privilege to state conditions for the loan with the borrower. And in the case of debt relief the same principle and practice applies. Such "green conditionality" imposed by the lenders in order to channel the freed up funds into sustainable environment investments (sustainable use or preservation of tropical forests, mangroves, coral reefs, etc) have

met with massive opposition from environmental NGOs and borrowing governments claiming that this is a form of "neo-imperialism". However, these same NGOs are at the same time strong supporters of "Debt of Nature Swaps" (DNS) which require even more stringent preparations and monitoring than straight forward debt relief because the attractiveness of the DNS to the debtor lies in the debt discount that can be negotiated. The discount is higher the worse the outlook for repayment of the debt. In other words, DNS encourages a debtor to display irresponsible economic management policies and unstable policy climate in order to maximize the discount!

The net effect of debt relief (whether by means of direct write-off or by means of a "Debt of nature swap") thus remains an empirical question to which the answer can only be established by means of a proper counter-factual comparison on a case-by-case basis. In the end the outcome is decided by how the authorities and the economic sectors of the country manage the freed up resources. Economic theory alone cannot provide a uni-directional answer.

### 2.6.2 The Natural Resource Curse

As shown in chapter 1.5 above, there has since the 1970s been increasing evidence (particularly from comparative and econometric studies) of a negative link between natural resource abundance and development performance in terms of economic growth and poverty reduction. This has led to the notion of an apparent "*Natural Resource Curse".*

The literature on this paradox has seen a progressive shift from explanations of the phenomenon that have focused on the particular problems of macroeconomic management that natural resources pose, to seeking to explain why governments have not been more successful in adopting policies that could address these problems[38]. The terms of trade (i.e. the ability to pay for manufactured capital goods imports by means of revenues from sale of natural resource outputs) of non-oil raw materials-exporting developing countries have worked consistently against the countries of Sub-Sahara Africa. Their raw materials export volumes have often doubled relative to 1980 levels, but the prices they have received for their minerals and agricultural exports have consistently declined over time relative to the prices they have had to pay per unit of imported manufactures. In spite of this terms of trade deterioration, research in this field has led to an increasing focus on trying to understand the political and institutional factors that lead to policy choices that are typified by persistent fiscal extravagance, poorly managed exchange rates, protectionism and inefficient use of government revenue accrued from taxing natural resource exploitation.

As a result, instead of seeking to explain why natural resource wealth has fostered various political pathologies and promoted poor outcomes, researchers now increasingly ask what political and social factors have enabled some resource rich countries to utilise these resources to promote development and have prevented many others from doing the same. This approach highlights the limitations of the view that there is a deterministic link between the structural characteristics of countries and

[38] For a review of this literature development, see Oxford Policy Management (2007), *Shared growth from renewable natural resources: A political economy perspective*." Revised Draft Scoping study for a DFID Work Stream, pp.9-15. The following overview is to a large extent extracted from that survey.

their societies, and the way in which these impact on the incentives and interests of political, economic and social agents.

The empirical macro-evidence presented in chapter 1.5 above suggests that countries with exploitable resources are generally more prone to predatory state behaviour. In less resource-endowed countries, states tend to make greater efforts to pursue developmental objectives that benefit broader constituents. The causal explanation appears to rest with the means by which ruling elites control the state and how the elite links to society. This hints at the possibility that different types of natural resources and other structural factors such as the size of the country or population density may also influence how developmental or predatory a particular state may be.

Increasingly, the role of social forces in shaping the development outcomes of natural resource abundant countries is being recognized as an important explanatory factor. It can been observed that such forces have enabled some resource rich countries, and prevented others, from building diverse institutions that allow the natural resources to fuel broad-based socio-economic development. Some sort of a consensus appears to be emerging, which acknowledges that various political and social variables mediate the relationship between the abundance of natural resources and different development outcomes, and that these variables influence the range of institutional options that may be available in any given context.

Within this context, studies have also focused on the extent to which differences between types of natural resources may influence observed outcomes. Explanation has been sought by focusing on the ease with which natural resources can be looted, and there has been specific concentration on the distinction between "point source"- and "diffuse" resources. *Point source resources* are those whose exploitation is capital intensive and whose ownership tends to be concentrated, e.g. oil, minerals and plantation based crops. *Diffuse resources* typically include the production of agricultural staples that have modest investment barriers and where associated property rights are likely to be more widely dispersed across society.

By combining an emphasis on the role of institutions with the distinction between *point source*- and *diffuse resources*, it has been found that compared to countries whose principal exports have been based on *diffuse natural resources*, the deceleration was much more severe and lasted much longer in *point source* rich countries, including countries relying on the export of plantation grown coffee and cocoa.

One conclusion drawn from this research is that countries dependent on point source resources and plantation crops are predisposed to heightened social divisions and weakened institutional capacity in response to shocks. These reactions in turn impede their ability to respond effectively to the shocks themselves. Crucial to sustained prosperity is effective and equitable management of shocks and, more generally, economic transitions. Furthermore, point source resources are characteristic of an unequal distribution of economic and political power and division of surpluses. *Point source resources feature vertical relationships between agents, whereas diffuse resources show horizontal relationships of equality, with the benefits to economic agents being more broadly spread. It is against this socio-economic background that point source resources result in bad institutions.* Regression results do indeed show

that countries with abundant point source resources end up with bad institutions, whereas governments and countries with abundant diffuse resources show no tendency to follow this pattern.

Researchers now tend to adopt the assumption that *point source resources are more easily captured by narrow elites, with the result being a highly skewed distribution of resources*. If this is the case, resource owners are then likely to lobby and maintain institutions that are inimical to growth and development and to protect narrow sector interests. The counter hypothesis is that where resources are more evenly distributed, there is less scope for political capture by resource owners and institutions and policies promote broad-based economic growth and general social welfare. However, and with reference to the observations in figure 1.6 in chapter 1.5, these hypotheses do not preclude the possibility of finding institutional solutions for the successful management of different types of natural resources, including those that feature point source resource characteristics.

*Tanzania* has had natural resource wealth at the centre of its economic policies and reform process over the past three decades. Focus has first of all been on the failed socialist *Ujamaa* experiment with management of the land resources and agriculture sector. During the past 20 years, the Tanzanian government has by means of economic reforms sought to remove the state from its commanding position in agricultural production in order to provide new incentives and opportunities to both smallholders and agribusiness. A National Land Policy was adopted in 1995, aiming to reshape the land tenure regime and increase local ownership. In the *agricultural sector* increased productivity resulted largely from expansion of cultivated areas, not from sustainable intensification, as a result of the many structural constraints related to poor rural infrastructure, limited educational opportunities and limited capacity to provide technical inputs that could encourage crop diversification and increase access to export markets for higher value crops[39].

In addition, the natural resource dependent tourism and mining sector have also undergone reforms aiming at attracting foreign capital to expand the output of these sectors. These reform initiatives have indeed created economic growth, but also social, environmental and political challenges.

During the 1980s and 1990s, following the *mining sector* reforms and new legislation that established framework for granting licences to private investors for prospecting and mining activities, and giving priority to large-scale foreign investments, the mining sector became one of the most dynamic sectors of Tanzania's economy. However, contrary to expectations of an orderly and well-managed expansion by means of large-scale mining companies, a "Klondyke" situation evolved with herds of unregulated and uncontrolled mining and gemstone camps, while new technology introduction and direct investment to enhance the value added from the sector did not materialize to anywhere near the anticipated degree. Only recently have some the well-organized gold and diamond mining companies started operations in Tanzania.

During this period rent seeking was made possible due to a weak regulatory framework, which also led to significant loss of revenue for the common good

[39] World Bank (1997), "*Tanzania - Country assistance strategy."* Washington D.C.

through smuggling of gold and semi-precious stones, and widespread tax evasion. Corruption from collusion between mining and marketing companies and government employees responsible for granting mining concessions, and overseeing tax revenue collection has become widespread since such people apparently have been able to act with relative impunity in pursuing personal gain. These rather uncontrolled mining sector activities have resulted in considerable environmental asset losses in several regions due to water contamination, deforestation, biodiversity loss and degradation of agricultural land, according to K. Kulindwa et al (2000).

The tourism potential of Tanzania has always been considered enormous, and the declared policies and strategies have included all the right "fair benefit sharing" elements. However, so far the prevailing land tenure regime has created conflicts over the ability of local communities and individuals to control use of lands when tourist enterprises want to expand their operations. In practice these entrepreneurs have failed to provide the expected job opportunities and failed to manage their tourism operations so as to create the anticipated well-being spillovers on the local residents in the areas with tourism potential. Liberalization has created economic conditions for entrepreneurs in tourism to extract significant benefits and the gap between their profits and the benefits to the locals has created disturbing tensions. Along the coast, many such entrepreneurs have got away with investments that have caused severe damage to mangrove forests and beaches, and the resulting coastal erosion and loss of important coastal fisheries have undermined the value to the locals of their coastal natural assets, see K. Kulindwa et al (2000) .

The above evolution of our understanding of the likely different national well-being outcomes resulting from a more careful simultaneous description of a country's natural resource endowment and the quality of it's institutions and governance, helps explain variations in a country's attractiveness from an investor perspective, and the natural resource impacts and poverty impacts of the investments that take place.

### 2.6.3 The Challenges of Common Property Management

The chapters above have established that the poor in developing countries typically are poor as a result of lack of assets, and that they depend much more heavily on and are more captive to access to harvesting from natural assets than are the non-poor. The poor are typically limited in their choices and their access is limited to fragile common property resources to which there is open access and no control of entry.

The original theory of the tragedy of the commons as formulated by G. Hardin in 1968[40] suggests that if property rights over natural resources is held in common, each individual has a rational incentive to overexploit that resource to maximise his/her gains, and to ignore the costs that for the rest of the community. It stated that so long as population growth is contained, this problem does not occur, as the number of users remains under control. Given the very simplistic policy setting upon which Hardin's analysis was based, the inevitable outcome when population numbers rise, is that long term sustainability is undermined since common property results in overuse of the resource, for example overgrazing and other forms of environmental degradation and pollution.

[40] G. Hardin (1968), "*The tragedy of the commons*", Science 162, pp. 1243-1248.

This theory has gradually come under careful scrutiny and criticism because of its rigid assumptions and limitations regarding alternative solutions to sustainable management of common property resources (CPR). Comprehensive studies in the field over the past four decades has convincingly shown that there are indeed social control mechanisms established in the form of self-governing institutions being developed and maintained that can be brought to bear on individual interests so that property structures can be established capable of serving in the long-run interest of the collective, and whereby an open access regime that leads to unlimited exploitation is avoided[41]. In short, in contrast to the long resilient "tragedy of the commons" myth, common property provides for a wide range of outcomes which includes both the tragic unsustainable outcome described Hardin in 1968, and successful management regimes that appear to provide for sustainable management of such local resources.

Where common property exists, users have often developed intricate webs of use rights that identify who has a long-term interest in the resource and thus has an incentive to collaborate in avoiding overuse. Under certain conditions local groups can devise common property regimes that allow their resources to be effectively managed. The diversity of experience, however, is wide and this has triggered a search to better understand the conditions under which particular institutional forms serve user groups well to sustain their natural resource assets[42].

The main "design principles" of E.Ostrom (2005) op.cit. describe the broad structural similarities among those self-organized systems that have been able to adapt and learn so as to be robust to the many social, economic, and ecological disturbances that occur over time:

- Clearly defined boundaries: The boundaries of the resource system and the households with rights to harvest resource units are clearly defined.
- Proportional equivalence between benefits and costs: Rules specifying the amount of resource products that a user is allocated are related to local conditions and to rules requiring labour, materials and/or money inputs.
- Collective-choice arrangements: Many of the individuals affected by harvesting and protection rules are included in the groups who can modify these rules.
- Monitoring: Monitors, who actively audit biophysical conditions and user behaviour, are at least partially accountable to the users and/or are the users themselves.
- Graduated sanctions: Users who violate rules-in-use are likely to receive graduated sanctions from other users, from officials accountable to these users, or from both.
- Conflict-resolution mechanisms: Users and officials have rapid access to low-cost, local means to resolve conflict among or between users and officials.
- Minimal recognition of rights to organise: the rights of users to devise their own institutions are not challenged by external government authorities and users have long-term tenure rights to the resource.

[41] See e.g. E. Ostrom (2005), "*Understanding institutional diversity"*, Princeton University Press, and T. Dietz, E. Ostrom and P.C. Stern (2003), "*The struggle to govern the commons"*. Science, Special Issue: "*Tragedy of the commons?*" 12. December 2003, Vol. 302

[42] See Oxford Policy Management (2007), op.cit

- Nested enterprises (for resources that are part of larger systems): Organisation of appropriation, provision, monitoring, enforcement, conflict resolution, and governance activities in multiple layers of nested enterprises.

Against these small-scale "design principles" and a comprehensive empirical review of what appears to have worked and what has not, the Oxford Policy Management study of 2007, op.cit., concludes for the wider context that it is now established that local-level problems of CPR management can often be addressed successfully through local level institutions. Furthermore, they conclude that successful resource-management institutions are diverse. Since there are typically many different ways in which the key design challenges for effective CPR can be addressed, such systems may still be vulnerable to several threats that can lead to their breakdown, e.g:

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- Where the number of stakeholders is much larger, diffuse, and widespread (particularly at the global level), CPR management can and does fail.
- The performance of such systems will depend heavily on social and political factors, and poor people's interests as resource users are likely to be systematically marginalised in many developing country contexts.
- Such systems are vulnerable and can break down in the face of pressure on and depletion of resources, ill-judged external interventions, wider conflict that undermines social capital, and attempts by powerful interests to secure access to resources
- There is not necessarily a trade-off between growth and poverty reduction objectives and environmental sustainability, but in practice there may be many cases where these objectives will be in conflict.
- The process of successful development can be characterised as one by which natural resources and the flow of rents from them are transformed into more productive forms of capital. Many low income countries are failing to achieve this transformation and indeed are living off their capital.
- A process of transformation of resources into growth, even if successful and inclusive and pro-poor at the national level, may leave global externalities unaddressed. The potential influence of deforestation on climate change and loss of biodiversity are probably the most significant examples. A critical challenge for any such systems will be how to ensure that national level incentives are effectively transmitted to the lowest level of decision-making, and to ensure that they operate in as pro-poor a manner as possible. Hence the effectiveness of national and local CPR management systems in key countries will be of central importance for the effectiveness of global initiatives.
- The literature on the relationship between natural resources endowments and development outcomes is rapidly developing and has yielded some suggestive results. However, caution is needed in interpreting empirical results as providing clearly established causal mechanisms.
- Initiatives towards more decentralised and participatory CPR management are an important part of current policy including in both the fisheries, livestock and forestry sectors. While there are important examples of success, doubts remain about the extent to which wider political and institutional constraints can be overcome.

### 2.6.4 Investment Choices Resulting from Perverse Incentives

It is well established from all economic sectors that policies that distort commodity prices and charges/tariffs for services so that these deviate from the resource costs of supply, impact directly on the profitability of-, and thus on the incentives to invest. This impacts on investment volumes as well as the allocation of investments between sectors, and the technologies chosen within each sector.

Fundamentally, economic policies that force producers and consumers to adjust their operations to prices that are artificially set below the resource costs of supplying the goods and services in question, lead to more demand and consumption than would have been the case with prices reflecting the real cost of supply. This signals to investors that investments are financially profitable even in cases where in fact such profitability is not present in economic terms. Typical cases are found in the transport-, water- and power sectors, all of which are associated with considerable environmental externalities.

When transport fuel prices are artificially held below their market price, travel and transport demand will be higher than otherwise, and this will lead to congestion in transport networks sooner than would otherwise be the case. This would result in political pressure for investments to expand the transport system capacity, even if there is no real economic justification for such investments. This wasteful effect is further enhanced if urban areas affected practice no- or very low parking fees and no road pricing scheme that captures the environmental costs of congestion and pollution. As a result, the public suffers excessive environmental damages (from air pollution, noise and congestion) and scarce public investment resources are diverted to increase urban road capacity instead of being used for e.g. public infrastructure, health, education, or environmental protection measures which are all generally under-funded since their positive environment externalities are not costed.

Likewise in the power sector, where below marginal cost power tariffs lead to excessive demand for conventionally generated power. In addition, investors choose low priced, but also low energy-efficient technologies and -implements which yield more polluting emissions than the costlier more energy efficient alternatives that would have been the optimal choice if buyers were facing a different energy price regime. As a result of such demand escalations and distorted investment decisions, there will be pressure to build more conventional power-plants to meet the “observed needs”. This reflects not only artificially high demand for power to operate existing production- and consumption implements, but also increased demand from users choosing to purchase new implements with lower energy efficiency than would have been chosen had power prices been higher. Jointly these distorted market forces add further to pollution (in the case of fossil fuel power plants) and loss of forest cover and biodiversity (in the case of hydropower projects).

Similar observation are made in the agricultural sector where subsidized water tariffs induce farmers (the agricultural sector of developing countries uses some 90% of all their freshwater sources being accessed for human uses) to use more water than otherwise, because they face no incentive to save water by growing crops or raising animals that are less “water intensive”, or by refraining from choosing to install and use water saving watering technologies when irrigating their fields and watering their animals. As if such wastage is not enough, the wastage also causes excessive lasting

damages to fields and soil quality in the form of salinity and water logging on a large scale in many developing countries. In this way, their subsidized water pricing policies not only tap their treasuries of valuable scarce public funds that could have been used in line with the country's declared poverty reduction strategy, but such policies also destroys important environmental and natural resource assets (cultivable soils) and thus erodes important components of these countries national wealth .In a similar way, excessive use of subsidized pesticides causes poisoning of farmers and their families and in addition undermines the future value of a country's soils and water resources because of the accumulation of toxic substances.

Water supply in the rapidly growing urban areas in developing countries is characterized by artificially set tariffs that are too low to generate the revenues required for maintenance and new investments needed to expand the networks and reduce leakages. The low subsidized water tariffs are claimed to be established for the benefit of those who cannot afford the water, but the reality is that the poor have no access to safe potable water from the public network. they have to buy unsafe water from private vendors at up to 30 times what the non-poor connected to the public piped network pay. By holding such tariffs artificially low, the authorities also keep potential investors away, and with a growing population, the health-, sanitary- and environmental conditions that poor face keep deteriorating[43].

In sum, the main point here is that all these natural resource-based sectors share a common fate: They are more often than not managed on the basis of myopic lobby group rent-seeking policies to the benefit of a few well-to-do and influential citizens, and at the cost and sacrifice of the many less endowed, and more natural resource dependent, poor smallholders and peri-urban dwellers. Such economic and financial policies severely undermine the public finances of the state, and in this way hinders maintenance of key public infrastructure assets, and discourages public and private investors from coming to the rescue with environmentally benign investments in such much needed infrastructure.

## 2.7 Look to and learn from Experience

There is a rich literature on the linkages between economic structural and sector reforms and the environment. Environmental impacts arise from changes in patterns and levels of public expenditures, but the direction of impact is not predetermined by the direction of change in the level of expenditure. When the constituencies that support environmental measures are weak, environmental expenditures may be cut disproportionately relative to other high priority expenditures.

However, "*getting the prices right*" can improve uses of land, forests and natural resources, wasteful industrial processes and choice of technologies in e.g. transportation, even in a situation where public expenditures for environment actions is reduced. Economic policy reforms that successfully internalise environmental externalities will mainstream environmental considerations and could justify reduced

[43] S. Hansen and R. Bhatia (2004), "*Water and poverty in a macro-economic contex*t". Paper commissioned by Norway's Ministry of the Environment for the CSD-Summit in April 2004

expenditures on e.g. an environmental agency, and thus free up these scarce resources for use in e.g. the social, health or primary education sector.

Positive or negative linkages between economic policy and environment impacts may also arise from relative price shifts. Farmers may switch from low- to highly soil eroding land use practices and crops as a result in one place, while the opposite may be observed some other place.

Subsidy removal on fuel may result in consumers and farmers switching from commercial fuels to fuelwood and dung. Similarly, water subsidies tend to result in excessive water use leading to harmful salinity and water logging, which in turn reduces the asset value of land holders and land users.

Changes in the pattern of taxes, trade duties, real wages, exchange rates can have both predictable and unforeseen environmental impacts with significant feedback on the economic indicators one had set out to change in the first place.

The examples and illustrations that follow are for the most part real world approaches to better natural resources management that were developed for implementation in Asian developing countries 12 – 25 years ago. With the massive technological IT-progress for monitoring and communication during the elapsed period, off-the-shelf monitoring instruments cost a fraction today of what they used to cost in the early to mid-1990s, they are much more effective and provides very much greater capacity for data collection, processing and dissemination. The barriers to their adoption and use for better and more sustainable management of poor countries' natural resources (in most cases at the same time with a scope for a much more equitable distribution impact profile) are no longer primarily of a technical nature, but political, institutional and administrative.

### 2.7.1 Regulations and Economic Instruments in the Forest Sector

Natural resources economics suggests the following economic instruments in order to ensure extraction of the maximum rent from the timber harvest in countries that are chronically understaffed in their forestry departments to undertake proper auditing and monitoring of actual logging activities:

- Levying taxes on the total volume of standing timber - whether or not it is harvested - has been tried in *Thailand*, and avoids the dependence of tax incidence on the harvest (under)reporting provided by the concessionaires. In *Malaysia* this has been tried in the form of volume control of timber harvested, whereby the logger only removes the volume of timber allocated to him. The collection effectiveness and efficiency of stumpage taxes applied in countries with tropical hardwoods suffers from information asymmetries and monitoring difficulties. Furthermore, stumpage fees are often set so low that the resources are practically given away, as has been observed in e.g. South Asian countries. Stumpage fees often constitute only a fraction of the marginal production costs. furthermore, poorly designed stumpage fees could encourage high grading, so that only high value species are taken out. Such effects could be countered by having in place a system of differentiated stumpage fees, see Sterner (2003) op.cit., chapter 30.

- Forest sector subsidies often come in the form of free seedlings, the number trees planted, or management assistance. Subsidy programs that have focused too exclusively on the number of planted trees or on the provision of seedlings, have often failed due to ignorance of the preferences and short-termism of local users. When demand for agricultural products is higher than for woody biomass, provision of free seedlings will be a weak incentive for tree planting, and may also hamper domestic production of seedlings. Such subsidy schemes are more likely to succeed where the land being reforested has no or few alternative income generating uses. A village woodlot case in Orissa in *India* financed with development assistance proved successful in reducing time needed for fuelwood gathering in poor villages and at the same time improved the natural forest cover biomass as a result of taking the wood collection pressure off these, see Køhlin (1998).

- The more infamous forestry subsidies are those that provide perverse incentives from an environmental perspective. Such subsidies are designed to encourage deforestation by combining regulations/legislation and subsidies/tax incentives that pay land owners to clear forests for alternative uses, e.g. livestock or other agriculture uses as has been practiced in Latin American countries.

- Auctioning of concessions, as is common in the petroleum sector, may be more difficult in the forest sector due to less clarity as regards security of tenure, the mix of tenure arrangements, lack of relatively competitive timber markets, and the often very heterogeneous forests to be harvested. One way around e.g. price impacts of an oligopolistic timber market situation in many countries could be sealed tender auctions. This as has been practiced *for along time in both Peninsular Malaysia, Sabah and Sarawak*.

- The duration and security of concessions is fundamental to the logging behaviour of concessionaires. Harvesting licences of 2-3 year duration as has been the practice in *Peninsular Malaysia* provide incentives for quick mining of the forest. For concessions to provide incentives for sustainable forest management the duration must match the rotation period, i.e. usually 25 years or more depending on the species, but there are cases where a 15 years rotation can be achieved for teak plantation (personal communication with Dr Abdul Rahim Nik, FRIM, Malaysia). The Peninsular State Governments of Malaysia has agreed to a Federal Government proposal for long term logging concessions with a 30 year minimum duration.

Optimum rent capture is a necessary condition for sustainable forest management since it will slow the rate of deforestation (disinvestment in forest assets) in the following three ways, see Steele and Ozdemiroglu (1994), pp.174-175:

1. Given a planned budget, increasing the revenue the government gets per concession reduces the rate at which the government needs to sell concessions in order to e.g. achieve a better balanced budget.

2. Optimal rent taxation reduces supernormal profits so that the rate of entry to the logging industry slows. With excessive profits, rent seeking results in the rush to

make quick profits, since concessionaires fear that conditions will be less favourable in the next round.

3. Raising taxes forces prices up and stops concessionaires from selling good timber at low prices. Higher timber prices increase incentives for more efficiency in both timber demand and supply. The underpricing of valuable tropical hardwoods means they have been substituted for low value plantation grown softwoods from Europe and North America for use in plywood cores and for rough construction purposes. Higher prices will also make sustainable forestry and industrial timber plantations economically more viable, i.e. stimulate investments in a sustainable management of environmental assets.

Experience from *Sabah and Sarawak* shows that even though they have a much higher forest rent capture than the states in Peninsular Malaysia, they spend proportionately less on enforcement and silvicultural development activities. It may be that the felling methods differ between the states to such an extent that such different spending patterns are justifiable from a sustainability perspective. With forest rent being such a strategic source of their State Treasury revenue, it is important that the States capture sufficient rent in order to facilitate substantially increased monitoring and development expenditures in the forestry sector. However, it is important to stress that capturing the rent for the State Treasury is one thing; equally important is the need to ensure that enough of that rent or other state revenue is actually spent on making operations in the forestry sector sustainable.

All *Malaysian states,* and in fact all developing countries, would seem to need substantial staff increases to secure proper monitoring and enforcement in the forestry sector. This will require additional revenue allocated for this purpose out of the State purse, but given the rather modest to low rent capture, and the obvious potentials for increasing it, this should not be the most difficult goal to achieve. In fact, the doubling of the cesses in peninsular Malaysia ten years ago (mid 1990s) suggests that once a specific tax or fee is instituted and its administration is in place, then it requires relatively little incremental effort to change its revenue generating ability by altering the fee levels. For non-distortive rent taxes, this would be the first best choice for decision makers.

It has also been suggested to use the armed forces to check illegal logging operations from the air, see CES (1995), p.73. Both the armed forces and the police are being used for this purpose in Malaysia, and this provides in addition for valuable armed forces training while at the same time engaging the armed forces in sustainable resources management activities. After all, it is protecting their own country's natural assets against depletion and saving it for future generations.

However, maximum rent capture will not by itself reduce the incentives of existing concessionaires to mine the concession area. Their harvesting behaviour can only be changed by means of changing the tenure rights and security, which may prove difficult to implement.

Some Malaysian states are already practicing that licensees and concessionaires should be made responsible for forest regeneration and adherence to logging methods and forest management methods determined by the State. It has been established that logging increases sedimentation, and that the amount of damaging sedimentation and the

associated external costs varies with logging method, see Othman et al (1995). The acknowledged polluter pay principle should be adhered to, and the Forestry Department has incorporated in the licensing agreement on the onus of logging contractors to bear the external costs of increased sediment yield.

Tropical forest endowed countries should develop and adopt criteria for reduced impact logging (RIL), and ensure that such logging practices are implemented and enforced. The State Governments should consider introduction of stiff performance bonds that will be cashed in if predetermined sustainability criteria are not met. In order for such performance bonds to change concessionaires' harvesting behaviour, the level of the bond must clearly exceed the costs of sustainable forest management. The bond must be of sufficient size to create a financial incentive to make the concessionaire wait until after the first rotation before logging. This approach, coupled with the threat of losing the concession licence if there is a failure to practice sustainable management, would more likely improve logging practice. A project-specific environmental guarantee fund method, on the other hand, as has been tried in the *Philippines* is not recommended.

There can be substantial marketed non-timber product (NTP) values from converted forests in the cases of natural rubber and palm oil production. But there are other marketed goods, as well as less tangible and not-marketed non-timber values as well. These non-timber values of forests are set to increase with income and technological development. Not only do non-timber products of tropical forests have a direct revenue side, see e.g. FRIM and ITTO (1994) and Vincent and Rozali (1995), chapter 4. Non-timber products include watershed protection, water supplies, erosion control, eco-tourism, potentials for finding economically valuable new species and genes for use in research and medicine, and carbon sequestration. Estimating such non-timber values provides for determining if prolonged rotation periods can be economically justified. The Forest Department of Malaysia has built such criteria into the operating guidelines for forest management, and the principles are being applied in Perak and Pahang States.

However, any estimate of such non-timber value is highly uncertain and often speculative, and will often be dismissed by decision-makers precisely for that reason. Let it be clear that the uncertainty about the magnitude of non-timber values is not a valid reason to ignore them. Adopting a slower rate of harvest can be viewed, in sound economic terms, as an insurance policy. It is a means of "buying time" until more is known about values and opportunities that could be irreversibly lost. In a way this recommends adopting a precautionary resource management principle based on a modified version of the strong definition of sustainability, as opposed to the neoclassical "weak" definition upon which the sustainability concept was discussed earlier. If this is not convincing for impatient developers, there may also be myopic reasons of timber values alone for slowing the rate of harvest. The argument is that one needs a lot better practical understanding of the regeneration of hill forests, in order to secure future harvests from these important past sources of Peninsular Malaysian timber.

The experience from the carbon offset forestry project in *Sabah* points to a promising economic instrument for sustainable natural resources management that carries with it the scope for multiple dividends, biodiversity conservation and carbon sequestration being but two of both national and global value. In order for it to apply widely and become a significant instrument for sustainable resources management, however, some severe barriers must be crossed. One is the lukewarm political attitude among some

government officials and NGOs. Carefully prepared and independently audited impact information may be the way to remove such scepticism and establish credibility beyond doubt. Part of the scepticism is founded in the justified belief that offsets are sold at a low price today, whereas their value will increase with time, and thus make it much more costly for developing countries to industrialize if and when an international $CO_2$ emission agreement is in place. However, such losses can be avoided by leasing the offsets for a given lease period, rather than selling them. In this way, the developing country can secure the right to renegotiate the lease cost if and when the scarcity of carbon offsets has increased their value in an offset credit market.

For this, but also for many other reasons, there is a clear need to involve and engage the government in the joint implementation process in a fundamental way and set the rules of the game, before providing for the private sector to act as implementers of the deals. Another obstacle is the lack of a real offset credit market in the rich countries. Clearly, the scope for exporting carbon offsets as part of joint implementation agreements requires very careful planning and independent auditing, but even with those requirements in place, no market will evolve unless carbon emitters in developed countries are willing to pay so much that the discounted net revenue to the concessionaire and the State exceeds the opportunity revenue from such forest land. Such willingness to pay will only come about on a large scale when credit markets for offsets are established by the industrialized countries.

The 7th. Malaysia Plan emphasized downstream diversification in order for industry to become less dependant on log- and sawn-wood exports, and on conventional uses of forest resources. The purpose of the log export ban was to create incentives for a second generation of further downstream processing industries, such as furniture making with high value added, where Malaysia may have a comparative advantage and be regionally and perhaps globally competitive. This could make it easier to diversify away from low-value added sawn-wood processing. Once such "infant industrial phases" have been completed, and an efficient downstream second generation industry is in place, removal of the log ban would provide for more rational decisions in a processing industry that no longer can claim infancy. It would stimulate dynamic efficiency measures, reduced wastage, and a better balance between sustainable supply and demand for logs, as well as between sawmilling capacity and the demand for their output by the furniture and moulding industries. There may be cases where adjustment assistance is needed to prevent rapid closures of many jobs in remote areas with shortage of alternative job opportunities. There would seem to be scope for compensation in these cases by means of the savings to the Government from a speedier reform of this industrial sector.

The impacts of different policy interventions on a the management of and investments in a natural resource assets can be illustrated for the case of forest assets (deforestation and reduced forest value) in developing countries. Similar impact overviews could be prepared for the other natural resource assets upon which many developing countries depend for sustained economic development. Such deforestation impacts have been documented in a series of econometric studies during the past three decades, and can be briefly summarised as in table 2.3. below:

**Table 2.3 Deforestation Impacts of Different Policy Interventions**

| Policy Intervention | Deforestation Impact | Comment |
|---|---|---|
| Devaluation | Increases | Raises export revenue from forest |
| Export stimulating measures | Increases | and agriculture products |
| Remove price controls on food | Increases | Raises prices farmers receive |
| Remove agriculture price subsidies | Is reduced | Reduces prices on farm products |
| Remove import barriers in agriculture | Is reduced | As above |
| Increase export taxes in agriculture | Is reduced | As above |
| Increase road investments | Increases | Reduces transport costs and time |
| Remove fuel subsidies for transport | Is reduced | Increases transport costs |
| Reduce relocation subsidies | Is reduced | |
| Reduce credit subsidies in farming | Indeterminate | Effects in both directions |
| Reduce subsidies on farm inputs | Indeterminate | As above |
| Reduce subsidies to forest management | Indeterminate | Depends on how is done |
| Reduce public sector employment | Indeterminate | Effects in both directions |
| Stricter monetary policies | Indeterminate | As above |
| Liberalize trade | Indeterminate | As above |

Source: S. Hansen (1996). op.cit.

## 2.7.2. The Management Challenges in Fisheries and Coastal Resources

Economic theory of open access resources management suggests management regimes resting on carefully monitored and enforced tradable catch quotas. Under this system, a Department of Fisheries would set overall annual catch quotas of different species in different zones and then allocate these quotas among fishermen, for example by means of auctioning. By this method, fishermen would be allowed to buy and sell quota among themselves after the initial allocation (which may be based on a straight- or modified "Grandfathering" formula). The advantage of this approach is that it would leave it to the market to determine the appropriate number and size of vessels for a given annual allowable catch. It would promote economic efficiency and maximize rent, and encourage technological development. Monitoring and enforcement must be effective, but that is not an argument against auctioning as such, because it is required regardless of how fishing rights are determined and allocated.

Individual transferable quotas meet important efficiency criteria in theory and in practice in single species fisheries in temperate waters, e.g. South Pacific and North Atlantic, with one or a limited number of fishing gears in use. However, the real world of multispecies-, multi-gear tropical fisheries as those along the Malaysian coast, render such management systems much more difficult for effective monitoring of the quotas/catches of each participating vessel. With more than 30,000 fishing vessels in operation in *Malaysia*, it requires strong logistics and manpower support to monitor and enforce this quota trade system. The general analysis above concluded that the direct regulation approaches applied along with economic subsidy instruments in the 1970s and 1980s to a large extent failed to achieve sustainable fisheries management in *Malaysian* waters. However, with the enforcement of the Fisheries Act of 1985, and the heavier penalties imposed, the total marine fish production from inshore fisheries was sustained at around 800,000 tons per year in the following decade. There is also

concurrence among the Bay of Bengal countries that due to the multispecies and multi-gear nature of these fisheries, to audit fish landings from various valid quota holders is not a workable solution.

A second recommendation is for Governments to resist temptation to resort to subsidies when pressure groups ask for favours. Uncontrolled expansion of fishing in offshore waters could deplete fish stocks and dissipate available rents, just as trawlers depleted the inshore waters off the West Coast of Malaysia during the 1960s and 1970s, see Vincent and Rozali et al (1995), chapter 6. Under the 7th. Malaysian Plan, there was a scheme whereby the fleet of existing trawler fishing vessels below 40 GRT would be reduced via a "buy back scheme". The utilization of this economic instrument to reduce excess fishing capacity was envisaged to reduce the heavy fishing pressure in the 5-12 nautical mile zone (zone B) off the West Coast of Malaysia, and a favourable economic growth outlook was seen as facilitating the implementation of this scheme because alternative job opportunities would emerge for fishermen made idle by the scheme.

Control of conversion of coastal mangroves to alternative land uses is crucial to preventing irreversible loss of such habitats. However, zoning and direct regulation are instruments that are only as effective as the whips that can be applied for enforcement and avoidance of political favourism deals. The scope for offsets along the lines attempted for tropical forest in Sabah, *Malaysia*, should be incorporated as an integral part of identifying the alternative options for utilizing and managing mangroves everywhere, taking on a full cost perspective. This means, among other things, to abolish direct and indirect subsidies to developers, e.g. developers of aquaculture projects so that they can compete for the coastal areas on equal terms once the environmental costs of their development have been explicitly addressed and considered. Deposit refund schemes should also be considered for introduction as an integral part of the project cost and cash flow analysis. The size of the deposit and the repayment schedule of it, could for example be linked to proper implementation of an EIA and monitoring of the adherence to it throughout the construction and operation period.

### 2.7.3. Wildlife and Tourism Management

Economic instruments have substantial potential for management and investment purposes of wildlife and conservation parks, as well as ecotourism. The twin roles of revenue raising and demand management are important, because the former must be fulfilled in order to fund the investments, monitoring, enforcement and maintenance of services needed to ascertain sustainability of attractive facilities, whereas the second can be used to secure a balance between demand and carrying capacity. The latter function is particularly important in fragile areas where endangered habitats and species require careful protection.

Corporatization (with or without private ownership) can enhance sustainable use of such areas. The key is to mainstream conservation and sustainable use into the products that visitors are prepared to pay handsomely for. Conservation and sustainable use of fragile ecosystems require high levels of monitoring, enforcement and maintenance of the area in question, and this requires use of local manpower and funds to pay for their services. The experience from the Anapurna Conservation Area Project and the Tiger Tops Company in *Nepal*, and the Ban Sap Tai local community cooperative for serving tourism by means of sustainable use of the Khao Yai National Park in *Thailand*, suggests

promising approaches where sustainable use services are priced for revenue generation as well and conservation and maintenance..

The offset instrument (applied on a pilot scale in Sabah, Malaysia, for carbon sequestration) should be considered as a means to capture wildlife-, biodiversity-, and ecotourism rent from megadiversity areas in tropical hot spot areas. Revenue from offset agreements may thus contribute to identify, establish and maintain new revenue- and local employment generating tourism activities. The candidates to be approached by forest concession holders would be international pharmaceutical and agrochemical companies, plus western environmental NGOs and research foundations. Such deals would, however, require very careful planning because of the long term commitments and the need to balance flexibility for the government and stability and low risk for the foreign participant, while at the same time make such conservation of non-timber use of the forest attractive to the concession holder.

It is important to determine whether a site has tourism or wildlife park potential, and if it has, whether it has attributes making it unique, or simply one of those beautiful recreational areas in the region of which there are "thirteen to the dozen". In the former case, there is substantial scope for rent capture, as the willingness to pay high entry fees to Bhutan and climbing expedition fees in Nepal, along with diving fees in certain Caribbean islands and visit fees to the *Galapagos* have shown. However, there are clearly a lot of sites around the developing world that are attractive as recreational sites, but where the rent due to natural uniqueness is missing. The only scope for rent capture in such cases would be relative accessibility and the spectrum of services offered compared to those of competing sites. Competition is what eliminates the rent, and as a result the scope for government revenue capture over and above what the operators need to salaries, to service invested capital, and pay for various inputs.

Nation states possessing such natural resources assets of tourist value should require performance bonds or other deposit refunds modalities (environmental escrow account) as part and parcel of the price for permission to develop a site. It is important that developers take this into account from the very first identification stage and incorporates these potential costs as an integral part of the project investment when designing it for cost-effective implementation. What this means in reality is that EIA becomes internalized as a natural and integral project element along with conventional infrastructure and construction components. It becomes one of the determinants in choice of technology, design, site and scale of the environment investment. Such a recommendation should ideally be proposed by national authorities as a requirement for states/provinces to enforce, and it could be made attractive to the state/provincial governments if they were given the right to the bond or deposit until it is to be refunded.

Such natural resource endowed countries should also consider adopting price discrimination as a means to capture foreign exchange. This can be done in the form of differential entrance fees and airport taxes for domestic and foreign visitors. *China* has been practicing this for years. It can be justified on the basis of different slopes of the demand curves of the two categories of visitors. The foreigner is much more captive and therefore less sensitive to price once he/she is at the site. The local visitor is likely to be more price sensitive, and prone to turn around if the price is considered too high.

### 2.7.4 Economic Instruments for Water Resources Management[44]

Domestic and industrial water demand in Malaysia has doubled from 2.6 billion cubic meters (bcm) since 1990 and continues to grow rapidly. Agricultural demand for irrigation water far exceeds the domestic amounts but is growing more slowly,. The search for an adequate supply of water to meet these demand increases requires the building of dams further upstream and increased use of groundwater. Both require heavy investments and funds to pay for increased water supply one way or another.

Water provision free of charge or at rates far below the marginal costs of supplying water, does not avoid the costs of water supply. On the contrary, such a supply policy will lead to excessive demand and thus misinform water agencies and politicians about the actual demand for water, in such a way that they are likely to be misled to undertake excessive and cost-inefficient infrastructural investments. Furthermore, dominating users such as agriculture tend to use water excessively when it is available to them at low or zero costs. Such use can have long term damaging environmental effects on the soils (salination, water logging), and at the same time divert scarce public resources away from needed investments in and maintenance of physical and social infrastructure. A water system that is not self-financing will require funds from general taxes or other activities. Since much of the payment will be indirect, water users will not receive appropriate information about what they are truly paying for water. The indirect ways of paying for water may cause distortions in other sectors of the economy and taken together these distortions may slow the rate of economic growth and progress. It is therefore important that all water users -- including agriculture -- are confronted with the full marginal costs of water supply as a basis for their production and consumption choices.

Water agencies that are unable to cover their costs from revenues, become dependent on the politics of the budget process. Operations, development and not the least maintenance tend to loose in such a battle. The outcome is increased demand for water to compensate for leakage losses, and investments in capital intensive new supply systems instead of sustained supply from existing systems with minimal leakages. As a result of deteriorating service, consumer willingness to pay more for water declines. Deficit operations prevents the water agency to expand supply to peri-urban squatter areas. In the end, low tariffs work counter to the equity goals that low tariffs were meant to promote. Both equity and efficiency goals could be better served by progressive water charges that reflect long run marginal costs of supply.

The equity goal is obstructed because water supply in developing countries tend to reach the well-to-do first, and leave out the poor, who end up paying much more than self-financing tariffs would have been, to monopolistic water vendors selling low quality and often unsafe water by the litre. The efficiency goal is prevented because water demand is not completely price-inelastic even among poor households. As a result, without cost-oriented water pricing the government will fail to ration water use effectively, and as a result fail to free up national resources for either better water management, or for better public services in other sectors.

A general approach to efficient and cost-effective water management can perhaps be summed up in the following steps:

[44] See e.g. S. Hansen and R. Bhatia (2004), op.cit

(a) Ensure that all sources are provided with operational and reasonably accurate meters, and that readings are recorded on a regular basis.

(b) Install meters at distribution pumping stations to map water use of a service area.

(c) Institute financial recording and reporting modified to isolate all costs associated with water supply and categorize those costs by function, to allow for subsequent demand management evaluation.

(d) Install meters at large commercial customers, including irrigated agriculture,

(e) Then, do the same at other commercial (including medium size farms), institutional and large residential customers, and finally, if feasible

(f) do so for smallholders, smaller- and low-income users.

(g) Accurate billing and collection systems with effective enforcement mechanisms must be secured in parallel.

By adopting an increasing block-rate tariff structure, the water agency may satisfy many critics. At the household level, the water tariff could increase stepwise so that it would be affordable for all for a minimum block amount equal to the basic household needs. The water tariff for the subsequent blocks should be higher, reflecting that water is used for less essential activities.

This review has identified the water and sanitation sector as the one environment investment area with by far the greatest potential for contributing to reducing the loss of DALYs. Mismanagement of water for large scale irrigated agriculture can be a major macro-economic factor. On a global scale, the World Bank (1993) found overgrazing of rangelands and irrigated agriculture to be the leading causes of land degradation and desertification, and estimated the direct annual income lost in the 1980s to be US$ 42.3 billion, an amount equal to overall gross annual foreign aid transfers. At the same time, it was estimated that the annual costs of preventive, corrective and rehabilitative measures were in the range of only US$ 10 – 22 billion.

In e.g. Uzbekistan, irrigated agriculture comprises 35% of GDP, 60% of foreign exchange earnings and 45% of employment. Inefficient management of water resources can cost such societies dearly when irrigated agriculture is the dominating water user. The shrinking of the Aral Sea in Central Asia is perhaps the most devastating case. The surface of the sea has declined 50% since around 1960, and the 3.5 million people around it have suffered severe losses from declining fisheries, loss of wetlands, and health damages from blowing salt and highly saline groundwater, see World Bank (2003b).

The World Bank has undertaken a study in Kenya that concludes that poor water resources development and management approaches cost the country significantly more than US$ 48 million per year, about 0.6% of GDP. The country's inadequate preparedness to rainfall variability costed the country at least Kshs 295 billion

between late 1997 and mid-2000. This was 15% of the GDP earned during that period (Mogaka et al (2002)).

The main challenge where irrigation mismanagement has taken place is then to increase water productivity in order to achieve *"more crop per drop*". The typical situation is one where the irrigating farmers are charged only a tiny fraction of the operating and maintenance costs for water supply and none of the capital costs. Cost recovery in irrigation systems is only 10% in the Philippines, 13% in Pakistan, and 25% in China, according to the World Bank (2002) which has estimated that developing countries spend as much as US$ 10 – 15 billion per year on irrigation subsidies and poor farmers are not the primary beneficiaries of such subsidies. This amount equals 20-25% of global official development assistance. Not only does this represent inefficient use of government revenue; it also results in lack of system maintenance, poor irrigation and drainage services, substantial leakages and losses of valuable water, and severe environmental damages followed by loss of soil fertility in the affected areas.

In India alone, almost US$ 5 billion of government revenue a year is spent on water subsidies for irrigation. This equals 10% of overall government tax revenues in India and represents a very significant drain on the budget by diverting funds away from alternative uses much more in line with a poverty reduction strategy. In the Indian state of Rajasthan, for example, the state pays 75 % of the operating and maintenance costs of irrigation, and these costs amount to 18% of the state's recurrent budget, see the World Bank (2003b). Clearly, there is considerable scope for efficiency gains in the irrigation sector and at the same time considerable scope for reallocating significant amounts of state funds to recurrent expenditures and or investments either in the water and sanitation sector or to other tasks defined as priority areas in the PRSP.

### 2.7.5 Water Pollution Abatement

The above general approach to efficient and cost-effective water management is also recommended for the management of wastewater effluents, but in that case it should be tailored to the special characteristics first of all of the polluting industries. Then – if proven feasible – prepare it for commercial customers and urban households that should be monitored, and have their effluents controlled in accordance with the polluter pays principle. Economic instruments such as performance bonds, deposit refund schemes and effluent charges are suitable measures for this purpose.

The basic idea is that each point polluter is given the option to chose between investing in and operating its own treatment facility, or subscribe to the treatment services of a central treatment plant. Such industries require a licence to release wastewater, partially treated or untreated to meet specifications, into a central sewage system. Such point emissions require close monitoring, and enforcement of stiff penalties when illegal emissions are detected. Such penalties could be in the form of fines that really hurt, and in the form of withdrawal of e.g. licences to produce and sell, see e.g. the policies described in the Malaysian National Conservation Strategy (1993), vol.1, pp.29-33.

With a political commitment to such a system, private entrepreneurs can be invited to tender for building, owning and operation of sewage and wastewater treatment facilities. Backed by the necessary laws and penalty schemes, they can offer individual sources of

point emissions subscription to connect to the treatment plant. Economies of specialization, -scope and -scale suggests that this option would be much more economical for polluting industries, commercial centres and households in urban areas, than investing in and operating individual treatment facilities. In many places the authorities would simply not allow the latter to take place. With a regulatory regime to mandate connecting to a wastewater treatment system, the owner/operator of it must be given the opportunity to charge fees that cover operating and maintenance costs plus a competitive return on the investments. Such systems can be publicly or privately owned and operated. Regardless of ownership regime, it is important to control that monopoly powers are not abused. This can be secured by means of performance bonds and conditions for renewal of operating licences.

Such a polluter pays principle based system can induce industry to (a) seek to reduce emissions of solids within the framework of their present production system, and (b) invest in new technology in order to reduce solids emissions. Such effects can be quite significant, as we shall see shortly in the case of palm oil milling.

*Malaysia* has gained unique experience in the use of regulatory and effluent charge instruments while successfully eliminating its most pressing water pollution problem in the 1970s resulting from discharges from its rapidly growing crude palm oil milling. This experience and the findings of studies done in that context would seem transferable to most industrial sectors in developing countries. The main conclusions and recommendations following from this experience are as follows:

* Pollution reduction -- even enforcement of very stringent standards --need not be an impediment to industrial expansion. The case of crude palm oil milling proves that such demands on industry can release dynamic forces and innovation efforts that improves competitiveness and leads to the development of new profitable marketable products from what used to be problematic and polluting discharges. This Malaysian experience -- while most encouraging for those claiming that there need not be a conflict between stringent environment standards and economic development -- is far from unique to Malaysia. Many similar cases from industrialized countries have been studied and documented.

* The fact that the industry being forced to reduce its pollution is large and important to the national economy is not grounds for being reluctant to addressing its pollution problem. Strong industrial lobby pressures for exemptions referring to excessive costs and loss of competitiveness often prove unfounded, as it certainly did in the crude palm oil milling case. However, one need to establish that there is a certain likelihood of technological development and innovation of new products and cost savings before enforcing very stringent new standards. This is particularly important when the affected industry is competing on the international market. However, being an exporter and exposed to international competition is in itself not sufficient reason to give up on the effort of enforcement of stringent environmental standards. Industry's claim of excessive costs to meet abatement targets tend to be unfounded everywhere. These costs rarely exceed 1-3% of turnover even in the most polluting chemical industries, unless they are equipped with completely out-of-date technology that would have to be scrapped and replaced for pure profit and survival reasons anyway.

* In all cases where stringent pollution standards are introduced -- regardless of the instruments being applied -- one would need to establish the incidence of the costs among stakeholders. The market conditions determine who ends up paying the bill. In the case of crude palm oil milling, the abatement costs were passed on predominantly to the palm growers. This illustrates how the ultimate costs of pollution control policies can occur primarily in sectors other than those aimed at with the regulation. In Malaysia, there is vertical integration of palm oil plantations and mills. With plantations owning the mills and the land, they have a certain ability to comply with the regulations. The compliance was facilitated by the public commitment to a gradual implementation.

* When a need for better environmental quality calls for government action, consultation with the affected industry is critical for preparing them for what needs to be done and for gaining their support for and understanding of the necessary measures. The Malaysian crude palm oil milling case of establishing an expert committee with industry representatives to help draft the Regulations for the DOE, is an example of early dialogue and involvement that will channel early information to industry so that they can plan and prepare themselves for the coming actions, while at the same time communicate their main problems and concerns to government and have these considered in the implementation process.

* Effluent charges and variation in their level was an integral part of the Regulation in the Malaysian Crude Palm Oil case, but. their ability to promote cost-effectiveness was compromised by some regulatory elements. On the other hand, fear of licence suspension is a perceived risk and cost to the industry and prompted innovation more so that the effluent charges did.

* In the crude palm oil case, effluent charges offer abatement cost savings compared to uniform standards, but the higher the standards the smaller the savings. The simulated effects of a tradable discharge permit system offers even greater savings, but they are still very small at high levels of abatement. However, this costs savings conclusion only holds so far as the system of uniform effluent standards and the administrative apparatus to monitor and enforce it is already in place.

* In a case where the policy instruments to achieve a given environmental improvement have not yet been chosen, the relative merits of effluents charges or tradable discharge permits are likely to be much more significant.

* The fact that effluent charges raise the costs to industry compared to a system of uniform standard, is not a national economic argument against effluent charges. The effluent charges paid by industry can be interpreted as potential compensation to the victims of pollution.

* In polluting sectors where the policy instruments and administrative arrangement for abatement, monitoring and enforcement has yet to be selected, one should carefully review the market conditions and determine the relative attributes of command and controls versus effluent charges and tradable discharge permits.

There is no general conclusion to be found, the best results can only be achieved by undertaking case by case EIAs and cost-effectiveness studies. However, the general sympathy in Malaysia with market driven solutions and privatization suggests that market approaches to pollution control may be favourably received if properly marketed by the authorities. After all, market-based policy instruments such as effluent charges and tradable permits reduce the need for direct government interference and control. However, tradable permits require good data on pollution status, and it requires several actors for a market to function. One may therefore require some time to make it operational for e.g. a river basin.

* In addition to stringent standards, effluent charges and/or tradable permit schemes, water pollution can be combated by means of performance bonds. This is already in place for the mining sector, but there is every reason to introduce such instruments in all sectors where investments involve risk of harmful pollution unless the stringent standards as recommended in the compulsory EIA are adhered to. As for the introduction of stringent standards, those affected will protest fiercely and claim this measure to be the end of their operations. If that is really so, then so be it, although it should be closed down in a manner that allows those with the least possibility to get new livelihood on their own to find alternative livelihoods.

### 2.7.6 Economic Instruments for Waste Management

Waste management as a local responsibility with increasing use of private sector for collection and transportation to disposal sites poses a number of possibilities for use of economic instruments for enhanced environmental quality. The deposit refund schemes from Scandinavia should be considered for a number of products containing toxics and hazardous materials that may be released when the product is scrapped in a traditional way (batteries, electric appliances, computers and other electronic equipment, and vehicles). The system is also clearly applicable to packaging such as bottles. With the proposed amendment to the EQA '74 from Malaysia's MOSTE, the road ahead for the introduction and use of such schemes would appear promising.

Direct payment for household waste collection based on the number bags collected is already practiced in some municipalities with success. It should become the rule in developing country municipalities because the waste volume is reduced and what is collected can be processed and stored in the best way for the environment. However, one needs to balance the pricing of the bags and the cost of collecting and transporting them, against the environmental costs to the public arising if households decide the charge is too high and begin to dump waste illegally. Enforcement of illegal dumping may be relatively easy in large cities, but much more difficult in villages and rural areas.

Hazardous and toxic waste by their very nature is likely to cause severe long term damages to the environment and people if thrown away uncontrolled. The actual collection, transport, treatment and disposal can be undertaken by the private sector, as has been decided on in Malaysia with a centralized plant established at Bukit Nanas, Negeri Sembilan handling 90% of 450,000 tonnes of toxic industrial waste generated annually by 1998. However, irrespective of ownership model, direct regulations combined with strict penalties for violation of whatever rules for collection, transport and disposal/storage, need to be instituted and enforced strictly. Production licence

suspension appears to be an effective threat based on the experience from coping with the effluents from crude palm oil milling in Malaysia. This threat can be broadened to many other pollution industries as well, and combined with fines that makes it unattractive not to abide by the regulations for packaging, storage, transportation and processing of such waste. A Department of Environment should have a right to licence (and as a logical consequence, a right to withdraw a licence) or have a right to decentralize this licensing and delicensing right to whatever local authority is best placed to monitor and enforce hazardous waste management. With privatization of hazardous waste handling, a strong incentive to apply the polluter pay principle has been instituted. Such a private enterprise need to cover its costs and earn a return on it principal. This can only be achieved by charging the producers of hazardous waste for the costs of collecting, transporting and treating and disposing of this waste in ways that are in accordance with the environmental regulations set by the Government. Obviously, some producers of such waste will try to avoid paying these costs by discarding of the waste illegally. It is of utmost importance that the law and bylaws provide for rapid and tough action against such violators, and that the executing agencies have the authority and capacity to enforce, so as to discourage others from similar behaviour. The policy and practice should be that paying the full cost of safe collection, treatment and disposal hazardous waste shall clearly be the least cost alternative for industry and other users of material resulting in such residuals.

### 2.7.7 Energy Pricing and Vehicle Taxation to Combat Air Pollution

A strategy to reduce the health impacts of air pollution in cities must focus on both stationary and mobile sources. Based on epidemiological studies elsewhere, and applying the willingness to pay to avoid a statistical death, and the ratio of avoided mortality benefits to avoided morbidity benefits, the magnitude of the estimated benefits suggests that the potential economic gains to developing countries from achieving typical Department of Environment particulate standards could be large, see Vincent and Rozali et al (1995), chapter 9.

This study has identified several promising economic instruments for use to achieve such targets. In the transport sector, the introduction of fuel price differentiation, favouring "green" filtered diesel, unleaded petrol, and hybrid engines will accelerate the diversion of vehicles towards such fuels, and it will improve air quality.

Toll roads are already in place and accepted. It would therefore imply very little extra costs of increasing the toll rates to reduce the peak traffic volumes, and as a result reduce air pollution. The Singapore area licensing scheme is clearly worth considering for many other cities as well.

Local communities should use parking fees much more actively both as a mode of revenue and to divert private car traffic away from the central business district.

Old vehicles contribute much more than new ones to unsafe and unhealthy driving. Introduction of a deposit refund system for old vehicles being turned in rather than operating them as a health hazard on the roads, or being dumped illegally in some remote lake or river, should therefore be considered based on the Scandinavian experience.

Poor vehicle maintenance has been shown to result in excessive emissions of harmful pollutants from vehicles, as well as excessive fuel consumption. Compulsory annual vehicle inspections and engine tunings should become mandatory at certified private garages. Clearly, the vehicle owners should pay the full costs of these services, both because (a) it is in accordance with the polluter pays principle, and (b) it would in many cases be in their own financial interest to own and operate a better maintained and less "thirsty" vehicle. As for producers of hazardous waste, there is a need for the executing agency of such vehicle inspections to have the clear authority to withdraw vehicle licence plates on the spot if a vehicle is detected where the owner has not followed the stated rules and procedures.

Short of political will to price externalities, it is no small achievement to have most energy and power prices reflect long run marginal costs to the industry. Price differentiation based on fuel quality measured from an environmental perspective can be a strong measure for fuel switching, because the alternatives are close substitutes. Tax incentives and rebates for abatement technology investments and for investment in new processing technology that is proven beyond doubt to reduce air pollution relative to what it replaces is already in place, but may be improved and tailor-made further.

Energy saving light bulbs are already becoming popular throughout South East and East Asia. However, the price differential to conventional light bulbs is still very high. With a high private discount rate, it may take a surtax on regular light bulbs or a government supported discount on the energy saving ones to speed up household- and commercial use of them.

Local authorities should be instructed to enforce waste burning regulations strictly, and penalize with high fines those who do burn waste in the open, in order to reduce the emissions of harmful particulates.

## 2.8 Scandinavian Experience with Economic Instruments

Based on the findings from Norway and Sweden summarized in Hansen (1997) (chapters 16 and 17), their experience as regards the direct effects on demand and supply, and indirect effects in the form of e.g. revenue used for environmental measures, on environmental goals, as well as the administrative and monitoring costs relative to the total tax/charge turnover is summarized in table 2.4. Much of this experience is transferable to developing country settings, and where the transaction costs are high in Scandinavia, they are likely to be prohibitive in poor developing countries.

The taxes included in table 2.4 share the low administrative- and monitoring cost characteristic where they have been tried out, but there may be some such initial bottlenecks in the case of poor developing countries due to the special constitutional and institutional conditions. As far as environmental impacts of these taxes are concerned, it is reasonable to assume that the Scandinavian experience is transferable to many developing countries. The table suggests that for those taxes and charges where the direct environmental effects are large, the indirect effects are harder to judge, whereas where the indirect effects are large, the direct effects are hard to judge or not so significant.

**Table 2.4 Summary of the Goal Achievement Effects and Administrative/Monitoring Cost Effectiveness**

| Environment Economic Instrument | Direct Environmental Effects | Indirect Environmental Effects | Adm. and Monitoring Costs as % of Turnover (e.g. tax revenue) |
|---|---|---|---|
| 1. Deposit refund for old cars | hard to judge | significant | less than 2% |
| 2. Fertilizer tax | some | large | less than 0.4% |
| 3. Gasoline tax | large | hard to judge | very low |
| 4. Air transport emission tax | some | some | 0.2% |
| 5. Tax on lead batteries | hard to judge | substantial | ca 1% |
| 6. Tax on small batteries | some | large | low |
| 7. $CO_2$ tax | some | some | very low |
| 8. $NO_x$ tax | large | hard to judge | less than 1% |
| 9. $SO_2$ tax | large | hard to judge | less than 1% |
| 10.Diesel tax differentiation | substantial | hard to judge | less than 1% |

Source: Ministry of Environment, Sweden, 1994

# 3. Making the Case for Investing in the Environment

## 3.1 The Global Evidence

Through it's strong links to poverty, environment relates to many MDGs, but it is prominently emphasized in MDG7: *Ensuring environmental sustainability*. MDG7 has the following targets and indicators, see table 3.1:

**Table 3.1 Targets and Indicators of Millennium Development Goal No. 7**

| *Targets* | *Indicators* |
|---|---|
| Integrate the principles of sustainable development into country policies and programs and reverse the loss of environmental resources. | • Proportion of land area covered by forests<br>• Area protected to maintain biological diversity<br>• Energy use per unit of GDP<br>• Per capita $CO_2$ emissions and consumption of ozone-depleting substances<br>• Proportion of population using solid fuels |
| Halve by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation. | • Proportion of population with sustainable access to an improved water source<br>• Proportion of population with sustainable access to adequate sanitation |
| Have achieved, by 2020,a significant improvement in the lives of at least 100 million slum dwellers | • Proportion of households with access to secure tenure |

Source: United Nations (2001, 2002).

Having established in chapter 1.1 that:

- Poor people are poor because their assets are few, and often of low quality;
- A significant fraction of those assets comprise natural and environmental resources that provide valuable ecosystem services;
- Environmental assets are highly vulnerable to overuse and external appropriation;

and in chapter 1.5 that in the countries most dependent on - , and vulnerable to depletion of their natural resource base that:

- There has over the past three decades been a severe lack of any kind of investments to compensate for their aggressive natural wealth depletion,

there is a two-fold need for alleviating poverty, and an obvious way out of the vicious poverty-environment circle requires:

- Investments in assets available to the poor, and
- Policy measures to facilitate efficient, sustainable and pro-poor investments.

However, the poor invariably lack access to capital, credit markets and insurance and cannot provide collateral. The poor are thus captive to a very limited number of resource use options, and very often the available options imply extraction and depletion of the natural resources nearest to them for use. Natural capital assets are relatively more important to the poor than elsewhere. And yet, since the poor have no

choice but to be more concerned with day-to-day survival than with longer run well-being, they are more likely to under-invest in resource conservation measures; e.g. tree planting, soil conservation and sustainable management of mangroves and coral reefs. The poor thus tend to discount the future very heavily; they apply a very high discount rate to the investment propositions they face compared to what the less poor apply, and as a result they prioritize their limited investments and resource use choices differently and more in response to their immediate needs.

In short, these circumstances contribute to explain why environmental investments – especially those of relevance from a poverty reduction perspective – do not just happen. Most of the return accruing to environment investments does not show up in the marketplace, unless markets are created for the benefits in question. As a consequence, the free market will tend to underinvest in such environmental assets. This means that governments, global agencies and NGOs must enter the scene and finance many of the required environmental investments in cases where the social and economic rate of return is high while the financial rate of return is below the free market cut-off point, to compensate for the lack of such investments coming from the free market. This discrepancy is enlarged in cases with a dominance of poor households, -individuals and –producers who all have very high discount rates as a basis for their investment decisions. In addition, many such investments have significant "public good" characteristics. This means that private interests are even less likely to result in the right amount of investment.

It was shown in table 1.1. in section 1.4 above that for all countries – including the least developed ones – human-, social- and institutional capital constitute the most important assets for enhanced well-being and economic growth. However, the different assets interact, and important in this context is the fact that access to natural resources and environmental quality are vital ingrediences of human health and labour productivity, and hence, human capital, via (1) it's direct impact on morbidity and mortality, and (2) via the quality of land resources and access to fuelwood and potable water, since the amount of time and family labour needed for such basic needs activities depend crucially on access to and quality of these vital resources. Environmental assets thus clearly influence the human capital formation.

Poor natural environmental living- and work conditions are found to be the cause of around 17% of the loss of Disability Adjusted Life Years (DALY)[45] in developing countries in year 2000, compared to only 4% in developed economies, see K. Lvovsky (2001)[46]. The main cause inducing loss of DALYs is disease transmission through poor water quality and lack of sanitation, with 40% of all environmentally induced DALYs. in developing countries. Second in line as cause of environmentally induced DALYs come indoor air pollution, followed by vector diseases, urban air pollution and agro-industrial waste, see e.g. D. W. Pearce (2005) table 3.6.

However, this ranking of causes of loss of DALYs varies between regions and large countries. Whereas poor water and lack of sanitation dominate overall in India and Sub-Sahara Africa, urban air pollution is the leading cause in China. In Sub-Sahara

[45] DALY is the World Health Organization indicator that combines life expectancy and the health quality of a year lived.
[46] Lvovosky, K. (2001), "*Health and environment".* Environment Strategy Papers, strategy Series No. 1, October 2001, The World Bank, Environment Department, Washington D.C.

Africa, vector diseases (malaria) takes second place close to poor water and sanitation in first place. These are all potential environmental investment areas and the challenges are:

1. To select which ones when and where so as to maximize the reduction in loss of DALYs for the limited amounts available for such environmental investments, and using such information
2. To present the merits of such investments so that additional financial resources are mobilized to reduce such losses of DALYs further, and thus bring us closer to achieving the MDGs in time. A major barrier to achieving this is that the benefits accrue to individuals other than the investor and cannot always be recouped by them. Therefore government intervention is often needed.

Lvovsky (2001) op.cit., p.11-12, provides a convincing empirical case for the above in a World Bank review of available evidence undertaken to assess the effectiveness of measures outside the health sector in achieving health improvements measured in terms of preventing the loss of DALYs. For various interventions, the review concluded with the following estimated costs per DALY saved:

- Hygiene behaviour change: USD 20 per DALY
- Water connections in rural areas: USD 35 " "
- Malaria control: USD 35-70 "
- Improved stoves (indoor air quality): USD 50-100 "
- LPG stoves and kerosene in rural areas: USD 150-200 "
- Improved quality of urban air: most measures cost over USD 1,000 "

These action areas are all directly environment-related (air- or water quality). However, water supply and sanitation spending tend to receive very little attention and priority in PRSPs and development budgets.

When in the following the returns to different environmental investments are presented, one should note that the analysis is myopically focusing on environmental investments. It does not take account of the fact that some of the goals of such investments could also be achieved by investing in e.g. human capital (i.e. education and direct health measures) in order to raise awareness of how to guard oneself and family members against the most obvious health hazards resulting from the environmental deficiencies that they are exposed to in their day-to-day life and work.

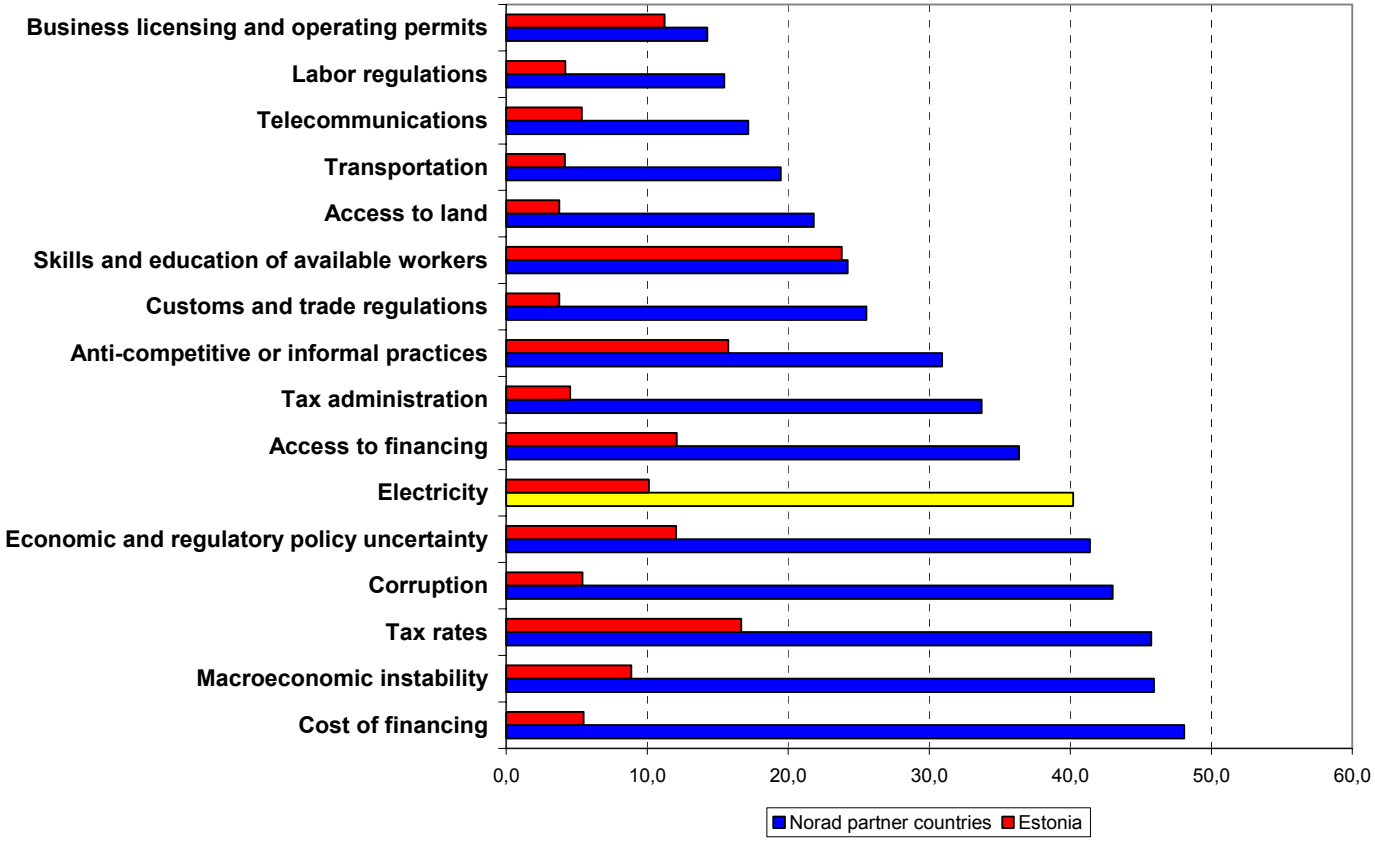
## 3.2 Barriers to Investments and Environment Improvements

Despite rapidly growing private sector investment in some of Norad's partner countries, many still face significant barriers to investment[47]. Figure 3.1 sets out the main barriers to investment in a selection of Norad partner countries[48] where data is available. The score is benchmarked against the barriers to investment in Estonia, a star pupil in the emerging market policy reform class.

[47] This section is based on S. Hansen and B. Brandtsæg (2005), " *Barriers to investment in the power sector in developing countries*", Commissioned for the Power Sector Task Force chaired by Norad, Econ Analysis/Nordic Consulting Group AS.
[48] Bangladesh, Ethiopia, Kenya, Tanzania, Uganda, Mozambique, Sri Lanka,

Macroeconomic instability and a dysfunctional financial system, which makes the cost of lending prohibitively expensive, represent the most significant challenges along with high tax rates and complex tax codes together with corruption, which is often fed by a complex and unpredictable regulatory environment . These factors are closely correlated with the quality of governance, and the better the governance the better the scope for facilitating environmentally benign investments and investments in environment assets. Against this background the investment barrier illustrations in figures 3.1 – 3.3 are shown as proxies for barriers to environmental investments.

**Figure 3.1 Main barriers to investment Norad partner countries.**

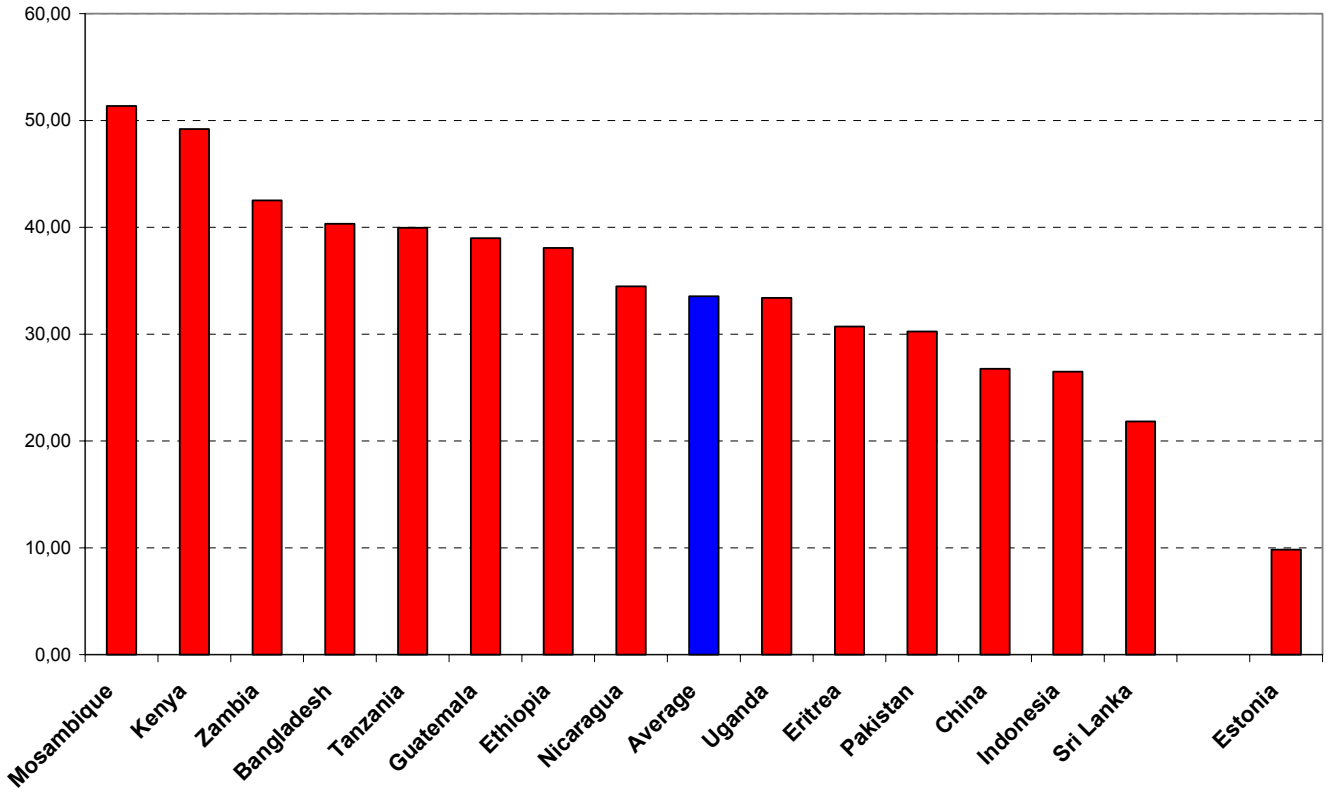



Source: World Bank Investment Climate Database 2002

The barriers to investment vary greatly between the countries surveyed. Some countries have a reasonably benign investment climate while the majority need to reduce barriers to investment substantially in order to attract more domestic and foreign investment capital. *Mozambique* and *Kenya* are the two countries with the most restrictive investment climate while a country like *Sri Lanka* has improved its investment climate significantly in recent years and has been awarded with a growing inflow of foreign direct investment and a lower country risk rating until recently when the domestic violence escalated again. *Estonia* used as the benchmark case has one of the best investment climates among any emerging market and has received in total foreign direct investments amounting to close to 100% of GDP over the last decade,

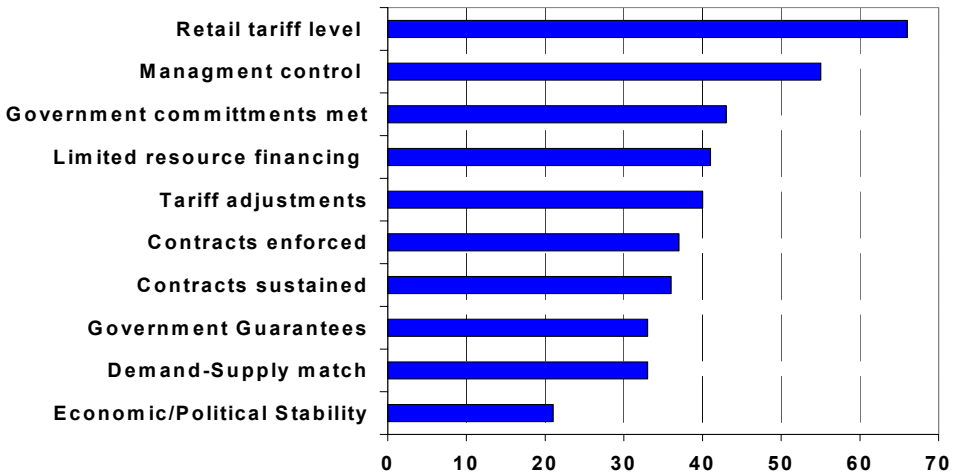
which has contributed substantially to productivity growth which has accelerates economic growth and reduced poverty.

**Figure 3.2 Investment barriers in a selection of Norad partner countries**




Source: World Bank Investment Climate Database 2002

**Figure 3.3 Critical factors for success of infrastructure investments in developing countries**




Source: Private Power Investors in Developing Countries. Survey 2002, World Bank

## 3.3 Investing in Environmental Assets – Sector by Sector

### 3.3.1 Water Supply and Sanitation

Mismanagement of water resources causes substantial health-, environmental- and economic losses on a scale (at least USD 60-70 billion annually) equivalent to the annual flow of foreign aid[49]. This obviously impedes efforts at implementing poverty reduction strategy programs (PRSPs). The 1994 World Development Report focused on the role of infrastructure in development. It concluded that, although there is great variation in performance between countries and sectors, there are great payoffs from increasing the efficiency of infrastructure provision. Three type of gains are expected outcomes of such reforms: Reduction in subsidies (i.e. reduced fiscal burden that constrains governments ability to implement development programs and PRSPs), technical gains to suppliers, and gains to users.

In 1990, the estimated annual fiscal burden due to subsidies incurred from inefficient pricing of water resources constituted almost USD 20 billion or 40% of overall foreign aid. In addition comes USD 55 billion of annual savings to infrastructure service providers from raising technical efficiency to best practice levels. This amounts to a quarter of annual infrastructure investments, and twice annual development finance for infrastructure. Purely, for illustration, if these technical infrastructure losses could be redirected for three years, at current costs in 1990 of roughly USD 150 per person for water systems, the one billion poor people without safe water could be served. By achieving such efficiency, service provision would adjust more in response to demand. It would enhance overall economic growth and competitiveness of the economies. Clearly, such results would not occur unless good governance and substantial capacity building takes place in government and public utilities, which again shows the importance of linking reforms, investments and management of operations closely in the PRSPs. Creating a conducive policy environment should be the dominating way of mobilizing higher revenues for new investments and for attracting inflow of new and additional resources for investments.

By the same logic, well designed and implemented investments and management plans for water resources will have significant positive impacts that are measurable in macro-economic terms and at the same time facilitates implementation of the national PRSPs.

Lack of safe water and adequate sanitation constitute by far the most important of the environmentally induced causes of loss of DALY, with some 7% of the total loss of DALY in developing countries. In Sub-Saharan Africa, where environment causes of DALY amount to almost 27% of total DALY losses, inadequate water and sanitation is estimated to be cause of some 10% of all DALY losses, and in India this percentage is 9%, see Pearce (2005)op.cit, page 52.

[49] S. Hansen and R. Bhatia (2004), *"Water and poverty in a macro-economic context"*. Paper commissioned by the Norwegian Ministry of Environment for the 2004 Commission for Sustainable Development Meeting, New York.

WHO has estimated the returns to water and sanitation investments for different levels of investments in developing countries, see Hutton and Haller (2004)[50]. The benefits accrue as:

- Time savings from avoided collection of water and visits to sanitation facilities. These benefits comprise some 75% of the total benefits from achieving the MDG7 target. Time savings will show up in increased output and productivity, and in higher school attendance (obviously, the overall benefit estimate is very sensitive to the estimated value of time used in these calculations);
- Health sector savings account for just under 10% of total benefits;
- Increased working- and school days from reduced illnesses account for the rest.

The MDG target relating to safe water is to halve the proportion of population without sustainable access to safe drinking water from the 1990 baseline[51]. Martin-Hurtado (2002) has estimated that the world would benefit tremendously from achieving this target because it could save the lives of up to 1 billion children under 5 years of age over the 2015-2020 period. The cost of achieving this MDG target is estimated to some USD 26 billion per year, but since the benefits as described above would amount to USD 84.4 billion, the benefit/cost ratio would be an impressive 3.2 : 1. It is noted that WHO – using the Hotton and Haller (2004) approach concludes with less than half the costs for meeting the MDG target, and therefore a more than twice as high a benefit/cost ratio, as seen in table 3.2 below, which is extracted from D. W. Pearce (2005), table 5.1.

It has been argued above that there are good reasons to assume significant positive externalities, and a significant contribution to achieving PRSP goals and MDGs. Therefore one would expect high economic returns to water supply and sanitation spending. Studies of the cost-effectiveness of drinking water supply and sanitation options in relation to diarrhoeal diseases control conclude that disinfection at point-of-use consistently is the most cost-effective intervention everywhere, and interventions targeted at key behaviours such as improved hand washing would also provide a highly cost-effective way of achieving substantial health gains, e.g. when the millions of DALYs avoided are compared to the costs of the interventions.

As for linkage between access to safe water and sanitation one the one hand and economic growth on the other, a study by J. Sachs (2001)[52] suggest that countries with per capita incomes below USD 750 per year and with access to safe water and sanitation grew on average 3.7% per year, as compared to only 0.1% annual per

[50] Pearce (2005) op.cit. cautions against methodological weaknesses and uncertainties in the data, but both he and WHO nevertheless uses this are the primary source of aggregate justification for such investments.

[51] Access to safe water in the MDG context refers to the proportion of population dependent on piped water, public tap, borehole, protected well, protected spring, and rainwater, with the availability of at least 20 liters/capita/day. This definition does not caputure service quality dimensions such water quality, reliability of supply and service delivery.

[52] Sachs, Jeffrey (2001), "*Macroeconomic and health: Investing in health for developing countries*". Copenhagen, World Health Organization.

capita income growth in countries with similar per capita income, but where access to safe water and sanitation was limited.

Recent research undertaken for the *China* Council for International Cooperation on Environment and Development (CCICED) by a team of international and Chinese experts have found that the most dramatic effects of water pollution are on the mental and physical health of children from drinking water and eating food contaminated by untreated industrial and municipal wastewater, see Warford and Yining (editors) (2002), chapter 3.

It is estimated that 1.5% of all deaths in China, or 64,000 persons per year, can be attributed to water pollution related to diseases. However, having valued these premature deaths moderately in economic terms, the highest costs of water pollution damages appear to come from IQ loss in children from ingestion of water and food contaminated with lead, mercury and other heavy metals. It is estimated that each year 7 million children are affected, losing on average 6.5 points on the IQ scale. Two other major water pollution impacts are non-fatal cancers and congenital abnormalities, whereas non-fatal hepatitis and diarrhoea/enteritis are relatively minor externality costs, according to these analyses. The total welfare loss from the impact of water pollution on health alone is estimated is estimated to US$ 13.4 billion for the late 1990s. This is equal to 1.3% of China's GDP.

Non-health damages are also likely to be significant, but so far estimates are less complete. Damages to crops are likely to the most important of these in a developing economy where agriculture constitutes a major economic and employment sector. A World Bank estimate of 1997 places such non-health water pollution costs in China at US$ 2 billion, equal to 0.2% of GDP. With this approach, total water related externalities amount to 1.5% of China's GDP.

An estimate of income lost as a result of water pollution was carried out for 1992 by Xie Guang and published in V. Smil (1996). It estimated these external costs as follows:

| | |
|---|---|
| Impact on human health: | |
| As a result of contaminated food | 2.42 billion Yuan |
| As a result of contaminated drinking water | 16.87 " " |
| Impacts on industrial output | 13.78 " " |
| Impacts on crop yields | 1.38 " " |
| Impact on livestock and fisheries | 1.16 " " |
| Total water pollution externalities (1992 prices) | 35.61 billion Yuan |

The research carried out for CCICED on environmental water resources costs of rice production in Hunan and Hubei, see Norse et al (2001), apply a different method of estimation. They have estimated the costs of removing nitrogen from drinking water supplies to obtain an acceptable drinking water quality and arrive at an annual all China estimate for the mid 1990s of 1 – 3 billion Yuan (US$ 0.1 – 0.4 billion). Eutrophication from mineral fertilisers on fisheries is estimated at 5 billion Yuan, or US$ 0.7 billion per year, while flood damage from wetland drainage is estimated at 4 billion Yuan, or US$ 0.6 billion. Pesticide induced loss on farm workers come to a large extent from water poisoning and is estimated to between 1 – 3 billion Yuan

(US$ 0.1 – 0.4 billion), while soil erosion damages – for the most part water-related in rice production – amount to 1 – 2 billion Yuan (US$ 0.1 – 0.25 billion). In total their range of estimates is 11 – 15 billion Yuan per year, equal to US$ 1.5 – 2 billion. In principle, these costs should be incorporated in the above overall estimates, but if one were to apply the same analytic approach to all other sources of water pollution and less efficient uses, one could well end up with a higher or lower total estimate.

Regional level studies attempting to assess the environmental cost of water pollution have been undertaken. One example is a study to assess the environmental cost of water pollution in Chongqing, China. A team of Chinese and Norwegian researchers estimated the resources cost, i.e. real resources spent or production possibilities foregone because of water pollution. The study concluded that the cost of water pollution equalled 1.2 percent of Chongqing's GDP (Yongguan et. Al (2001)).

Another way to look at the impacts of water quality and sanitation comes from analysis related to a cholera epidemic in *Peru*, see Moss et al (2003), p. 57, where the costs of not providing for safe water and sanitation were not considered. Peru spent up to US$ 1 billion to fight off and treat the effects of this epidemic. It is estimated that US$ 100 million – or a tenth of what was actually spent – could have prevented the epidemic in the first place. Add to these monetary expenses the value of lost working days of life due to disease and deaths, and the benefit cost ratio of preventive action by means of investments in water and sanitation would have taken on astronomical figures.

An example of the benefits of environmentally benign improved water resources management concerns a biological control program of water hyacinth undertaken in *Benin* in the early 1990s[53]. It had been estimated that water hyacinth at the peak of the infection had reduced the annual income from fishing and trade of the 200,000 affected people by some USD 84 million. The reduction of water hyacinth cover through biological control was credited with an yearly increase in income of USD 30.5 million. Since the net present value of the total cost of the control program was just above USD 2 million, the benefit-cost ratio of the program was enormous.

SIWI (2005) op.cit also shows water saving technologies to be economically efficient. Low cost drip irrigation can minimize water wastage and increase yields by delivering the right quantity of water at the right time. In *Nepal*, for example farmers can now buy drip irrigation kits for as little as USD 13 a piece, and expect 20% to 70% yield increase. With a three year time frame and 10% discount rate, the net present value of the incremental gains would be USD 570 per farmer.

It is now well established that the poor are the least likely to have reliable service or access to new water connections and sanitary services, (S. Hansen and R. Bhatia (2004) op. cit). Instead, the poor continue depend on traditional sources of supply, which are often afflicted by declining access and quality. The latter is caused by contamination from poor sanitation and industrial effluents.

[53] Stockholm International Water Institute (SIWI) (2005), "*Making water a part of economic development – the economic benefits of improved water management and services*." A report commissioned by the Governments of Norway and Sweden as inputs to the CSD 2004-2005.

Not only do the poor have the least reliable and least accessible service of public water, they also end up paying much more than the rich and the not-so-poor. The reason is simply that public water supplies do not reach the poor. This is typical in many poor urban areas and squatter areas in metropolitan areas in developing countries where public water is so heavily subsidized that there is no revenue for the extension and maintenance of a reliable supply via the network to poor areas. Short of cheap public water, the poor end up captive to water vendors as their only supplier. These water vendors charge as much as ten to twenty times or more than the heavily subsidized public charges for those with connections (for water which the poor cannot access). Studies have found these excess cost ratios hurting the poor to be as high as 20 in Ecuador, 16 in Peru, 10 in Columbia and Turkey and 5 in Ivory Coast.

The budget share for water across income groups is declining, thus reflecting that water is a basic necessity, see e.g. Hansen et al (2002). In one of the poorest areas of China, it was found that most rural households do not pay for water at all, and those who pay, only use 0.4% of their budget for water. In urban areas where most households have access and pay for water, the budget share is also very low. If a water tariff increase were to take place, the distribution effect would indeed be somewhat regressive, but at the same time, the public utility would be able to provide a much more reliable and higher quality water delivery service, which may well be of great value to the poor, and worth the extra cost to them.

Several field studies have contributed to removing the resilient myth that poor people cannot afford or are unwilling to pay for safe and reliable public water to meet their daily needs[54]. Poor urban African households are willing to pay a considerable share of their income for reliable access to safe water, enough to finance the necessary investments, if the authorities would let it happen[55]. If there is political will to remove free or subsidized water and sanitation from the privileged few and to invest to provide it at user tariffs that cover investments and operating costs, then a major barrier to achieving the water and sanitation MDG has been removed. In short, table 3.2 shows that the benefit-cost ratios for investments in safe water and sanitation are very high indeed.

It is therefore fundamentally untrue to claim that the poor cannot afford to pay the costs of public water supply if it were to be extended to their residential areas. The main obstacle to extending such networks is often that the residents are squatters or others without formal ownership or lease rights to the land the live on, or that real estate owners have plans to remove the poor and develop the land for other more profitable purposes. The main excuse, however, has often been that for social and welfare reasons one cannot afford to extend the public networks to where the poor live, because they cannot afford to pay the cost of water supply. Considering the real world alternative these residents actually face and have to adapt to, they would be more than happy to pay the full cost of the water they need, but the relevant authorities should be imaginative about modes of financing and paying for water to residents in such areas so as to simultaneously secure both equity and efficiency in the water market. In fact, if already connected consumers in the richer parts of the community were to pay the full cost of their water, experience from many developing

[54] S. Hansen and R. Bhatia (2004),op.cit
[55] See e.g. S. Hansen (1993), op.cit., Box 19.2, p.136.

country cities has shown that overall water for consumption could drop by as much as 20% and waste of freshwater would also be significantly reduced. Both effects would free up public resources which could be reallocated in accordance with the country's PRSP and at the same time it would be an environmentally benign measure.

Detailed reviews of the efficiency and equity impact of alternative ways of generating public sector resources to finance sustainable infrastructure development, including water and sanitation, is found in Pagiola et al (2002). Incentives to promote reforms, leverage resources and improve targeting with regard to water supply and sanitation is discussed in detail in Mehta (2003).

During the last two decades, there are reports of a number of successful experiences or 'Good Practice' cases of community involvement and management in providing public sanitation services to the poor slum-dwellers as well as for meeting the needs of "floating populations" in cities.[56] Such experiences have provided sanitation and health benefits to millions of urban poor in Asia, Africa and Latin America. However, these experiences have covered only a small proportion of the total populations who need such services and there is an urgent need to support programs where such efforts can be 'scaled-up' to cover much large number of people in different regions over time.

**Table 3.2 WHO estimates of water and sanitation investment costs and benefits (USD billion per year)**

| Goal | Cost | Benefits | Benefit/cost ratio |
|---|---|---|---|
| Halving the population with access to suitable water and sanitation:<br><br>The Millennium Development Goal target | 11.3 | 84.4 | 7.5 |
| All population with access to suitable water and sanitation | 22.6 | 262.9 | 11.6 |
| All population plus water treatment with chlorine and safe storage | 24.6 | 344.1 | 14.0 |
| All population plus in-house piped water plus in-house sewerage and partial treatment | 136.5 | 555.9 | 4.1 |

Source: Hutton and Haller (2004). Investment costs are annualized over 20 to 40 years depending on the nature of the investment. Curiously, no discount rate is stated.

Only 15- 20 percent of slum dwellers today have minimum access to sanitation in any of *India*'s cities. This reflects the problems confronting city governments as they begin to tackle these huge deficits. In most cases the poor cannot pay upfront for the

[56] "Floating population refers to migrants not yet registered as residents of the city where they work, and therefore fail to enjoy the main rights and privileges of registered urban dwellers, see S. Hansen and R. Bhatia (2004), op.cit for an overview.

costs for toilet construction. In such a deficit situation, the choice becomes one of providing basic access for all, versus good sanitation for some.

Community toilets rather than individual toilets are a preferred option because they can provide everyone, even the poorest, with sanitation. And the costs of provision for everyone can be afforded. Those who are better-off can, and will, gradually build individual facilities for themselves. In this way, the pressure on community toilets will probably diminish over time, but everyone will continue to have access. Community Toilet Blocks (CTBs) are community-managed and controlled because the toilet blocks produce a possibility of change that helps develop new leaders, new relationships within communities and new relationships with external agencies.

The first case examined is the *Sulabh* Community Toilet Complexes (CTC) in *India***.** They have succeeded in providing clean toilets and bathing facilities to urban poor at nominal charges. There are around 6000 community toilets providing toilet-cum-bath services to around 3 million people in 625 towns on a pay-and-use basis. A key aspect of Sulabh's program is its inclusion of facilities for bathing and doing laundry. Their public toilets are staffed by an attendant 24 hours a day and supply powdered soap for hand washing, bathing, and laundry. Some special toilet complex facilities have also provided telephone services and primary healthcare. Free services are offered to women, children and the disabled. This is very important for the homeless and the very poor who live under crammed conditions.

However, the number of such units required is 150,000 complexes (compared with 6000 today) to meet the sanitation needs of currently unserved urban population in India. Thus, the scaling-up effort is quite substantive and it would be important to analyze the factors that support such investments as well as identify factors that constrain rapid multiplication of such complexes. There is an urgent need to analyze the management and financing constraints that have inhibited the growth of such complexes. Further, there is a need to assess what legal, regulatory, institutional and policy changes may be required to accelerate the setting-up of CTCs in Indian mega cities and towns.

Sulabh runs the public toilets-cum-bath complexes on "pay and use" basis without putting any burden on public exchequer for their maintenance. Sulabh undertakes maintenance of these complexes for a period of thirty years, free of cost to the local body/sponsoring authority. Children in slums and other weaker sections of the society who do not have the capacity to pay are allowed free use of these facilities. All other users currently pay Re 1 for toilet and Re 1 for using bath facility.

The Sulabh CTCs charge Re 1 per use from the male users only, while women and children are allowed free use of the facilities. If this is taken into account a family may have to pay Rs 30 to 40 per month for using facilities that are not available anywhere else in the neighbourhood. This means that the Sulabh CTCs are affordable even for poor slum dwellers.

In Pune, India, a partnership between the municipal government, NGOs and community-based organizations has built more than 400 community toilet blocks with over 10,000 seats at a cost of about Rs.400 million. Assuming that 50 persons use a toilet seat a day, more than 500,000 people in the slums of Pune (out of a slum

population of 1.1 million) have benefited from the programme. They have also demonstrated the potential of municipal community partnerships to improve conditions for low-income groups.

As of July 2003, 180 toilet blocks had been completed and another 110 were underway in Mumbai. This will provide sanitation facilities to about 0.3 million persons (out of a total of over 3 million) in the slums of Mumbai.

The scaling-up of such CTCs faces a series of barriers and challenges:

- The current program run by Sulabh needs to be "scaled-up" significantly if it shall be able to meet the unserved population among the 300 million current residents in urban areas and another 200 million who will be added to urban population over the next 15 years.

- There are significant institutional, management and financial constraints to "scaling-up" of the Sulabh program both over time and across regions.

- The financial sustainability of the program is based on 100 percent subsidies in capital costs and revenues raised from the users cover only a part of the O&M expenses in most complexes. Even where biogas units can be added, the financial viability depends on the availability of capital subsidies to the extent of 75% of capital costs.

- It is absolutely necessary for the complexes to raise revenues by renting space for advertisements or for grocery shops or other activities or by adding biogas plants. Since land and the CTC is owned by the funding agency, this may require a change in the contracts between Sulabh and funding agencies.

- In sum, it is the public funds for sanitation that constrain the total number of CTCs that are built. The existing institutional structure and lack of financial viability and sustainability are serious constraints to the "Scaling – Up " of the Sulabh model of community sanitation.

The Slum Dweller Federations/Mahila Milan around India have developed skills of persuasion in showing local governments that an unconventional toilet-building partnership with a well-organized community organization is a realistic, even attractive, proposition for solving big problems that halt progress in well-being in municipalities up and down the sub-continent. These features are:

- sharing costs with a community reduces the city's sanitation cost burden;
- when communities build toilets, the city's construction burden is eliminated;
- when communities maintain the toilets, the city's maintenance costs are eliminated;
- community-built toilets often cost less than those the city builds, so a city's infrastructure budgets can be spread further, increasing service delivery.

These programs also demonstrate that implementation on a large scale requires cooperation with government agencies and/or the organizations responsible for

building and managing trunk infrastructure – even if this is only to permit these community initiatives.

However, it has not been possible to obtain any data on revenues, costs or financial viability of these CTBs except to say that collection rates have been depressed in some toilet blocks. In the absence of any data, it is difficult to say that the CTBs are financially viable and hence sustainable over time. In the case of doubts about its financial viability and long term sustainability, it is difficult to say how such a program can be "scaled up" to provide sanitation services to millions of urban poor in India.

In *Pakistan*, Orangi sanitation project is a well-known example of community involvement in providing affordable sanitation services to the urban poor in Karachi. Orangi township, Karachi's largest squatter settlement (katchi abadi) has a population of about 900,000 out of a total population of 10 million in Karachi. Before the Orangi Pilot Project (OPP) was established in the township, there was no proper sanitation system. The Orangi project is a low-cost sanitation program which enables low-income households to construct and maintain modern sanitation (pour-flush latrines in their own homes and underground sewerage pipelines in the lanes) with their own funds and under their own management.

Through developing low cost technologies and cutting costs by eliminating middle men or contractors, the OPP enabled the affordability of sanitation facilities for the low income inhabitants of Orangi. Through imparting health education, advising and motivating collective action, the OPP staff got rid of various psychological and sociological barriers that had prevented the households from taking the responsibility of sanitation in their hands. By providing technical innovations and help they were able to provide know-how and affordable sanitation options. Between July 1981 and November 1993, Orangi residents invested more than US$2.2 million on improved sanitation and drainage systems. This has provided 88,000 houses – about 90% of the Orangi residents- with good toilets.

The Orangi project model has already been successfully transferred to 42 settlements in Karachi. It offers an alternative approach to the problem of developing water and sanitation provision in urban areas from which important lessons can be drawn.

Through developing low cost technologies and cutting costs by eliminating middle men or contractors, the OPP enabled the affordability of sanitation facilities for the low income inhabitants of Orangi. The funds came mainly from the households themselves who were poor though not destitute. Since the households invested their own funds they had incentive to maintain the system and provided finances and management for operations of the system too, making the project financially viable using local funds. The main drains and treatment plants that are the government's responsibility, need to be maintained properly to ensure the success of the efforts of the community members. The project facilitated a self-help approach by promoting community organization and political mobilization.

The OPP programs have not been without problems. While the Orangi residents constructed their toilets and sewer lines in the area, the government failed to construct the sewer mains and treatment plant to evacuate the sewage from the area. One of the

lessons drawn by OPP is the need to work with both the communities and the government to solve environmental problems in squatter settlements. Waste from the Orangi sewers runs into open waterways that flow to the sea. These waterways are overburdened by waste from Orangi and from Karachi in general and still tend to overflow during heavy rains. The main sewers required to prevent this flooding are the responsibility of the Karachi authorities. OPP has developed designs for main sewers and is lobbying the Karachi Municipal Corporation to build them.

The Water Aid-*Bangladesh* Urban Programme has been implemented since 1998 by a group of seven partner NGOs in approximately 168 slums in the Dhaka metropolitan area and in Chittagong City Corporation, the two largest urban areas in Bangladesh. There are approximately 92,000 households in the working area as a whole, of which 27 percent are estimated to have received one or more of the programs services. Programme services include: Water points providing supply water through legal connections to metropolitan water authority lines; installation of tubewells; construction of sanitation blocks combining water points and hygienic latrines; community/cluster latrines with septic tanks; household water-seal, pit latrines; construction of footpaths; drainage improvements; solid waste management; and hygiene education.

All physical improvements are wholly or partially paid for by local users. Each partner NGO has a revolving fund through which repaid loans can be used for additional programme activities.

For water points, most partner NGOs have worked out methods of covering costs and getting loans paid. For sanitation blocks there are still no firm decisions on how to accomplish these goals and also get enough water to community residents. The per-person, per-use charge for using sanitation blocks inhibits their use by local area residents, so a large percentage of cost recovery seems to be based on commercial sales to passers-by in locations where people are charged per use.

The unclean condition of most observed programme latrines suggests a need for improved staff training on latrine cleaning and maintenance. The fact that many programme area residents, especially the poorest, still use hang or open latrines shows that there remains an enormous need for investment in sanitation facilities -- preceded, of course, by motivational campaigns.

Hygiene education is provided in most cases to slum dwellers regardless of whether they use programme water and sanitation facilities. The greatest impact on hygiene awareness has been on hand washing knowledge, understanding how worms infection spreads, using safe water, and covering food to avoid diarrhea disease.

The most significant programme achievement to date is in creating a good working relationship with the Dhaka Water and Sewerage Authority (DWASA). The outcome of these efforts has been a high degree of interest among senior management at DWASA in the programme, and a willingness to approve piped supply connections in slums. The importance of this cannot be over-stated. It opens the door for slum dwellers throughout Dhaka (and Chittagong too) to have the same access to piped supply water which other urban area residents have.

If Water Aid and its urban partner NGOs decide to expand services to include poorer slum area residents, modified guidelines and cost-sharing arrangements will be required. Providing water and sanitation services to the very poor living outside of slums would require entirely new programme strategies.

The returns to investing in raising awareness and making villagers adopting good hygiene practices can be most impressive, as seen in the case of Mirzapur village in *Bangladesh*, see S. Hansen (1993), p. 137. The investment constituted a large number of handpumps and latrines and training of the villagers in their use and the importance to their own health of adopting simple good hygiene practices. In addition, in this country where maintenance never was high on the agenda, the project included payment to women for maintaining the latrine pits. As a result of the project the villagers changed permanently to more hygienic use of water and sanitary facilities. A post-evaluation study compared several project-related before and after indicators in Mirzapur to a control village where no such investments had taken place. Before the project the frequency of diarrhoea and intestinal diseases were equal in the two villages. After project completion in Mirzapur, the incidence of diarrhoea had dropped 40%, that of child dysentery 30% in Mirzapur, and the duration of diarrhoea among children had been halved.

Although a number of community–managed urban sanitation programs have provided services to a few millions, there is an urgent need to scale-up these efforts to meet the MDG goals of meeting the demands for over one billion residents in cities and towns. Such 'scaling-up' would require actions at a number of levels in the international organizations and central and local governments in developing countries.

First and foremost is to recognize that *the financing needs for meeting the MDGs for adequate urban sanitation (to more than one billion urban residents) are likely to be much more than estimated for providing improved sanitation*. Governments, local bodies, international lending institutions and bilateral aid agencies have to understand and accept that far greater funds are required for meeting the MDGs than the resources available in the past.

Governments and local bodies should consider additional taxes on water use and/ or property taxes in areas where property values have increased in part as a result of improved infrastructure, such as public water and sanitation. Such taxes should be specifically marked and allocated to provisioning of sanitation services to the poor. Financing for sanitation will require special funding provisions as well as providing sufficient funds through poverty reduction support credits (PRSC).

Second, additional financial resources have to be raised through financing mechanisms for leveraging resources through private sector participation and/or through greater community resources. The design of financing mechanisms for leveraging resources while linking with domestic credit markets would require emphasis on risk management and partial risk guarantee framework; funding for project preparation and implementation and resources for efficient management (see Mehta (2003).

Third, the greatest challenge for community sanitation systems has been low tariffs, generating revenues that are too low for cost recovery and financial sustainability of

existing or new services. Targeted subsidies are required to provide access to and use of sanitation facilities by the poor. Such subsidies are in the nature of capital cost sharing or per capita ceilings on basic services. Cross-subsidization or direct support from the local governments may be helpful in some cases. From the experience of many projects, it is important to recognize that cost recovery and subsidy rules must be set in a clear and transparent manner.

Fourth, for the governments to provide legal and institutional support to a number of NGOs who are assisting communities in providing sanitation services. For a long-term sustainability of investments in urban sanitation, the community schemes have to raise revenues from users who are too poor to contribute enough to cover even the O&M costs. Other sources of revenues have to be found to meet O&M costs and a part of the capital costs. For example, in *India*, NGOs assisting communities can raise revenues from their toilet complexes by renting space or selling biogas and thus reduce their dependence on government funds and subsidies. However, this will require changes in policies and regulations for NGOs and funding organizations such as the municipalities or international donors/banks. If necessary, new organizational forms should be promoted that involve communities in planning and supervision and at the same time provide sustainable management accountable to the communities. Further, it is imperative to enable these NGOs to raise financial resources from the market or financing institutions, or to create new organizations better able to do so.

Fifth, though there are claims for a number of success stories or 'islands of success' or 'good practice' cases in community-managed water and sanitation systems, the available documentation is rather inadequate in providing data on coverage (i.e. number of people benefited), methods of financing, financial viability, sources of revenues, cost recovery etc. It is imperative that a detailed evaluation study of these experiences (including those that did not succeed) is carried out that provides necessary data on financial aspects and on how to scale-up both over time (financial sustainability) and over space (new regions/areas)

In response to making development aid budgets and allocations recipient oriented, i.e. in line with developing governments' long term plans and PRSPs, donors tend to allocate rather little for the WSS sector relative to what the above suggests as regards potentials for achieving key MDGs. Germany appears to have had the highest water supply and sanitation share of their total ODA, amounting to around 10%, which is about twice the EU average. The EU average, again, is about twice that of Norway's ODA share, and significantly higher than that of Norway's "likeminded" countries, even when allocations through multilateral institutions are included[57].

### 3.3.2 Energy Provision and Air Pollution Control

As for investments in water, the quality of energy assets matter as well as the quantity. Reliance on and captivity to fuelwood and biomass imposes restraints on household members' mobility and ability to seek better paid employment. It perpetuates the poverty trap since woodfuels and dung requires lots of time when it has to be collected and carried, and causes harmful health effects –especially on women and children - in the form of indoor air pollution when used. Dung used for fuel, reduces the amount of dung available for use as fertilizer and as a result, crop

[57] Hansen, Stein and Ramesh Bhatia (2004), op.cit.

yields. Electricity and other modern fuels, on the other hand, permit flexibility of location, frees up time for other activities (productive, studies, leisure), enable transportation to be undertaken with fast, modern means, both contributing to the household well-being. Life expectancy, income, schooling and nutrition are all directly correlated with the use of modern fuels.

Would it be worth while to extend electricity to more than 500 million more people by the MDG year of 2015, and would it be worth while to provide modern heating fuels and cooking to perhaps 700 million by that same date? D. W. Pearce (2005), table 5.7, finds that the annual investment needed to achieve this is USD 28 billion.

In order to justify such investments one would need to document benefits amounting to USD 40 – 56 per capita per year just to offset such costs. In order to illustrate what this would mean for the budgets of the poor, D. W .Pearce (2005) finds that for the very poor with USD1 per day income, this would amount to 10%-15% of it. For those at USD 2 per day income, it would tap them of 5% – 8% of their per capita income, in both cases assuming that getting access to the many conveniences (e.g. freeing up of time for more productive activities, much reduced exposure to indoor air pollution, improved health and more time for kids to study and do homework) that follow with access to electricity and modern fuels does not increase their income earning opportunities (which in fact such conveniences will indeed do). Since the costs of such energy improvement programs is less than 10% of actual average rural energy expenditures in developing countries and less than 50% even in rural *Nepal*, one can conclude that such investments would very probably have significant positive benefit-cost ratios.

K. Lvovsky (2001) op.cit. found indoor air pollution to account for some 20% of all environmentally induced loss of DALYs in developing countries, see table 3.6 in D. W. Pearce (2005). The poor tend to rely heavily on energy-inefficient fuels, such as fuelwood, biomass and animal waste (i.e. dung). The resulting indoor air pollution from 2.4 billion people burning biomass for cooking and heating worldwide is thought to claim considerable premature deaths and extensive morbidity. The International Energy Agency (IEA) (2004) estimates that at least 1.6 million children and women die each year from indoor air pollution, half of these in *China* and *India* alone.

Also for some stove improvement programs (e.g. in *Kenya* and *Guatemala*) D. W. Pearce (2005) finds documentation that suggests very high benefit-cost ratios due to the improved indoor air quality and subsequent improved health conditions of women and children. In addition to this come the savings in time for collecting biomass fuels and the possible reduced pressure on e.g. forest resources from the reduced demand for fuelwood (although this latter factor is no longer considered a major threat, since what is collected is usually fallen twigs and branches[58]). Studies in *Nepal* by Kumar and Hotchkiss (1988)[59], found that poor rural households that were constrained to have family members fetch fuelwood and water, had available 24% less labour for

[58] See Hansen, Stein (1993) op.cit., pp. 118-126.
[59] Kumar, S. K and D. Hotchkiss (1988), "*Consequences of deforestation for women's time allocation, agricultural production and nutrition in hill areas of Nepal.*" IFPRI Research ReportNo 69, Washington D.C.

farming activities. As a result, a comparison to a control group showed that they also suffered from poor nourishment.

Investing in controlling outdoor air pollution is first and foremost an urban issue, although agriculture, crop yields, forestry and ecosystems more generally can suffer severely from acidification. However, the incidence of reducing outdoor air pollution in urban areas is not well documented. however, in so far as the poor are likely to live in more polluted areas (where property values are lower), in dwellings that are more exposed to air pollutions (no air conditioning with filters) and being more exposed to polluted air in their daily activities (street vendors, public transport service providers and truck drivers, etc), air pollution control should be "pro-poor" if the worst polluted areas are a first priority for cleanup actions. Benefit-cost ratios calculated for control of emissions from power stations and industries in *Shanghai, China*, and for transport vehicles in *Santiago, Chile*, suggest that such investments are worth while, D. W. Pearce (2005), p.88.

The poor are also most exposed and vulnerable to the environmental effects of climate change. This is due to

- Their low income and asset base limit their ability to adjust and relocate in response to changing climate, weather events and rising water level,
- The poor are already located on marginal lands where they are most exposed to the adverse and catastrophic impacts of climate change events (floods, droughts, extreme weather events)

Against this background it is of direct relevance from an MDG perspective to consider investments and compensatory actions to mitigate climate change impacts on the poor and to help them become more resilient to climate change impacts that are already on line to happen. A range of cost and benefit estimates have been prepared to assist in the planning of such actions and programs, see e.g. D. W. Pearce (2005), op.cit. chapters 5 and 6. The range of average cost estimates for reaching the 550 ppm CO2 atmospheric concentration target, now widely accepted in the climate change policy debate, varies from USD 20 to USD 80 per ton of carbon. At the same time, there are estimates of the damage costs if global warming is permitted to continue with "business as usual", and an upper bound of such marginal damage costs is USD 50 per ton of carbon. However, several adverse climate change impacts are omitted from this calculation. Therefore, it is quite possible that the long-run climate change target passes a benefit-cost test.

### 3.3.3 Slowing Land Degradation

D. W. Pearce (2005), pp. 89-90 has recently surveyed the returns to investments in soil conservation technologies. His findings suggest that the economic attractiveness varies considerably between the different measures. Whereas a survey of a dozen studies of agronomic measures such as tied ridges, contour planting, intercropping, no till, etc generally concluded with a positive net present value, i.e. that benefits exceeded costs, only half of the vegetative measures examined (alley cropping, farm forestry, gum Arabic, shelter belts, etc), structural measures such as rock dams, bunds, terraces, and management measures such as animal traction, fodder banks etc, passed the same welfare-economic test. The net economic benefits from such investments also depend on the initial soil conditions, and the local context. Typically, if top soils

are thin initially, the benefits from preventing further soil erosion can be highly significant, while preventing even high rates of erosion may yield inadequate benefits to justify the investment in case where the top soil is so deep that no traceable adverse yield impacts are found within the time horizon for which effects are measured with the given discount rate. However, it should be noted that slowing land degradation is likely to have many other benefits, including halting biodiversity losses and reduced global warming.

D. W. Pearce (2005) p.95, also refers to an econometric study that has shown soil quality and climate to affect agricultural labour productivity significantly. Comparing agricultural output per worker for good soils/good climate conditions to poor soils/poor climate it was found that the former yielded 28% increase in Sub-Sahara Africa, 34% increase in Asia, and a 22% increase in high-income countries.

However, it is important to note that the high discount rate applied by poor people to such investments may discourage soil conservation investments that yield their benefits in the medium to long term. If credit is not available, such investments may simply not be feasible. .

Estimating the costs of "desertification" is a highly speculative activity. First, because of the still incomplete understanding of the processes leading to such land degradation, since this make it difficult to estimate with some degree of accuracy what successful combating of such processes actually cost. Second, what costs resulting from "desertification" to include; i.e. what are the benefits from avoiding or reducing "desertification".

R. Martin-Hurtado (2002) of the World Bank estimated the annual costs of a 15 year program for reducing desertification to between USD 16 and 36 billion, and the annual on-site benefits in the form of avoided productivity losses, to USD 52.5 billion per year[60]. This yields a benefit-cost ratio in the range of 1.5 – 3.3, and suggests that such investments are economically justified. Since poor people are over-represented in fragile areas exposed to the threats of "desertification" the incidence of the benefits from such investments would also be favourable.

### 3.3.4 Protected Area Conservation and Wildlife Management

Terrestrial ecosystem conservation aims to resist the pressures to convert land with diverse features and species to, uses that result in less diversity. This is most often done by establishing protected areas (PAs). When attempting to estimate the benefits of a conservation intervention, one must focus on how the flow of benefits provided by the ecosystem would change. Focus must be on

(a) what would happen if we did nothing, and
(b) what would happen if one intervenes in a specific way?

Here it is important to "keep cool" and not instantaneously assume that everything is lost in case of an intervention. Impact assessment must be site specific. Even where important ecosystem services are changed or perhaps lost, there may be new activities

[60] Social-, off-site- and global benefits from reducing desertification are not included in the Martin-Hurtado (2002) benefit estimates.

started that also have value to the stakeholders and that they may prefer. Degradation might involve conversion to use, e.g. from a virgin ecosystem to a cultivated piece of land which provides crops and income for the affected stakeholders. It is an assessment of the net impacts summed and discounted over the lifetime of the project, including the costs of the conservation measures themselves, that one must focus on.

Initially, without conservation, the flow of benefits might consist of a certain volume biodiversity conservation benefits, an amount of downstream water services, recreation services and the value of extraction of forest products. With a specific conservation program implemented, one might find that the first three categories of services provided by this ecosystem have increased, while the extraction of forest products is reduced as a result of the conservation project. In addition comes the costs of implementing and monitoring the conservation measures. There is no apriori answer to whether a conservation initiative is worth the effort. This must be decided on a case-by-case basis.

Even if there are overall net benefits from a conservation program, a remaining key challenge when establishing and managing PAs in developing countries is how to compensate displaced people in the PA proper or those living in buffer zones, but who have traditionally depended on hunting, fishing, harvesting and gathering of non-timber products in the PA for their living. Securing a non-declining asset base for the affected vulnerable stakeholders in and around PAs and the compensation needed for this to be guaranteed, must be included as part of the costs of such area protection against unsustainable use. In practice, however, such compensation (if at all provided) tends to be based on estimated foregone income rather than foregone assets, see e.g. D.W. Pearce and T. Swanson (2005) op.cit.

Experience from PA development has shown that[61]:

- It is relatively easy to get funds for physical construction, but much harder to get funding for maintenance, basic operations, and in particular protection of those ecosystem functions that makes the PA worth protecting from a natural asset value perspective.
- As a result, PA managements are allowed and encouraged to set up their own sources of funding through a number of economic venture – hotels, ecotourism developments, museums, zoos, sale of specimens etc.
- The sources of funding available to the PAs only capture individual user values of PAs. Ecosystem services to society and the services of biological diversity/heritage for the country and the global community cannot be captured by the individual PAs.
- The net result is a systematic tendency to overexploit user values by means of economic ventures, while ecosystem services and preservation of biological values do not get sufficient attention. This leads to a variety of undesirable management conflicts between local stakeholders and national authorities and entrepreneurial developers.

[61] Hansen, Stein and Haakon Vennemo (2004), *"Protected area task force report to CCICED 2004"*.Report to CCICED's Protected Areas Task Force, Oslo.

- Some PAs are in a more difficult position than others. In particular, PAs with low immediate user value but significant value in terms of ecosystem services and biological preservation are facing a difficult situation and a funding gap.

Several cases from Norway's partner countries illustrate the shortcomings of what has been practiced by national authorities and how this has deteriorated the well-being of (especially poor) affected stakeholders in- or adjacent to areas that are converted into PAs, even when the PAs have generated sufficient revenue to compensate fully for the losses incurred. The following examples from Norwegian partner countries are extracted from D. W. Pearce (2005), pp.79-80:

- Uganda: In the Lake Mburo National Park the local community received in 1998 some USD 230,000 from the national park, but this constituted no more than 1/3 of the measured losses they incurred (USD 700,000). Local stakeholders were thus worse off with the national park than without it. This, however, does not mean that conserving such land in the form of a national park is not worth while for Uganda. All the above can tell is that given the present system of converting benefits to cash and the system for distributing cash compensation to stakeholders, has so far been unsuccessful in making this conservation an attractive option for affected poor stakeholders.

- Tanzania: the Western Serengeti local communities to the west of the Serengeti National Park has since the mid-1990s become participants in a variety of public and private revenue sharing schemes based on the rich wildlife resources of the region. In spite the many funding schemes they have suffered USD 1 million (USD 110 per household) in damages due to wildlife, but received only USD 75,000 (USD 8 per household) in compensation out of the very substantial revenue generated from tourism. Tanzania thus has a long way to go before wildlife conservation becomes competitive with agricultural land uses for the 75,000 people living in the Serengeti and Bunda district.

- India: In Bhadra Tiger Reserve, compensation for livestock loss due to tigers amounted to just 5% of the livestock value, and compensation for crop losses due to elephants was just 14%.

- Madagascar: A detailed benefit-cost study of the Marovoay PA showed modest net benefits to the less poor and modest but significant losses for the poorest households affected.

In all these cases it would have been possible to offset the damages to the poor either from cash revenue collected from tourist entrants to these PAs or by compensatory investments in the assets of the poor affected stakeholders, such as by tree planting, provision of credit to facilitate investments in soils management to provide for improved yields, better livestock management, and/or by creating local PA-related workplaces for these stakeholders. By so doing, the authorities would have created allies for the protection and sustainable management, instead of creating sabotaging enemies of the PAs.

This report has vigorously argued that the basis for reducing and eliminating poverty must be to increase the asset base of the poor. The basic requirement for minimizing

conflict and ensuring that all affected parties support the conservation measures is for the net benefits for each affected stakeholder party to be positive with the PA established. In other words:

- Ensuring that the PA project (investment and operation) as a whole passes a benefit-cost test;
- Ensuring that the costs and benefits are distributed in such a way that each party is better off with the PA than without it.

Unfortunately, there are very few studies that carefully and in a consistent way allow for identification and estimation of costs and benefits of PAs and other conserved land or marine areas. The most often referred to surveys of this kind[62] rest their favourable conclusions on a discredited methodology[63]. The validity of the conclusions and recommendations drawn from such surveys is therefore highly questionable.

An example of a carefully conducted "with-without" analysis of a conservation program is the World Bank study of the benefits of protecting the forest remnants of the severely deforested *Haiti*, the poorest country in the western hemisphere[64]. This study focused on whether it would make sense for such a poor and mismanaged country to devote resources to protect it's remaining forest areas. By means of order of magnitude estimates the study predicted the impacts of continued forest degradation upstream of the irrigated agricultural land. This land had already been severely affected by siltation caused by prior deforestation, and the impact of additional deforestation was predicted by extrapolating the impact of previous deforestation, and measuring it in the form of lost irrigated agricultural output. such estimation was done (a) assuming that the project would halt degradation at current levels, and (b) that it would partially reverse past degradation. In addition to the losses imposed on agriculture, damages to infrastructure resulting from deforestation were also estimated. The estimated benefits from such action were then compared to the expected costs of protecting the targeted protected areas, including the investments in conservation and the management of it, and the foregone income from not logging the area and converting it to cultivated land. The results of these alternative scenarios suggested that the avoided losses to downstream irrigated agriculture would far exceed the foregone gains from converting upstream forested areas to agriculture, even if the project were to succeed only in halting degradation at current levels. This rather conservative assessment showed that it would be beneficial for the country to undertake either one of the two studied conservation measures.

A success story is the *Bhutan Trust Fund for Environmental Conservation* (BTF) which was established in 1991 with an initial endowment of USD 21 million, which had expanded to over USD 36 million by 2005, see L. Emerton et al (2006), p37. It has granted USD 5 million to some 40 beneficiaries focusing on biodiversity and local capacity building. More 140 individuals and several NGOs have benefited and

[62]Balmford et al (2002), "*Economic reasons for conserving wild nature*." Science. 297: 950-953.
R. K. Turner et al (2003), "*Valuing nature: Lessons learnt and future research directions*" Ecological Economics, 46: 493-510.
[63] R. Constanza et al (1997), "*The value of the world's ecosystem services and natural capital*." Nature 387: pp.253-260.
[64] World Bank (1996), "*Haiti forest and parks protection technical assistance Project: Staff appraisal report.*" Report No T.-6948-HA, Washington D.C.

received training grants from BTF, for example in natural science training. BTF operates under an annual spending limit based on the endowment's valuation at the end of the preceding fiscal year. Three factors. appear to explain the success of the BTF (see L. Emerton et al (2006), op. cit.:

- It is governed by a fully Bhutanese management board of 7 high-level members with ultimate program and fiduciary responsibility. In other words, it has *strong local governance*.
- BTF relies on *independent expertise* to advise on investment policy and strategy; and
- The Government of Bhutan is *integrating environment management across all sectors,* and BTF is thus looking beyond a compartmentalized "green" agenda so as to move forward with the government with it's agenda in a mainstreamed way.

Investing in wildlife as a basis for generating tourism jobs and revenue is one very real option for sustainable wildlife management and local job creation. The success of such efforts from a poverty environment nexus perspective is measured by the extent to which the poor get a fair share of the revenue and profits. This net benefits from such eco-tourism potential is further discussed below, but can in many cases not be separated from the more conventional benefits of wildlife in meeting the basic needs for bush meat among poor local dwellers.

Development of wildlife tourism can generate significant revenues that can benefit the poor, provided that poor local stakeholders are involved in the project and the benefits are shared fairly with them. How the property rights are, and how they allow such sharing of benefits is crucial for the outcome. Very often foreign operators, or joint ventures between local resource-strong investors and foreign tour operators capture virtually all the benefits and only crumples are left for those who traditionally have resided the area of touristic attraction, and in many cases, e.g. the Masai people in Masai Mara., are an integral part of the attraction due to their culture and life style, see e.g. D. W. Pearce (2005), p.205. However, integrating the poor local dwellers into a wildlife management project may fail unless it becomes clear that it is done in such a way that it enhances their asset base in a sustainable way.

The poor in many areas depend on bush-meat which tends to be hunted under de-facto open access conditions .where the risk of over-harvesting and as a result, extinction of the very resource base upon which these poor local people rely, is very real, as in the case of fisheries. Investments in licensing and resource rights regimes are thus very real options for securing the asset base of these vulnerable people. Successful management requires that the directly affected local groups do not lose because of the new management regime.

Wildlife management holds potential for creating conflicts over alternative land uses. Wildlife tends to be land extensive and require large tracts of land, depending on which species are meant to occupy the land in question. If the alternative use of such land is crops and/or livestock, the land has an alternative market value to which the net benefits of wildlife conservation should be compared. The costs of such conservation must include also damage caused by the wildlife on adjacent areas as

well as the cost of keeping poachers out, and culling the wildlife so as to keep the soils and vegetation intact for a sustainable stock of wildlife.

Potential conflicts between affected local populations that have traditionally hunted the wildlife now to be protected, and the conservationists and protected area managers can be reduced or even eliminated if the locals are actively involved in such a way that they experience net benefits that exceed the value of what they would have otherwise extracted from the affected area.

Comparison of alternative protected area management regimes have shown that outcomes can be very different in terms of (a) overall feasibility of such investments, depending on the ability of the managers to capture the willingness of PA users in the form of entrance and use fees, and (b) how these revenues and benefits are distributed among the various stakeholders.

One exception which has adopted a consistent methodology for showing how to meet the above conditions for attractiveness to all stakeholders is a CCICED[65] funded study of giant panda conservation in *China's Sichuan Province*.[66] This study was designed to identify the various parties whose costs and benefits needed to be considered explicitly as a basis for "enlisting" local support for the panda protection actions. These stakeholders included:

- Tourists to the panda reserves;
- Tourists to China who were willing to contribute financially to panda conservation even if they did not plan or wish to visit the reserves;
- The managers of the reserves;
- Local and international conservations; and not the least
- The local and extremely poor farmers who lost cultivable land and access to gathering of non-timber forest products because of the PA status of the reserves, along with
- The wardens who are there to protect the wild pandas, but are both poorly paid and strongly resented by the local poor farmers, and thus have minimal incentives to manage the PA effectively.

The study was then centred around a comprehensive and carefully designed willingness to pay for panda protection survey among visiting- and non-visiting tourists. The study established that the willingness to pay for such conservation by (a) raising the entrance fees to the reserves, and (b) paying for a "panda stamp" on visas issued by the government, would be sufficient to raise tens of millions of USD on an annual basis, thus comparing extremely favourably with the present modest annual budget for the panda reserve of USD 0.25 million.

Having revealed such willingness to pay for such PA management, the tourists would be no worse off with the payments than without them, since they receive a benefit in return in the form of assurance of sustained panda preservation, and that they thus

[65] CCICED = China Council for International Cooperation on Environment and Development (a multidonor sponsored activity managed by China's State Environment Protection Agency (SEPA) and Canada's IDRC.

[66] T. Swanson et al (2000), "*The economics of panda reserve management*" CCICED, Aileen International Press.

contribute to compensate the poor farmers for asset losses resulting from this form of conservation. By sharing this revenue, both the farmers, the wardens and the conservationists would be better off. The basis for the present resentment against the wardens would thus be removed if such a management and financing regime were introduced.

However, even if a preservation investment is convincingly documented, getting the various parties – including the responsible central authorities - to agree to such solutions is not easy. Sometimes it requires new or revised legislation and/or regulations, and in some cases there are politically influential rent seeking stakeholders who practice illegal extraction and poaching and who cannot be reasonably compensated for their illegal pre-conservation practices.

Pakistan has more than 20 years experience with wildlife conservation based on the *Pakistan Trophy Hunting Programme* (PTHP), see L. Emerton et al (2006), pp. 46-47 PTHP is aimed at strengthening local incentives for the conservation of large mammals by generating revenues from very costly permits for sustainable hunting of endangered species, and have the revenue fairly shared with local communities. In theory 20% of the revenue goes to the Provincial Government and 80% of the trophy fee goes to the community where the hunt took place. Surveys – albeit based on uncertain data – suggests that attitudes of local people to wildlife poaching have changed and that wildlife protection attitudes have improved. Poaching and uncontrolled hunting has been significantly reduced. Unsurprisingly, a major challenge in Pakistan is to ensure that the income from trophy hunting actually reaches the local community stakeholders. Very little data is available to prove that such transfers have actually taken place, but what little there is suggests that the greatest conservation success has occurred where communities have been able to take the lead and assume more responsibility for operating the programme, with NGOs and Government playing a supporting role as capacity builders..

A unique PA success story from Sub Sahara Africa has been the Communal Areas Management Programme for Indigenous Resources (CAMPFIRE) program that started in *Zimbabwe* (then a Norwegian partner country) in 1989[67]. Crucial to its success was establishment of appropriate ownership rights and empowerment of local communities for the resolution of the classic PA conflicts between farming and wildlife. The subsequent political turmoil resulting in dramatic deteriorating governance and a poor security situation in Zimbabwe, poses an obvious threat to the sustainability of CAMPFIRE and most other development promoting activities in the country, but this cannot alter the fact that given a stable political regime and benign national policy setting, the CAMPFIRE concept is a "best practice case" worth copying many other places in Africa and elsewhere where PA establishments are considered or where poorly performing PAs are in need of reforms and reorganization.

The basis for establishing this program was a comparison of the relative merits of conventional cattle ranching and wildlife ranching on the common property dry areas that were considered for protection in this case. It was established that the local ecology with shrubs and bushes and parasites and predators to which cattle was

[67] See T. Sterner (2003) chapter 31, for a review of this program.

vulnerable made this land uneconomical for conventional cattle ranching. At the same time it was established that wildlife had co-evolved with the local ecology and was thus much more resilient and better adapted to survive on such land than cattle. Even if wildlife yield less meat, carefully planned wildlife ranching can raise revenue from a combination of higher unit prices for the meat, plus revenues from trophy hunting, hides and safari-tourism.

However, what made CAMPFIRE unique and novel was the outreach to include local small farmers who are most exposed to the threats and losses from living with wildlife and devolution of appropriate authority to their local communities, and a design that manifested a sharing of benefits that would make local stakeholders winners. To create the basis for a harmonious coexistence between farming and wildlife, CAMPFIRE established organizations at various levels (local, regional and national) with villages being the smallest decision making units. Clusters of villages constitute wards and clusters of wards constitute districts. It is then Rural District Council (where all wards are represented) which decide how much of the money generated to pass on to the wards or villages. This typically amounts to some 80%, whereas the rest is reserved for managing CAMPFIRE in the districts and for general council administration and development activities. It is not easy to establish administrative delineations free of conflicts in such programs, and obviously the administrative borders upon which the CAMPFIRE structure is based does not necessarily reflect ecological, wildlife and cultural structures[68].

The annual CAMPFIRE revenue grew from USD 0.3 to 1.5 million between 1989 and 1995, and this only included the 12 originally involved districts. It later became country-wide. In addition to these direct revenues, and the ecological benefits from more sustainable management of the wildlife, the program has provided for substantial capacity building at the community level in fields such as marketing, tourism and negotiation with tour operators, and with these increasing skills the communities have received an increasing share of overall revenue generated under the program.

In spite of the many challenges it has faced and is facing, CAMPFIRE has still shown that the best way to protect wildlife appears to be giving appropriate property rights to local communities, which may involve increased hunting and trade so as to make animals valuable to those who live with them[69].

This experience is further confirmed by the impacts of establishment of private property rights in game species in *Namibia,* see M. P. Wells (1997), p.31. This policy reform led to the establishment of wildlife ranches and conservancies, where some 20 landowners with 10,000 – 15,000 ha ranches joined together in the 1990s to establish common outer boundaries to their combined properties, and established contracts for the joint management and use of their wildlife. By early 1996, four conservancies, each of 100,000 – 150,000ha had been established, and the rate of return to these merged operations compared favourably to the rate of return to individual wildlife ranches. Both scales of operation show positive rate of return on the environmental investment, but the merged operations suggest there are economies of scale. It is of

[68] In a similar project in Namibia, one has allowed the local communities to define themselves as districts in order to establish stronger local ownership to the concept, see T. Sterner (2003), p.419.
[69] T. Sterner (2003), op.cit. p. 420.

importance to note that the economic returns are significantly higher than the financial returns to such investments, thus indicating that such investments also generate important social, environmental and developmental values not captured by a financial analysis. This Namibian experience showed that the number of wildlife increased, as did species diversity and biomass. This indicates that such project can be designed to conform well with sustainability criteria.

The above panda PA management example from *China* illustrates how what has so far been non-feasible can be turned into a highly feasible and at the same time poverty reducing and conflict removing opportunity. Studies that have compared the management of Kenya's and Zambia's PAs with that of the Kruger Park in South Africa clearly illustrate that there is a great potential for significant increase in rent capture for the benefit of the locally affected parties if there is political willingness to allow this to happen, see D. W. Pearce (2005), p 104. In his table 6.12 he has summarized the rates of return to effective wildlife conservation ventures in four Sub-Saharan African countries (*Namibia. Botswana, Zimbabwe and Kenya*). He find that many wildlife ventures (ostrich farming, crocodile farming, safari hunting, game harvesting and wildlife ranching) are more profitable than cattle.

*South African National Parks* (SANParks) now wants tourism and related commercial activities to be undertaken by the private sector and charge market-based prices subject to a regulatory framework designed to minimize adverse environmental impacts and ensure a relatively risk-free returns to the conservation assets being leveraged, see L. Emerton et al (2006), op.cit. p.58. Part of this approach includes leasing of several small camps in a.o. Kruger National Park for 20 years in anticipation of generation of significant revenues for SANParks and thus contributing to the broader economic development objectives. This program has generated over USD 35 million investments in the parks, and a very significant revenue is anticipated which will finance a substantial portion of the SANParks' costs and generate more than what the Government is presently subsidizing the organization with. On top of this comes a large number of direct and indirect jobs and export revenue being generated. Emerton et al (2006) op.cit. finds that the following factors have been identified as underpinning the success of the adopted approach:

- Good quality sites as a starting point for viable operations,
- Experienced operators capable of quick and responsible delivery,
- A competitive bidding system requiring excess demand for sites,
- Motivated operators able to develop imaginative and far-reaching empowering schemes,
- "Balanced" contract management to ensure long-term success of the process, and
- Managerial flexibility to update environmental rules on issues such as carrying capacity in light of experience..

### 3.3.5 Forest Ecosystem Values versus Conversion Values

Studies of the value of forest ecosystems suggest that the dominant economic value of forests lies in their carbon storage and sequestration[70]. Annual emissions from

[70] J. Smith and S. Scherr (2002), "*Forest carbon and local livelihoods: Assessment of opportunities and policy recommendations*." Occasional Paper 37, Bogor: CIFOR

deforestation account for more than 18% of global greenhouse gas emissions, more than is produced by the whole of the global transport sector[71].

The Stern (2006) report op.cit also argues that this is an area where in principle rapid reductions in emissions could be achieved, because progress is not dependent on the development of new technology, with benefits from protecting existing forests (especially tropical forests with high carbon stocks per hectare) greater than those from the creation of new forests. The opportunity cost of forest protection in the eight countries responsible for 70% of the emissions from land use are relatively modest – currently around $5 billion per annum, although this would be likely to rise over time. These calculations suggest that the potential global gains from forest protection (measured just in terms of reduced carbon emissions) substantially exceed the opportunity cost of exploitation and conversion to agricultural land.

The role of carbon payments in raising the returns to conservation is time and again shown to be crucial, and often in excess of the discounted economic value of the more conventional forest goods and service values (i.e. from logging, fuelwood, non-timber forest products, genetic information, recreation, watershed benefits, and existence values), see e.g. D. W. Pearce (2005) pp.91-92, who concludes that a present value of carbon storage between USD 360 and USD 2,200 per hectare would more than compensate for many conservation values of tropical forests and thus pass a conventional benefit-cost test, but the amounts are very site specific. Smith and Scherr (2002), op.cit. show the minimum amounts of payments per ton of carbon to local communities needed to convince the stakeholders to refrain from land conversion to other land uses (e.g. land clearing for agriculture).varies from USD 3 to USD 31 based on a number of studies of tropical agro-forestry – and PA farm cases in South America, Sub-Sahara Africa and Indonesia.

A review of the costs and benefits of some 20 forest conservation- versus forest conversion projects in developing countries provide as a main conclusion that the analytic outcomes are very site- and "conversion for what"- specific, see D. W. Pearce (2005), table 6.6. Some such studies show significant benefit-cost ratios from conservation or sustainable use, whereas others suggest that conversion may indeed be profitable. It generally makes more often economic sense to convert secondary forest than to convert primary forest. Before a conclusion can be had, one also has to make clear whether the conversion is for conventional clear cut logging, slash and burn or reduced impact logging (RIL). The ecosystem impacts from conversion will vary significantly between these alternative alteration approaches. A forest concessionaire will not normally adopt the costlier RIL method unless compensated for the incremental costs. A funding mechanism such as the Global Environment Facility (GEF) has been set up to e.g. help secure concessionaires to choose RIL over conventional clear cutting in areas where the ecosystem values at risk are considerable.

For the conversion cases it is usually required that the alternative use is high value agro-forestry or high-value timber extraction if conversion shall pay. Furthermore, for conservation to pay non-market forest product values must be captured through some market mechanism. Since the non-market biodiversity value is unlikely to be

[71] N. Stern (2006), "*The economics of climate change*", Report to HM treasury, UK

captured, and often omitted from conventional economic analysis, the GEF mechanism for financing the incremental costs of land uses that prevents the loss of such values becomes an important policy instrument for the conservation of global commons benefits, i.e. biodiversity and carbon storage.

As regards the economic value of genetic information in forests, the present level of knowledge leave much to be desired. The gap between the low and high estimates of the pharmaceutical value of the same "hot spot" land areas, which reflects the maximum willingness to pay for bio prospecting, is so large that it would be meaningless at this stage to present a verdict in terms of dollar value per hectare of "hot spot" land. The lower set of such values suggest that conservation does not pay, while the higher estimates clearly suggest that conservation for bio prospecting is worth while.

A general problem worldwide, but particularly in developing countries is that budget allocations for protection of national parks and other protected areas is insufficient to match the protection needs against the various exploitation pressures (encroachment, logging and wildlife poaching) on such areas and their vulnerable resources.

Governments are generally reluctant to allocate more funds to conservation and forest protection because the benefits are not always very obvious, and if they were, they tend to be much underappreciated and often accrue sometime into the future and perhaps to communities that are not among the politically most influential ones. At the same time, the opportunity costs of scarce public budgets are high due to the many pressing developing needs of the nation.

It is therefore of critical importance that the benefits that accrue from nature conservation and sustainable use of the natural resource assets be identified and estimated in order to determine the level of public expenditure, as well as the incremental expenses to generate local, national and global benefits that may be funded by donor agencies, NGOs, private industry, and international agencies such as the GEF, and be justified by the public goods aspect of conservation.

In addition to estimating the overall benefits and the incremental expenses to generate the various categories of benefits, it is well known that such calculations may reduce to mere academic exercises unless formulae for the sharing of these benefits and costs among the affected parties are found and agreed upon. The successful implementation of sustainable use and biodiversity conservation practices depend fundamentally on the affected parties' acceptance of the incidence of the benefits and costs following from the actions undertaken.

The total economic value of such an area consists of both direct and indirect values as well as options values and existence values[72]. These values are reduced or lost if the area is not properly managed, i.e. sustainably used, and such losses which are typically not valued by governments when they allocate budgets and develop policy instruments for revenue raising and area management, include:

[72] Pearce, David W and R. Kerry Turner (1990), "*Economics of Natural Resources and the Environment*." Harvester Wheatsheaf, UK

-biodiversity losses and associated revenues from biodiversity prospecting,
-losses of aesthetic and non-use values,
-loss of eco- and other tourism and recreational activities,
-water productivity losses due to soil erosion and sedimentation,
-loss of future hydropower production due to the above,
-loss of carbon sequestration,
-loss of micro-climate benefits, and
-loss of watershed protection.

There are various economic methods available for estimating such benefits and cost savings, and the choice among them depends in part on what data are available and of course on the circumstances and the budgets for data collection. Methods for estimating the respective willingness of the various groups of beneficiaries to pay to ensure the continuation of these benefits are well developed, and several studies have estimated the willingness of both users and non-users to preserve the option of using the park in the future, or even for its mere existence even if they explicitly declare that they have no intention of ever using the area.

In a case study from *Costa Rica*, the following estimated annual environmental values per hectare from sustaining primary forests were estimated (in 1989-US$):

| | **Range in $ per hectare**: |
|---|---|
| 1. Hydrological benefits | $ 16.55 - $ 35.60 |
| 2. Carbon Sequestration | $ 60.00 - $ 120.00 |
| 3. Ecotourism | $ 12.56 - $ 25.12 |
| 4. Future pharmaceuticals | $ 0.15 |
| 5. Transfer of funds | $ 12.80 - $ 32.00 |
| Annual total | $ 102.20 - $ 213.70 |
| Net present value (at 8% discount rate) | $ 1277.50 - $ 2671.30 |

Perhaps most surprising to some in this context is the very low value attached to future pharmaceuticals. This result is, however, fully in line with most economic research on the biodiversity value for use in pharmaceutical research[73]. For reasons of consistency, one obviously has to apply marginal analysis across the entire spectrum of competing resources and uses for them. This then requires the identification of the marginal element of a large an complex ecosystem. While it is undisputedly clear that it is impossible to estimate the value of the marginal species from this perspective with any precision, even deriving an estimate for its maximum possible value is a highly speculative exercise.

It would seem reasonable to apply statistical theory and assume that new potential products are generated by a Poisson process. Considering not the extremely large number of species, but rather, narrowing the focus to the 250,000 species of higher plants that are assumed to have exceptionally high pharmaceutical potential, and comparing the numbers to the annual average approval of 23.8 new drugs by the U.S. Food and Drug Administration in recent years (which can represent world discovery

[73] Simpson, R. David, Roger A Sedjo and John W. Reid (1995), "*Valuing Biodiversity for Use in Pharmaceutical Research.*" Forthcoming in Journal of Political Economy

rates), of which approximately 10 are derived from higher plants, the expected marginal value cannot be very large. Recall also that the estimated pharmaceutical research and development expenditure per successfully derived product is around $300 million.

Even if we assume that the financial return to a new pharmaceutical product is an attractive 50%, and their discount rate is 10%, the maximum possible value of the marginal species is slightly less than $10,000, given the collection of relevant 250,000 species and an expected cost of evaluating a sample of around $3,600. With a more realistic probability of success in hitting on any given species for any given potential product, this marginal value drops drastically. The marginal value is also extremely sensitive to the assumed financial rate of return, and it drops substantially when the rate of return is reduced below 50%.

Even if the high marginal value of $10,000 for a marginal species is retained, this translates into no more that at most $20 per hectare of maximum willingness to pay by pharmaceutical companies for the conservation of the most attractive tropical biodiversity "hot spots" , and in most other places it would immediately drop to less than one dollar. This is of course not to say that we should not be concerned with loss of biodiversity. The point to be learnt from this economic analysis is that *if the international community values biological diversity so highly that it is prepared to fund land owners and land users to conserve the tropical forests or manage them as sustainable forestry, then there is limited financial support to get for it from a myopic profit-seeking pharmaceutical industry.*

In addition to the increasing number of GEF-projects where such nature value estimation experience is accumulating, there are now innovative private sector initiatives undertaken where the participants enter in anticipation of future international binding greenhouse gas- or biodiversity agreements. Such a deal was recently signed between a Norwegian consortium and a hydropower company in *Costa Rica* in anticipation of a future international agreement for trade in nationally guaranteed carbon certificates[74]. Backed by Costa Rican legislation and institutional arrangements, whereby a portion of the Costa Rican gasoline tax is earmarked for a national forestry fund, a Norwegian consortium interested in acquiring future carbon emission credits offered to pay US$ 10 per ton of carbon sequestered or per ton of carbon sequestration capacity saved as compared to a well defined "business as usual" watershed development scenario. The payment would take the form of transfers to the Costa Rican forestry fund that pays smallholders in the particular watershed area for undertaking treeplanting and/or protection of the forest cover as an alternative to the "base case" of continued land clearing by slash and burn land conversion to much less sustainable land uses. It is estimated that some 250,000 tons of carbon will be saved over the next 25 years by this action.

The agreement between the two parties includes a neutral assessment of the amount of carbon sequestered, carbon sequestration saved, and incremental hydropower output as a result of slower sedimentation and silting of the dams in the watershed over the next 25

[74] Costa Rica's Minister of Environment and Energy, Rene Castro Salazar, and Norway's Ambassador to Costa Rica, Liv Kerr attended the formal issuance of these certificates on 07th February 1997 in San Jose, where the project was formally presented by the Costa Rican Minister to a World Bank Seminar on globalization and sustainable development.

years. The cost per ton of carbon saved is simply the estimate of what it would take to convince the local rural dwellers to switch from unsustainable land use practices to adopting the sustainable use patterns, and in view of the available alternatives facing the farmers in the watershed, this value was set at US$ 10 per ton of carbon. An independent auditor is hired to monitor progress and secure compliance from contracted farmers, and penalties and disincentives are in place to secure their compliance. The Costa Rican Ministry of Finance guarantees the face value of the issued certificates for 20 years in case they become tradable (and even if they do not, the goodwill and public relations value for the industry participants is probably well worth the money spent!).

A similar agreement was struck between a coal fired power utility in Eastern United States and a Foundation with substantial logging concessions in *Sarawak, Malaysia* ten years ago, with no government involvement. An international broker brought the two parties together; the utility company had expressed an interest in acquiring goodwill and possibly tradable carbon certificates by saving or sequestering somewhere in the world as much carbon as the increase from their planned plant expansions in the USA in order to come out of their overall investment with a zero incremental emission. They were prepared to pay for the goodwill and public relations effect of this initiative and perhaps secure some carbon and/or biodiversity certificates of tradable value for the future. At the same time, the Sarawak-based logging concession holder was eager to improve its image after criticism from environmental groups for the cost-effective but destructive logging of pristine tropical rain forests. They were prepared to consider switching to the somewhat costlier so-called reduced impact logging (RIL) method, which saves lot of the biodiversity, retains more of the carbon sequestration capacity and results in much less erosion, silting and sedimentation of the rivers. In this case no State guarantees were given as in the Costa Rican case.

### 3.3.6 Investing for Sustainable Agriculture and Forestry

Most of Sub-Sahara Africa today appears to be "overpopulated" in spite of an average population density that is less than ¼ of that of Asia. This observation is explained by a widespread application of extensive and environmentally destructive agricultural practices to a very fragile natural resource base that is highly prone to erosion- and other environment damages (e.g. droughts and floods)[75].

It has long been assumed by international experts that one of the main obstacles to taking a long term view when cultivating land and investing in it for increased and lasting yields and for prevention of land degradation, has been the lack of private ownership regimes. Therefore, many economic reform programs have included measures to increase land tenure security of farmers as a means to stimulate investments and facilitate it by better access to rural credits. There can be little doubt that tenure security stimulates as prescribed. However, it does not follow that huge country-wide land registration and titling projects constitute the most cost-efficient way to go about this challenge, as e.g. Peruvian economist Hernando de Soto has been advocating and for which he has received considerable Norwegian financial support to help *Tanzania*, see e.g. Bistandsaktuelt, No.2/2007, p.12. This myopic private

[75] See e.g. Stein Hansen (1993) "*Miljø- og fattigdomskrise i sør – et utviklingsøkonomisk perspektiv*", Universitetsforlaget (Scandinavian University Press) Oslo

ownership-focused approach was warned against already in the mid-1990s[76], and more recently in a comprehensive IIED study[77] where the appropriateness of many of the de Soto recommendations are questioned for an East and Southern African setting. It has been estimated e.g in the case of *Sri Lanka*, where lack of land registration and land titles made it difficult for the courts to establish compensation for land acquisition for road right-of-way, and therefore had become the main delaying factor in getting highway projects underway, that establishing such a land register would take more than 20 years[78]!

Integrated approaches including well-designed incentives for stakeholder involvement in governing land use towards a more sustainable way have proven highly successful for poor smallholders and for the natural resource base upon which their well-being depends, in *Nepal* and *India*. In 1977 a local stakeholder involvement project was started whereby steep overgrazed mountain pastures in certain parts of Nepal and India, where each farm unit was less than one hectare of terraced cultivated land, was to be converted to sustainably managed farmland. Creating local ownership to the project was crucial. Local farmers and representatives of the central authorities met to figure out how to deal with overgrazing being out of control and leading to accelerated soil erosion, land slides and flooding. The agreed solution that was eventually reached was to stop uncontrolled grazing on common land. At the same time it was agreed with the Central Government to have villagers invest by replanting erodes gullies and hillsides with resilient grasses with a deep root structure and to plant trees with similar characteristics upstream of the cultivated terraces, so that farmers could derive fodder, fuelwood and poles. Three years after startup per capita income in the three Nepali villages had quadrupled while at the same time the local farmers where adopting environmentally more benign cultivation and pasturing practices. The seven Nepali villages that had been hesitant to follow suit, had been convinced and decided to follow. A similar experience with such common access to the land was observed in the Indian village. These projects were not derived from a poverty reduction plan, and the land degradation that had triggered the project was not a result of poverty, but rather a result of a Central Government initiative to control common land that had previously been accessed in an uncontrolled way by local stakeholders, see S. Hansen (1993), p.150..

There is little evidence of private titling leading to increased investment in *African* agriculture. Constraints to adoption of technology and intensification seem to lie primarily with capital and labour constraints at the household level, and with weak infrastructure and inaccessible markets, i.e. factors affecting choices regarding whether to invest and where to invest, see the discussion in chapter 3.2 above. Instead, there has been a renewed focus on different common property regimes, to safeguard both poor landless farmers and pastoral groups, in order to promote environmental protection and biodiversity protection. Common property regimes might in fact be more efficient ways of managing common-pool resources than private property

[76] Platteau, J. P. (1995), „*The evolutionary theory of land rights as applied to Sub-Saharan Africa. A critical assessment"*, Cahiers de la Faculte des Sciences Eonomique et Sociales No 145, Namour: Facultes Universitaire Notre-Dame de la Paix (also in Development and Change: 27 (1): 29-86.
[77] Kingwill, R., B. Cousins, T. Cousins, D. Hornby, L. Royston and W. Smit (2006) "*Gatekeeper (124) - Mysteries and Myths: De Soto, Property and Poverty in South Africa*". May 2006 – IIED, UK
[78] Stein Hansen (2000), " *Framework in measuring poverty impact of transport projects.*" Final report, Contract no. A99427: EDEV, Asian Development Bank, Manila.

regimes, especially in highly dynamic dryland ecosystems, see R. Øygard et al (1999), pp.19-20. However, there are no simple and easily transferable tenure models between dryland- and rangeland ecosystems because there is so much variation both ecologically and culturally from site to site. There are many examples of conflicts and strifes arising of land rights between different stakeholders. Temptations among the most powerful to capture the benefits are observed irrespective of traditional tenure arrangements when increasing pressures on the common resource base is observed. Tenure systems must allow herders to move at short notice so as to capitalize on areas of high productivity and not be hindered by time-consuming procedures, and tenure systems must provide secure access to a range of ecological zones. But such opportunistic land management also implies a danger not being able to control land use and thus stimulate overgrazing and erosion, and must therefore be carefully assessed on a case-by-case basis, see R. Øygard et al (1999),op.cit. pp.24.

R. Øygard et al (1999), pp 31-40, provide a comprehensive overview of the changing approaches to addressing the pastoralist challenges over time. Establishing pastoralist associations has been a key area of institution building, but the diverse cultural settings and variation in stakeholder literacy and readiness to adapt to and adopt new systems pose new challenges in new situations. What turns out to be "good practice" in one setting may fail in the next project. The common denominator is that pastoralist institution building is a long-term cumulative and participatory process, serving as a means to empower the pastoralist groups, improve service delivery and promote sustainable use of rangeland resources. Investing in pastoralist systems require that the technologies adopted are carefully placed in the context of how the specific pastoralist system under analysis works, and the sequencing of inputs is critical to success. In broad terms, it appears that one should start such investments with strategic water development, animal health and marketing, and then move into management of key resources and food security, followed by the more complex and broader aspects of grazing management at a later stage, when community-based organizations are well established. At the same time, one has to take explicit account of the degree to which poor infrastructure is an obstacle to poverty reduction in such pastoralist systems, because infrastructure bottlenecks have often been given inadequate priority, often due to the relatively high investments per household.

The choice of livestock output is crucial for pastoralists. However, even if diversification of livestock species is important to risk management in dry areas, the aid agencies have often been myopically focused on cattle, see R. Øygard et al (1999), p.57. Experience and research has shown, however, that under conditions where the fodder resources are too scarce for each household to have a milking cow, goats can be an interesting and often much more profitable alternative. When grazing areas declined, fallow periods were shortened and average farm size declined in *Rwanda* during the 1970s and 1980s, there was a shift towards goats and sheep, especially for women farmers who were denied land ownership and for poor farmers – regardless of gender – because they could spread the risk and afford several goats but perhaps only one cow, the latter making them much more risk exposed. As has been documented in *Ethiopia*, goats often produce milk in harsh environments when the cattle have dried up, and it is much quicker, easier and cheaper to rebuild a herd of goats than a stock of cows if the herd should be lost for some reason. Goats are much more resilient because they can survive and produce milk based on a much wider range of fodder than cows, and they demand much less water. The argument that goat browsing

degrades the environment is reduced to a minimal incremental impact if the goat stock is properly managed in ways that are familiar to the pastoralists.

Moving beyond the complex pastoralist systems, there are ways of reducing the vulnerability of the natural resource assets to erosion, drought and floods by means of investing in more appropriate equipment and land management techniques. Such actions will at the same time raise the carrying capacity of this basic natural asset and enhance the scope for economic growth, increased employment opportunities and as a result, reduced poverty. Such actions include policy reforms that will stimulate and encourage investments in

- Intensification practices,
- Irrigation and water management,
- Optimal fallowing, and
- Land clearing

Obviously, the appropriate investment towards enhancing the yields of and income from the land and natural resource base varies with the eco-climatic conditions. Among these, dryland farming is a high risk and challenging task where the difficulties of developing sustainable farming tends to grow with increasing aridity because a.o. the response to labour and fertilizer is lower in arid environments. Such land is also highly exposed to variable and erratic rainfall which again creates extreme yield variation, and this again makes investments in costly seeds and fertilizer inputs risky. Add to this that arid conditions makes it more difficult to accumulate soil organic material due to low biomass production and high decomposition rates for soil organic matter. The spare soil cover also leads to high run-off and soil erosion, and this is all topped by socio-economic constraints, many of which are similar to those faced by the pastoralists.

However, precisely because of the very low use of yield-enhancing technologies there is considerable scope for yield increase. R. Øygard et al (1999),p.44, conclude that inappropriate agricultural and economic policies with perverse taxation and subsidies, combined with low population densities, low income and poorly developed rural infrastructure, and low levels of education and agricultural research, are important explanatory factors behind this state of affairs. In addition, one must also remember that with low population densities and scarcity of labour for planting, weeding and harvesting, extension of cultivated areas is often found to be the more immediate economic solution due to the reluctance of taking on the more capital-intensive intensification alternative. In order for the poorer – often female headed - farm households to choose new yield enhancing technologies, the available technology must be low cost and have a low risk of failure.

Integrated nutrient management (INM) which combines organic and mineral methods of soil fertilization with physical and biological measures for soil and water conservation, covers a range of technologies where the optimal choice in a given setting depends on the market situation, the price ratio of inputs to outputs, the availability of inputs, the scarcity of and alternative uses of organic material (i.e. for fodder and/or fuel), labour availability and costs, and farmers' knowledge. INM is based on the principles of maximizing the use of organic material, ensure access to inorganic fertilizer and improved efficiency of its use, and minimizing the loss of

plant nutrients. The eco-climatic and geological conditions of dryland areas where rainfed agriculture is practiced, varies substantially, and so do the risks and economic attractiveness to dryland farmers associated with adopting technologies from the INM "menu", see R. Øygard et al (1999), pp.45-53 for a comprehensive overview.

Phosphorus, together with nitrogen, is the nutrient most frequently limiting plant growth in sub-Sahara Africa. Based on a comprehensive review of studies in sub-Sahara Africa, R. Øygard et al (1999), p.48 find that investments making it possible to increase the use of phosphorus is seen as the cornerstone in developing sustainable agricultural production systems in sub-Sahara Africa because it will produce effects beyond just higher yields. In soils with serious phosphorus deficiencies, farmers can only grow crops that tolerate low phosphorus levels. With increased supply of phosphorus, farmer can choose from a wider variety of crops. This contributes not only to improved economics and welfare of the farmer, but as an integral part of this, to increasing robustness of the agricultural production, which means reduced risk of trying out new and higher value crops. In this way INM with investment in increased phosphorus use also enhances biodiversity. Nitrogen fixation will also be increased, since phosphorus deficiency often seriously limits nitrogen fixation.

In densely populated highlands of *Ethiopia*, the importance of crop residues provide as much as 90% of the livestock feed, but the quality of this feed is often very low. However, there are several investment opportunities for enhancing the quality of these residues and thus the returns to investments in livestock in such areas. By treating the residues with urea, one immediately (after 2-3 weeks) increases the digestibility, raises the nitrogen content of the straw, and increases the voluntary intake over that of untreated straw by 25-50%, according to Preston (1995). Milk production of the animals can almost double and animals are fattened. Urea can also be used as soil amendment and there is in general a low economic risk involved in using urea to enhance the quality of crop residues, since it so quickly transfers into an economically valuable output in the form of more milk and meat. At the same time, using urea to enhance the quality of crop residues is independent of climate variations, unlike the case when urea is used as a fertilizer, see R. Øygard et al (1999), p. 59.

The value of the yield increase due to fertilizer, divided by the fertilizer cost is found to be one of the key variables that local dryland farmers decide their fertilizer use on. Depending on their perceived risk of crop loss, they will require a value cost ratio (VCR) ranging from 2 and up. In this context it is of interest to observe the experience from *Niger* with applying fertilizer directly in the planting hole instead of no fertilizer or conventional fertilizer broadcasting. In the case of such staple crops as millet and sorghum, the ICRISAT Sahelian Centre (1998) found that such point application of fertilizer immediately after a rain shower would increase grain yields by 30 – 100% or more, compared with no fertilizer application, and provide for an earlier harvest than otherwise. It was found VCRs as high as eleven from investments in such intensive cropping systems, compared to only 1.2 for conventional fertilizer use.

A classic econometric study of the scope for improved yields and job creation in developing countries agriculture by Pingali and Binswanger from 1983[79] showed that

[79] Pingali, P.N. and H.Binswanger (1983), "*Population density, farming density, patterns of labour use, and mechanisms*.". Discussion Paper , report ARU 11, Washington D.C. World Bank, Agriculture and Rural Development Department.

if agricultural intensity were increased 10%, yields would increase by 4.4% and employment by 3.4%. Clearly, not all investments considered viable at that time would be considered environmentally benign today (e.g. use of many chemicals banned today to fight pests), but the key message of their analysis remains valid: Agricultural intensification (by means of actions that do not harm the soils and biodiversity) means enhanced capacity of the natural resource assets to feed more people and create additional employment. When such a development is not observed, it is most often due to national policies and regulations that discourage such actions by the farmers and landowners.

Intensification usually implies a stronger integration between crop and livestock production or between tree crops and other crops on the land between the trees. Such intensification and integration become the more attractive the scarcer the land available. In the former case such intensification investments can be to the benefit of both sectors. Crop production will benefit from more manure becoming available, and draft animals can be used for ploughing and transport of the produce and of inputs into the agricultural activities. Livestock benefits because crop residues serves as animal fodder. However, such intensification of land use requires investment in the land with proper inputs (i.e. increased appropriate fertilizer accompanied by a return of part of the crop residues, greater integration of legumes into the farming system and better quality feed resources) and management in order to avoid widespread environmental degradation, see R. Øygard et al (1999), p. 57..

In line with this, the Asian Development Bank (ADB 1990)[80] found that coconut plantations in *Sri Lanka* were extensively cultivated and only utilized 25% of the land. The unused land between the palm trees had a potential for growing e.g. bananas, pineapple, citrus, papaya and other high value fruits, plus vegetables, root crops and flowers for sale. Furthermore, there was also scope for having animals graze on such land. By taking advantage of these potentials and investing in these land assets accordingly, it was estimated that labour intensity on such plantations could increase five-fold and raise the number of new such jobs by the equivalent of two years natural growth in the number new labour force entrants. Similar findings were presented for coconut plantations in the *Philippines* where it was found that by rehabilitating and replanting poorly maintained plantations, a considerable share of the rapidly growing new labour force entrants exerting erosion pressure on fragile sloping uphill lands to seek a subsistence living there, in this way would have a choice to migrate to the much less fragile plains and finds better paid jobs on the rehabilitated plantations. In this way, such land investments would lead to the combined benefits of saving fragile up hill land from erosive destruction and biodiversity threatening clearing, and at the same time create much needed jobs for a rapidly growing labour force that faced few alternatives to the destructive clearance of fragile unspoiled sloping forest land[81].

An interesting case of investments in intensified agriculture related to population pressure is what has been observed on the *Ukara Island in Lake Victoria in Tanzania.* The Kara people living on this island which is densely populated (remained constant at 240 persons per square kilometre over the past 100 years) had developed a form of intensified agriculture since long before the Europeans colonized East Africa. The

[80] Asian Development Bank (1990), "*Economic policies for sustainable development*", Manila.
[81] See Stein Hansen (1993), op.cit. p.86.

Kara people had invested in erosion controls, fallowing systems, cultivation of fodder for livestock fenced in, and production of fertilizer, all of which focused on preventing overgrazing and degradation of the soil fertility on the island. The Kara people had established a system of private land ownership and heritance rights, and rights to sell property. Once the Kara population density had reached this level, they appeared to have realized that his was the limit of the islands carrying capacity for the agricultural technologies they had developed, and as a result, "surplus" population moved to the mainland, and were observed to give up their intensive cultivation practices as soon as they settled there[82].

One the most research cases where a doomed land use development trend was reversed is the turn-around of the *Machakos District in Kenya*[83]. In the 1930s development researchers saw no hope for this district which was experiencing extremely rapid population growth, increasing erosion, soil degradation and deforestation as a result of increasing demand for fuelwood. Fifty years later – in the mid-1990s – these doomsday predictions had been proven completely wrong in spite of a six-fold explosive increase in population from 227,000 in 1930 to around 1.5 million in 1995. Contrary to all professional predictions, agricultural output per capita increased manifold at the same time, and the degree of self-sufficiency maintained. This was made possible by means of a significantly intensified agriculture combined with a changeover to more high-value and more drought-resistant crops from extensive livestock rearing. In spite of – or more correctly; because of - the range of growing pressure factors threatening to degrade soils and forest cover further, and thus undermine the basis for survival, the peoples (led by groups of women) of Machakos adopted low-cost agricultural practices that retained soil fertility and changed to crops that were less erosive. Today the tree-cover is more widespread than before World War II. This changeover has created a large number of new workplaces both in agriculture directly and indirectly in support sectors both in industry and services. Previously, large livestock herds gave prestige, but caused soil erosion and damage due to overgrazing. Today livestock is viewed purely in economic terms as draft power for ploughing etc. Overall, this development change has made it profitable to manage agricultural land and forests in a sustainable way, and the demand for fuelwood has not led to deforestation as predicted by the early experts. *How was this change of course made possible*? English et al (1993) op.cit. believe that an important part of the explanation is that the Akamba-people residing in the Machakos District traditionally has prioritized targeted education and training combined with the formation of local self-help groups where female smallholders have always played an active role in channelling savings into investments that have contributed to enhancing the carrying capacity of the land. This system has gone a long way in substituting for farmer credits. Furthermore, in this district there is a tradition that smallholders be secured returns to their investments in the land they cultivate even if private tenure has not been widely practiced. One must also not ignore the fact that Machakos district is relatively easily accessed from the Nairobi market, and this has facilitated transfer of new ideas, technologies and new products.

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[82] J.E. Kocher (1973) „*Rural development, income distribution and fertility*". New York; Population Council.

[83] English, John C., Mary Tiffen and Michael Mortimer (1993), "*Resource management in Machakos District, Kenya, 1939-1990.*" Policy and Research Division, Environment Department, The World Bank, Washington D.C.

This Machakos case is unfortunately atypical of the general picture in poor developing countries. It would be a mistake to assume that such success is possible irrespective of the framework conditions and policy instruments that the government has adopted and is actively implementing. The typical case is unfortunately one of complex bureaucratic and discouraging obstacles to achieving such development results. Population pressure alone does not trigger such innovative mechanisms and initiatives as observed in the Machakos case. It is not the number of people, but the total human capital (i.e. the combination of population and it's level of education, training and social/institutional context) and it's interaction with a societal framework of policy instruments and the degree of workable legislation/regulations, that appears to be the critical factor for getting development on to a sustainable path[84].

It does not follow from the above encouraging observations that long term environmental sustainability will be secured if rural population continues to grow at e.g. 3% per year, and the rate of new jobs creation outside of agriculture is far below this growth rate. One is obviously approaching critical carrying capacity thresholds, and local sustainability thus hinges on new jobs being created in or around e.g. Nairobi in such numbers that the excess new labour force entrants can be absorbed there, and not remain in Machakos District and exert an excessive pressure on the fragile natural resource base.

In many areas where the rural population is growing at a much faster rate than new land being cultivated, such as in *East-Nigeria***,** H. Ruthenberg (1980), in his classic "Farming systems in the tropics." observed drastic loss of maize yields when the fallow periods were shortened in order to meet a growing short term local food demand. Gradual shortening of the fallow periods with no attempts at compensating for the soil nutrient losses by means of increased use of fertilizer and pest management and labour, provides a sure sign of soil degradation and declining yields. However, field experience from *South- and North Nigeria* has shown that farmers who actively invest in new techniques for rehabilitating the soil, can make it fertile much quicker than if they resort to natural fallowing, see e.g. Mortimer (1989) and Lal and Okigbo (1990).

### 3.3.7 Flood and Drought Protection

Poor people living on marginal, and often sloping, land tend to be most vulnerable to the impacts of natural disasters such as floods and drought, or more generally; climate variability. The land on which they live tends to be more erosion exposed, and they often live on or adjacent to flood plains that are severely hit when large floods arise. Such weather variability vulnerability is observed in a large number of poor countries in Asia and Africa, and the two examples below are selected to show the severity of the problem. Investing in enhancing the resilience of their natural resource assets is likely to be a preferred development cooperation area in order to improve the likelihood of sustaining a growth process towards achievement of the MDGs, as opposed to repeated frequent returns to emergency relief actions to repair damages caused by extreme weather events, and then starting the growth process all over again.

[84] Paul M. Romer (1990), "*Endogenous technological changes*". Journal of Political Economy, 98,5, part 2.

*Mozambique* provides some good illustrations of how such natural calamities impact on people via the natural resource assets upon which their income and well-being depends.

Droughts are main causes for water shortage for domestic-, livestock-, irrigation- and other water uses.Mozambique experiences irregular rainfall that may lead to runoff deficits in the rivers which reduces hydropower production, as well as supply of irrigation water upon which the farmers depend, and makes those relying on rainfed agriculture highly vulnerable to crop losses as well

Floods caused by torrential rains that causes severe swelling of rivers and flooding over wide areas of cultivated and grazing land. Natural disasters such as severe floods and droughts tend to occur at frequent intervals in Mozambique (every three to four years on average). Drought shocks with severe impacts have occurred seven times over the past 24 years, and floods have occurred six times over the same period. The 2000 flood damage was estimated at USD 550 million in direct, indirect and disaster relief costs[85].When droughts strike, the loss of agricultural output tends to be significant in percentage terms of GDP (it was estimated to be 4% in 1994, see R. Dankova (2005)op.cit.p.29. The average drought and flood is less severe, but still very serious. R. Dankova(2005), op.cit. has estimated the periodic flood and drought damages to be equivalent to USD 70 million annually. This is equal to almost 2% of GDP. From a different perspective, these water shocks reduce the average annual economic growth rate of Mozambique by 1.1%.

Against this history of natural events and forecasting future events, R. Dankova (2005) has presented a comprehensive public investment plan in water management infrastructure for the 2005-2025 period amounting to USD 1,063 billion, with focus on flood protection, irrigation rehabilitation and dams for storage and regulation of water. Compared to a "do nothing" alternative with an assumed 5% annual GDP growth, implementation of the said water sector investment program would enhance the natural resource asset base, upon which such a large part of the population depends. It would result in an increased GDP growth rate due to avoided water shock-related losses, more specifically, it was estimated that such environment-linked investments would lead to a 0.75 mitigation of the 1.1% annualized loss in the growth rate due to water shock events. The benefit-cost analysis carried out concluded with an economic internal rate of return of 10.1%, which suggests that such a comprehensive investment to protect and prevent the natural resource base from deterioration an lost income generating opportunities would be worth while from a national perspective.

In the case of *Kenya*, the costly impacts of refraining from investing to retain the natural resource assets from climate variability damages have been studied and estimated by H. Mogaka et al (2006), [86]. The El Nino induced floods and La Nina induced droughts are weather events estimated to have cost Kenya about 14% of its

[85] Dankova, R. (2005), "*The role of water in the Mozambique economy- Identifying vulnerability and constraints to growth."* Government of Mozambique, Ministry of Public Works and Housing, National Directorate of Water, The World Bank., p.27.
[86] Mogaka, H. S. Gichere, R. Davis and R. Hirji (2006), "*Climate variability and water resources degradation in Kenya – Improving water resources development and management."* World Bank Working Paper No. 69. Washington D.C.

GDP during the 1997-2000 period. On a longer term basis, floods and droughts are estimated to cost the economy about 2.4% of GDP annually

In addition, also on a regular basis, water resources degradation costs Kenya at least 0.5% of GDP annually, and probably much more due the high degree of water and natural resource dependence of all economic sectors of the country. The two main components of these losses are: (a) Seawater contamination of coastal aquifers due to groundwater exploitation beyond their sustainable yield, which forces the tourism industry and residents to invest in desalination equipment, and in costly pumping machinery due to the steady lowering of the groundwater table, (b) water quality deterioration due to discharges of urban, industrial and agricultural wastes which must be combated with costly water treatment investments, plus high costs in the form of lost fisheries export opportunities from e.g. Lake Victoria. Much of these man-induced costs could in many cases be avoided at very moderate costs simply by the government giving priority to proper enforcement of existing laws and regulations.

Some of these costs are caused by weather variability and extreme environmental events, but an increasing share is due to human actions such as lack of proper water- and natural resources management. This again is caused by poor governance and a lack of commitment by the Government to establish and enforce clear and effective legislation, regulations and tenure rights regimes. While population growth has been one of the world's highest (between 3 and 4% per year) expenditures on water supplies and related services declined 70% between 1994 and 2001. Furthermore, almost all water sector spending have been recurrent costs, with insufficient funds allocated for proper water allocation, policing of illegal water extraction, control of discharges of waste into lakes and rivers, catchments protection, and efforts to prevent excessive erosion in headwaters. While population pressure and water demand is increasing, water storage infrastructure has been declining, and the country is becoming increasingly vulnerable to weather variability and extreme events. Much of the losses and costs that are induced by poor governance and inefficient polices could be avoided at very modest costs, and it is also reasonable to assume (see the Mozambique case above) that much of the damage caused by weather variability could be prevented with long-term benefits as an outcome, by adopting and investing in highly costs –effective damage-reducing countermeasures.

### 3.3.8 Tourism for Poverty Reduction and Sustainable Development

Tourism is among the most rapidly growing sectors in developing countries both in terms of income generation and job creation with 6 million new jobs annually, according to the UN Commission on Sustainable Development. At the same time, it is observed that increasingly, the challenges facing sustainable tourism, poverty reduction and protection of the environment, are intersecting. It is increasingly understood that tourism – when planned and designed in an eco-benign way, and involving local stakeholders actively as guides, wardens, servicing staff and as suppliers of cultural events and handicrafts, and eventually in key managerial positions - provides labour intensive new income generating activities based the key concept of sustainable use of the natural heritage and cultural resource assets of the locality. In this way, tourism can enhance the natural and cultural asset value upon which local stakeholders depend for a chance to break out of poverty.

Where local wildlife and biodiversity has been under threat from poachers, prospectors and land developers, eco-tourism directed at high-income visitors can provide the necessary attraction of making sustainable use of this dwindling natural resources a more attractive option than eradicating them for a quick cash profit. Tourism can thus raise local awareness for these eco-system values and how these can benefit local stakeholders if properly managed.

Clearly, investments in eco-tourism means not only investments in the form of securing the rights to protect "hot spots" and other endangered areas against poaching and degradation, but it also means investing in the necessary environmentally benign infrastructure required to provide access and accommodation for tourists. Such activities also means more diversified jobs in hitherto very one-sided extractive local economies. When this is done in an empowering way, involving local stakeholders, the chance of establishing local ownership to the project is considerable, and protection/sustainable management of wildlife and biodiversity become the obvious preferred alternative for how to use such areas. A failure to become involved in eco-tourism thus represents a failure to capitalize on opportunities presented in natural and cultural resource management and sustainable development. Even if successful eco-tourism poses threats in the form of pressures on the natural resource base that made the site attractive for eco-tourism in the first place, the alternative development without eco-tourism tends to be much more threatening to both the peoples well-being and the nature. Studies referred to in earlier sections of this review clearly show that the tourists' willingness to pay for unique eco-touristic services is high. The challenge involved is to make Governments committed to prepare the ground for investors under clearly stated rules and conditions that secure a fair share of the benefits to accrue to the local populations that would otherwise have resorted to poaching and depletion of the local resource base out of poverty imposed necessity[87].

However, this has proved easier said than done in e.g. Norway's main partner countries where natural tourism asset values are systematically eroded. As a consequence, their role in Poverty Reduction Strategies is missing when Governments fail to institute and enforce proper social- and environmental regulations on entrepreneurs granted licences and concessions for tourism development investments, and at the same time fail to enforce measures to prevent exploitative corrupt collusion practices between government employees and entrepreneurs, see e.g. section 2.6.2 above.

In the case of *Tanzania,* with its enormous nature-based tourism potential for poverty reduction, significant lasting environmental damages have followed in the wake of tourism developments, particularly along the coast in the form of destruction of mangrove forests leading to coastal land erosion and loss of fisheries, marine ecosystems disruption and loss of biodiversity. There has been a consistent failure to invest, and oblige users to reinvest, in maintaining the integrity of national parks. The challenge facing the Government is to allocate resources to upgrade its enforcement capacity by more and better trained staff equipped with proper communication equipment and authority to enforce legislation and regulations. At the same time, however, the very centralized approach adopted by national policy makers has largely

[87] UNWorld tourism Organization (2006), "*Poverty alleviation through tourism – a compilation of good practices.*" Madrid, Spain .

ignored the need to involve local communities and stakeholders in decision making so that these can take ownership and responsible role in project developments and plan designs, and in this way secure a fair share of the benefits for the local communities in the form of new non-agriculture jobs, local physical and social infrastructure, which again shall contribute to increased job opportunities in- or as a result of the tourism development.

*Ecuador*'s premium nature tourism destination is the Galapabos Islands. It generates substantial tourism revenue from well-off visitors, but not many are local Ecuadorians and backpackers, due to the high costs of visiting the islands. However, many residents of the Galapagos have found it difficult to benefit from ecotourism. The well-off foreign visitors visit from cruise ships and leave very limited amounts behind for local residents, unlike what the traditional backpackers and local visitors had done previously. Less than 15% of foreigners' expenditures are estimated to reach the islands, D. Southgate (1996). Local employment generated from such tourism has been very limited due to lack of appropriate skills and experience. Ecuador's experience is the rule rather than the exception, but there are cases which show that it is possible to plan for better returns for the local residents.

Limiting and regulating access to nature tourism destinations can provide for significant economic and environmental gains, see M. P. Wells (1997), p.28. The two *Egyptian* Red Sea diving resorts Hurghada and Sharm el Sheikh were compared from this perspective because the former had allowed unlimited reef use for fishing and tourism and unrestricted coastline development, as contrasted to that of Sharm which had carefully managed coral reef use and restricted coastal development and uses by means of an effective compliance program. These two resorts have performed dramatically different. Hurghada has a three times higher development density and reef overuse (three times as many visitors and twice as many boats) compared to Sharm, and has allowed reckless exploitation and allowed unrestricted pollution from hotels , leading to poor water visibility. Sharm, in contrast, has focused on "specialialized tourism" with a restricted number of operators who have invested in conservation, and the hotels have participated actively in making tourism attraction on and off the reef nature conservation oriented by means of briefings and information to the visitors. With sewage control in place the visibility is far greater than at Hurghada. Unsurprisingly, Sharm hotels are able to charge visitors twice the daily rate as what Hurghada hotels are able to, and the rents from conservation are estimated to be almost twice as high in Sharm as a result of the adopted strategy and policies.

The Anapurna Conservation Area Project (ACAP) in *Nepal* since the late 1980s, is a good practice example of effective integration of unique mountain tourism, local economic development and protected area management into what is now referred to as sustainable use of a fragile natural resource assets. In the 1990s some 40,000 people of diverse ethnic background inhabited the ACAP region, and most of them were poor rural farmers. At the same time some 45,000 foreign trekkers came each year to experience the scenery and culture of the people living there. Their trekking along one or two trails has attracted the establishment of lots of tea shops, food stalls and overnight accommodation; all of which are labour intensive and generating income that remained with the local communities. ACAP management was delegated to the King Mahandra Trust for Nature Conservation, which was Nepal's most prominent NGO, and which encouraged local participation in natural resource

management. This was a break-through contrast to conventional protected area national parks that offered very little – if any – net benefits to local stakeholders. ACAP, in contrast, was thus established for active use of the conservation area in such a way that revenue would be generated and retained among local stakeholders while at the same time minimizing adverse environmental effects from trekker activities. ACAP was authorized to collect and retain a visitor entry fee, thus helping the conservation project to become financially self-sufficient, see M.P. Wells (1997), op.cit., p.33.

B. Aylward et al (1996), provide another good case nature tourism example from *Costa Rica's* Monteverde Cloud Forest Biological Preserve. The local community with two neighbouring towns had over 30 well-established hotels in the 1990s, with more than 90% of the visitors to the Cloud Forest Preserve staying on the average two nights, and they patronize local shops and restaurants, gasoline stations and use local tour guides, and they pay to visit local galleries, factories and a butterfly farm. Tourism based on the local human and natural resource assets thus have a substantial positive impact on the local community, since virtually all these enterprises are locally owned, and it is in their interest to maintain the preserve in pristine condition so that the visitors are attracted..

### 3.3.9. Coral Reefs and Marine Ecosystems

Investing for sustainable management of marine ecosystems is a rather recent phenomenon. Marine ecosystems are characterized by an absence of clearly defined traditional property rights, and even if they were defined, there would be technical difficulties of implementing any such rights due to the non-territorial or migratory nature of many aquatic resources. Management issues such as exclusion, enforcement and monitoring pose special problems beyond what one is faced with when designing management regimes for terrestrial parks.

While most studies of coral reefs destruction omit the value of the alternative uses that emerge from destruction, a study by H. Cesar (1996) is an exception that illustrates the costs and benefits of reef conservation compared to current reef (mis)management practice in *Indonesia*. The study indicates a considerable rate of return to conservation compared to current reef degrading practices, see table 3.3. The challenge then (as in the case of tropical forest- and "hot spot" conservation) is to identify the winners and losers among the stakeholders, and seek out possible ways of raising the financing for conservation. At the same time one must make it the attractive alternative for the stakeholders, including sufficient incentives for policing of short term rent seeking destructive behaviour which usually is illegal by the legislation of the country, but nevertheless widely practiced due to the de facto open access regimes that prevail. A major challenge facing a reef conservation program that is clearly economically beneficial to the country, is the fact that those benefiting from conservation are not the same as those perform destructive reef mining, fish blasting etc, and who are also often poor people with few alternative income earning opportunities. A crucial integral part of any such project is thus to secure a distribution of the costs and benefits that will be favourable and acceptable to the different stakeholder groups.

Studies referred to by D. W. Pearce (2005), p.101 suggest that existing annual revenues from use of reefs are substantial, and that sustainable harvesting of coral reef-related fish, shore protection and dive tourism in the Caribbean amounts to

billions of USD. This benefit and revenue is, however, threatened by the annual degradation causing losses amounting to several hundreds of million of USD.

**Table 3.3 Present value of costs and benefits of reef conservation in Indonesia, USD '000/km2**

| Activity threatening the reefs | Foregone benefits of conservation = costs of conservation | Benefits of conservation | Benefit-cost ratio of conservation |
|---|---|---|---|
| **Poison fishing** | 33 | 43-476 | 1.3 – 14.4 |
| **Blast fishing** | 15 | 98-761 | 6.5 – 50.7 |
| **Mining** | 121 | 176-903 | 1.5 – 7.5 |
| **Sedimentation due to logging** | 98 | 273 | 2.8 |
| **Overfishing** | 39 | 109 | 2.8 |

Source: H. Cesar (1996), "*Economic analysis of Indonesian coral reefs*". Environment Department, The World Bank, Washington D.C.

In *Malaysia* a willingness to pay study for the services from a coral reef marine reserve area showed considerable such willingness Price discrimination between foreign and local tourists would yield the optimal revenue from sustainable management. Such revenue would suffice to manage and police the reef reserve and a sewage disposal system[88].

### 3.3.10 Wetlands and Mangroves

Empirical evidence from several studies reviewed by D. W. Pearce (2005) op. cit. suggests that the net benefits of wetland- and mangroves conservation exceeds the benefits of conversion to other uses. His review of 6 Asian, 5 African and one Central American wetland- and mangrove conservation projects find benefit-cost ratios ranging from 0.3 (conservation is not an attractive option) to above 5 in three of the African cases studied, see his table 6.11, p. 102. The cases where conservation yield larger net benefits than conversion include conversion to aquaculture, including shrimp farming, to agriculture, woodchip production from mangroves. As explained above, pressures for conversion and actual conversion often takes place because conversion is associated with direct monetary revenue for the developer and perhaps the public sector, whereas the benefits from conservation are to a large degree non-monetized and indirect and often accrue to a different and less influential set of stakeholders.

M. P. Wells (1997), p. 12, provides an interesting example of the opportunity value of wetlands as a tourist revenue generator, based on how many tourist visits would be lost if the unique Greater St Lucia Wetland Park in *South Africa* was to allow mining instead of being developed for conservation and tourism. A comprehensive analysis estimated that at least 20,000 fewer tourists would visit South Africa each year if mining went ahead at St. Lucia. At US$ 3,750 per visit, the foregone annual revenue to the national tourist industry would be about US$ 75 million, an amount comparable to the expected revenues from mining.

[88] B.H. Yeo (2002), "*Valuing a marine park in Malaysia*." in D. W. Pearce et al (2002), "Valuing the environment in developing countries: Case studies". Cheltenham: Edward Elgar: 311-326.

Natural resource investments for the purpose of restoring wetlands have been assessed by IUCN for the Waza Logone Floodplain in *Cameroon***,** where major irrigation schemes have been implemented without due consideration of the many – and often unanticipated – damages to and degradation of the floodplain natural resource assets. This floodplain represents a critical area of biodiversity and high productivity in a dry area where rainfall is uncertain and livelihoods are extremely insecure for the 130,000 people who rely on floodplain and wetland resources for their basic income and subsistence. The reduction in the inundated floodplain area due to the irrigation scheme has resulted in substantial losses which include reduction in crop agriculture, loss of fisheries, decrease in dryland pasture, loss of plant resources, decrease in wildlife populations and reduction in surface water availability. Estimates of the economic costs of the flood loss and the value of re-inundation were carried out to see if investments in flood release measures would enhance the natural resources assets sufficiently to justify such action. It was calculated that prior to the irrigation investment, the value contributed by the natural inundation of the Waza Logone Floodplain was over USD 10 million per year, or more than USD 3,000 per square km. The irrigation scheme reduced the inundated area by almost 30%, and incurred economic losses for the local population of some USD 2.4 million annually, half of which was pasture losses. Based on the pilot flood releases of 1994 and 1997 of restoring floodplain goods and services, and the further recovery of floodplain ecology and biology, it was estimated the re-inundation options considered (a minimum-, medium- and maximum flood release option) would generate incremental economic benefits ranging from USD 1.1 to 2.3 million per year, and a positive net present value from such natural asset enhancing environment investment in the range of USD 5.6 – 7.8 million, which translates into USD 50 added economic value per floodplain-dependent member of the population[89].

IUCN also carried out a study of the economic value of wetland wastewater purification and nutrient retention functions for the Nakivubo Swamp in Kampala, *Uganda*[90]. This wetland provides a unique and important set of services such as providing a buffer service through which much of the city's industrial and domestic wastewater pass before being discharged into Lake Victoria to the Kampala dwellers. It provides the main drainage channel for Kampala. Due to its high nutrient retention capacity which effectively removes bacteria and microbes, it physically, chemically and biologically eliminates pollutants and sediments from the wastewater which passes through it, thus reducing the pollution load entering inner Murchison Bay. This wetland thus plays a significant role in maintaining the quality of both the city's water supply and the open waters of the Murchison Bay part of Lake Victoria. The economic valuation done by IUCN showed that the wastewater purification and nutrient retention services of the Nakivubo Swamp have an economic value between USD 1 – 1.75 million per year. With annual costs of maintaining the wetland capacity to provide these natural asset services (including the provision of the ecological integrity of the swamp) of only USD 235,000, investments that secures these wetland services, are highly profitable for Uganda. It saves the Government considerable costs

[89] L. Emerton (editor) (2005), "*Values and Rewards: Counting and capturing ecosystem water services for sustainable development.*" IUCN Water, Nature and Economics Technical Paper No 1, pp. 43-47, Gland, Switzerland.

[90] L. Emerton (2005). op.cit. pp.77-82.

in alternative waste and water pollution mitigation investments, and thus provides a strong argument against further drainage and reclamation of this wetland.

The Muthurajawala Wetland north of Colombo, *Sri Lanka*, harbours important biodiversity and provides a range of ecological and hydrological services[91] because it receives and retains high loads of domestic and industrial wastes, and sediment and silt loads, from both surrounding and upstream areas. Wetland plants facilitate sediment deposition before water enters the Negombo Lagoon. They also act as a filter for through-flowing waters, and assist in the removal of nutrients and toxic substances. Furthermore, it buffers floodwaters and discharges them slowly into the lagoon, and finally provides an important source of water supply for households not connected to piped water supply. Water quality and fisheries production depend heavily on these wetland services. More than 3,000 families from 26 villages depend on such downstream fisheries. Economic analysis has convincingly shown the value of investing in the protection of this wetland to exceed USD 8 million per year and USD 2,600 per hectare per year. Flood attenuation constitutes 2/3 of these benefits, and industrial wastewater treatment another 22%. Of the remaining 11%, 7% constitute benefits to agricultural production, support to downstream fisheries while the remaining 4% includes benefits from firewood, fishing, leisure, recreation, domestic sewage treatment and freshwater supplies. More than 30,000 mostly poor slum dwellers and fishing households are the main recipients of these benefits.

When assessing the value of such natural assets, the prevailing property rights regime could be crucial to the benefit valuation. Wetlands managed as open access may result in excessive exploitation and thus in reduced wetland yields compared to what would have resulted from a well managed and controlled access to the same area. It is therefore important that wetland assets are valued according to their potential value with a rational resource right regime, as opposed to the observed value when a non-sustainable management regime is being practiced.

In the wake of the Tsunami that struck South- and South-East Asia during the Christmas 2004, it became clear that having mangroves in places provides protection and resilience against extreme natural events such as massive waves. Mangroves were of course already well known for their value in protecting shorelines against storms and associated erosion and as a crucial breeding ground for many fish- and shrimp species. Detailed studies of the value of intact mangroves when the Tsunami struck have been carried out in two coastal villages on the South-East coast of *Sri Lanka*, see IUCN (2006), "Economic value of mangroves". The study estimated that the intact and healthy mangroves have an overall use value for livelihood and protection of about USD 8,000 per household, or USD 15,000/hectare/household. The protective value alone as demonstrated by the impacts of the Tsunami accounts for about USD 2,000 per household or USD 3,500 per hectare per household. The protection value includes the value of property (about 90%), livelihoods and infrastructure.

### 3.3.11 Fisheries

Fish can be considered as natural capital for development and represent a potential source of sustaining wealth for developing countries. Fisheries are exploited as a source of direct economic benefits (activity based such as employment) and as a

[91] L. Emerton (2005). op.cit. pp.83-88

source of indirect economic benefits (resource rent generated, extracted as taxes and re-invested into the economy) and also a country's export earnings. For example, in *Guinea-Bissau,* the fisheries sector provides half the funding for the regular budget.

According to FAO around 95% of the people employed as full-time fishers are from developing countries, which also account for over 60% of fisheries production, and fish is the most valuable agricultural commodity traded internationally. However, whilst the fisheries sector was judged to be significant (in either growth or poverty terms) in twelve African countries, the sector was explicitly discussed in detail as part of the overall strategy in only three national Poverty Reduction Strategies (*Ghana, Guinea and Senegal*)[92].

This is particularly disturbing since small-scale fisheries dominate in tropical developing countries, and the numbers of small-scale vessels and fishers often greatly exceed those in industrial fisheries. The poverty reduction challenges are magnified because these small-scale (often subsistence-based) fisheries are often based in rural communities, spread over a large geographic area (such as the coasts of South-East Asia and the Pacific Islands, and along the Mekong and Amazon Rivers and their floodplains), and are often politically marginalized from the centres of fisheries decision-making. Furthermore, the fisheries are often multi-species, multi-gear, and multi-scale, operating in ecosystems where hundreds of different species of organisms may be commercially harvested.

Fisheries tend to be open access common property assets and communal management is rarely strictly enforced. The consequence is very often over-fishing. Cost-benefit analysis of fisheries compare the benefits of better management regimes with the costs of establishing those regimes. A major challenge facing the authorities that seek to introduce and enforce sustainable management regimes for currently over-fished stocks, is how to deal with the unavoidable increase in unemployment among poor fisherfolks resulting from the necessary reductions in fishing efforts.

Where over-fishing and stock depletion has been extensive, such as has been the case with marine fisheries in the *Philippines*, a substantial reduction catch would be required to secure maximum overall profits from fisheries[93]. However, given the fleet structure, the way the fisheries are organized and the labour intensive techniques applied, massive unemployment would result from the reduced harvesting. In fact, with close to half a million fisherfolks becoming unemployed as a result, the cost of the unemployment would have to be almost twice that of per capita income. This shows that (a) it would not be feasible to switch quickly to a sustainable yield fisheries regime, and (b) a gradual change combining several reform components (a strong monitoring and licence regime, combined with efforts to prevent recruitment to the industry, and a transferable quota scheme to encourage high-cost fishermen to sell their quotas to low-cost fishermen and then to exit the industry) would be needed to improve the deteriorating asset situation.

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[92] A. Thorpe et al (2004), " *African poverty reduction strategy programmes and the fisheries sector: Current situation and opportunities.*" African Development Bank.

[93] D. Israel and C. Banzon (1998), "*Overfishing in the Philippine marine fisheries sector*." EEPSEA Research Report, Singapore

The 2004 World Bank report, "*Saving Fish and Fishers: Toward Sustainable and Equitable Governance of the Global Fishing Secto"*, concluded that:

"*Weak governance is the main underlying cause of over-fishing. The common access nature of the fishery resources (with often conflicting notions about whether wild fish stocks are the property of the nation, the community, or the individual fisher); technical and enforcement difficulties in controlling the levels of catch; and the migratory character of the fish resources and the resulting supranational institutional requirements for effective control all provide great challenges to the governance structure, which many international, regional, and national institutions have not been able to meet".*

The same report suggests that all fisheries regimes comprise five basic components, embedded in a wider social and political framework:

- The Fisheries Management System;
- The Monitoring, Control, and Surveillance System (MCS);
- The Fisheries Judicial System;
- Decentralized decision-making and collaborative management (co-management);

Definition of the access rights.

The above crisis description suggests that the most urgent investment needs in the fisheries sector of developing countries comprises investments to strengthen these five components, i.e. human and institutional capital investments to remove tensions and conflicting interests among agencies with interests in the fisheries resources deriving from the legal and institutional framework, and ensure good governance and power to enforce sustainability-enhancing local, national and international rules and regulations governing the rights of the poor and securing a sustainable management of the fish stocks. The World Bank (2004), op.cit finds that increasingly, co-management is being considered as a tool for positively impacting on poverty reduction efforts in the fisheries sector of developing countries. Co-management arrangements range from those that are largely consultative, to those in which the fishers design, implement, and enforce laws and regulations with advice from the government

A case of successful regime change to overcome overfishing problems has been observed for shrimp fisheries in *Madagascar,* where a new set of long-term tradable licences was established in 2000 and appears to be working. The benefit-cost ratio of this intervention has been estimated to an impressive 1.5[94].

[94] See D.S. Rojat et al (2004), "*Co-management of the shrimp fishery in Madagascar*." IFFET Proceedings, Japan

# 4. Integration of Environment in Poverty Reduction Strategy Papers (PRSPs)

## 4.1 The Slow Road to Integration and Mainstreaming

### 4.1.1 The Global Overview

Poverty Reduction Strategy Papers (PRSP) describe a country's macroeconomic, structural and social policies and programs to promote growth and reduce poverty, as well as associated external financing needs. PRSPs are prepared by governments through a participatory process involving civil society and development partners, including the World Bank and the International Monetary Fund (IMF).

In Bojø and Reddy's (2003) review[95] of PRSPs and Millennium Development Goal No 7 (MDG7) ensuring environmental sustainability, they found that about 50 countries had prepared 22 interim- and 28 full PRSPs. This was an increase in PRSP reporting from 40 in total in their 2002 review[96]. They asked the following three questions:

- To what extent do PRSPs define and adopt targets and indicators that align with those of MDG7?
- To what extent do the available data allow tracking of progress with respect to MDG7?
- When data are available, what are the trends, and how can the data be effectively utilized to examine the status and trends of countries in relation to MDG7?

They found that:

- Only 12 of the 28 full PRSPs included some information on the baselines and targets in line with the MDG7;
- None of the 22 interim PRSPs had any discussion on the long-term perspective;
- Within those 12 PRSPs that had some such information, attention was almost exclusively on water and sanitation;

But they also found that available data could be used to document the status and trends of relevant MDG7 indicators, and their analysis of the available data on targets and indicators of MDG7 showed that for the PRSP countries reviewed the following MDG7-relevant changes had taken place during the 1990s:

- Growth in access to safe water is still low in several countries of Africa, reflecting the challenge in meeting the MDG7 target, see figure 4.1 below;

[95] Bojø, J. and R. C. Reddy (2003), "*Poverty reduction strategies and the Millennium Development Goal on environmental sustainability – opportunities for alignment"* . Environmental Economics Series Paper No 92, World Bank Environment Department, September 2003

[96] Bojø, J. and R. C. Reddy (2002), "*Poverty reduction strategies and environment: A review of 40 full and interim PRSPs"* Environment Development Paper No 86, The World Bank Environment Department, Washington D.C.

- Most countries will not be able to reach the MDG7 sanitation target with the current pace of improvement in access, see figure 4.2 below;
- Progress on secure tenure is modest considering the multiple challenges involved in achieving this MDG7 target;
- The proportion of people relying on traditional fuels remains high, particularly in rural Africa, and is likely to remain so within the MDG horizon;
- The rate of deforestation has marginally declined, with marginal improvements in the forest cover of Central Asia, but a continuous loss of in the forest cover in Africa;
- Land area declared protected has grown significantly with additional area brought under legal protection.

They concluded that a major effort is needed to raise the level of attention to MDG7 in the PRSPs, but observed that coverage of environmental issues had improved considerably in the revisions from interim to full PRSPs.

In their most recent and more in-depth follow up report, Bojø et al's (2004)[97] review coverage is expanded to 39 full PRSPs, 14 interim PRSPs, 21 Progress Reports and 21 Poverty Reductions Strategy Credits (PRSCs). The coverage of the MDG environmental indicators in the full PRSPs has been significantly expanded from May 2003 to May 2004, see table 4.1 below.

**Table 4.1 Change in Coverage of the MDG Environmental Indicators in full PRSPs from 2003 to 2004**

| Variable | Area under forest | Solid fuels/traditional energy | Access to safe water | Access to adequate sanitation | Secure tenure |
|---|---|---|---|---|---|
| **Baseline** | 10 > 11 | 7 > 8 | 24 > 32 | 18 > 24 | 0 > 0 |
| **Targets for 2015-MDG horizon** | 1 > 1 | 0 > 0 | 12 > 14 | 5 > 6 | 0 > 0 |
| **Targets for 2004-06-PRSP horizon** | 3 > 3 | 1 > 2 | 14 > 21 | 9 > 15 | 2 > 2 |
| **Capacity, finance and monitoring** | 7 > 10 | 6 > 8 | 8 > 12 | 6 > 9 | 5 > 6 |

Source: Bojø et al (2004), op. cit. , p.18, and Bojø and Reddy (2003), op.cit., p.10

Bojø et al (2004) op.cit. address four major areas of environmental mainstreaming in PRSPs:

[97] Bojø, J., K. Green, S. Kishore, S. Pilapitiya, and R. C. Reddy (2004), "*Environment in poverty reduction strategies and poverty reduction support credits",* Environment Economics Paper No 102, World Bank Environment Department, November 2004.

- Diagnosis of environmental issues;
- Analysis of poverty-environment links;
- Environmentally relevant actions; and
- The extent to which participation and consultation processes have allowed environmental concerns to be heard.

For each of 17 criteria they assessed the PRSP reports using scores ranging from 0 (no mention), 1(mention, but no elaboration), 2 (elaboration), to 3 (good practice). They computed country score in the form of unweighted averaged. For the PRSP Progress Reports they focused on process and the five criteria relevant for implementation, monitoring and evaluation; a total of six variables to rate for each progress report. The same six variables are applied in the PRSC assessment, but here a context variable is added so that the score can reflect how effectively environment is mainstreamed. What this latest PRSP review finds is that there is:

- High variance around a low, but improving average score on the 0 – 3 scale from a low 0.9 in the 2002 review, via 1.3 in the 2003 review to 1.5 in this latest one of 2004;
- Slow improvement on the diagnosis of issues and opportunities score covering four aspects, from 1.0 to 1.2 in the latest assessment,
- The average score for the 7 items listed under analysis of poverty – environment links improved marginally from 1.2 to 1.3 in the 2004 assessment;
- As for proposed responses the average score across the 5 rated aspects improved from 1.8 to 2.1;
- The average score for the process item improved from 1.6 to 1.8, mostly reflecting the improvements accruing when interim PRSPs are turned into full PRSPs;
- The full PRSPs have environment significantly better mainstreamed than the interim ones; Among the 53 developing countries that had submitted interim or full PRSPs by June 2004, the average score was 1.5, covering a range from 2.4 to 0.3., with 29 of 31 scores at or above 1.5 being full PRSPs, while only 10 of the remaining 22 with a below 1.5 score were full PRSPs. Whereas the average score full PRSPs was 1.7, it was only 0.8 for the interim PRSPs;
- There are high-scoring countries found in all regions, and several of Norway's partner countries fall in this category (Mozambique, Zambia, Sri Lanka, Nicaragua, as well as Cambodia and Bolivia);
- However, only 14 out of the 53 reviewed PRSPs have targets and indicators aligned with the MDG7,
- As in the previous reviews, attention is almost entirely focused on the water and sanitation targets.
- Environmental health issues get much more attention than natural resources management issues and biodiversity;
- Among the environmental health issues, focus is mostly on water and sanitation, whereas indoor air pollution is often neglected in spite of the heavy reliance on solid fuels, particularly in Sub-Saharan Africa;
- *There is no significant correlation between a well mainstreamed PRSP and implementation and monitoring of poverty reduction mainstreaming.*

- PRSCs score 1.4 on average. They are based on a detailed policy matrix constituting a multitude of a multitude of benchmarks and actions, of which only one or two are environmental benchmarks. They often tend to start out with a focus on health and education, and later on in the sequence perhaps turn to e.g. environment as a priority. Only 4 PRSCs had environment listed at all, and in each case as a secondary theme. Since PRSCs are basket funding it is inherently difficult to associate such basket funding directly with environmental actions.
- In each PRSC where the score is low, one should recall that (a) a PRSC should not be expected to respond across the board to all priorities in a PRSP, (b) Other donors than the world Bank may have a comparative advantage to respond to the environmental issues in a particular economy, (c) There may be other World Bank activities that more directly respond to the PRSP's environmental priorities, see e.g. Hansen and Hansen (1999)[98], and (d) There is generally a sequence of PRSCs in any given country, and the thematic attention tends to shift over time.

All of the coping activities reviewed in this report require political commitment and implementation of decisions. *The political leadership at local, national and international levels are at the same time the main obstacle and the solution to the successful achievement of the MDGs.*

An important instrument for the low-income developing countries in the strive to succeed here is their development of and commitment to their PRSPs. Much technical assistance from donor agencies is now directed to accelerate this process. This process provides a promising mechanism for incorporating the fight against disease by means of improved water and sanitation into a more comprehensive development strategy, because it impels governments and civil society to look across a range of policies in the closely interlinked fields of health, education, water and sanitation, environmental management, gender relation, and other areas to tailor-make the most effective and equitable national solutions. For example, safe water and sanitation, backed by proper hygienic behaviour such as hand washing and the use of soap, could dramatically reduce the incidence of many diarrhoeal- and other waterborne diseases that kill millions of children each year. At the same time, it is well known that such behavioural change require literate mothers, and this again means a dramatically increased emphasis on the education of children in general and girls in particular. Education thus constitutes a key facilitator of environmental awareness which in turn improves the climate for environmental investments.

Two deeply concerning observations emerge in this context.

- *The first is that very few national PRSPs prepared so far actually identify, target and make significantly increased commitments to such actions as priority issues.*

[98] Hansen, Jørgen Karthum and Stein Hansen (1999)"*Integrating environmental concerns into economy-wide policies in developing countries: the role of multilateral development banks*."pp. 45-69, Environment and Development Economics, Vol 4, part 1, February 1999.

- *Second, the local capacity to undertake and implement the PRSPs is not at all in place, and the PRSPs do not explicitly make commitments to appropriately deal with this shortcoming. As a result, the likelihood of achieving the MDGs becomes small. Clearly, the politicians bear the responsibility for the outcome.*

There should be no shortage of information and "best case" examples to convince politicians of what works and what does not in different settings. However, politicians understand that re-election depends in many cases on their having "delivered" something to their constituents in general, or to interest groups they are aligned with, in particular. Consequently, there is enormous immediate political value in keeping water prices and the direct fees associated with other water services (e.g. sewer connection fees) as low as possible. This political setting characteristic and its practical "no reform" outcome are at the core of the obstacles to reaching the MDGs, and has to be addressed in the open if such societies are to find a way to solve the problem of under-funded and under-performing water systems, see Moss et al (2003).

The poor seldom have much say in such development debates. In fact, the poor are rather invisible and often end up with no more than promises of water free of charge, which always turn out to be a non-performing promise.

Politicians, however, eager to contribute to reaching the MDGs, should seek popularity in order to be re-elected, by carefully preparing an agenda focusing on the fact that the poor are willing and able to pay the full price of water, simply because the real world alternative they face is so much worse! The decision makers should carefully prepare such projects so as to convincingly show that the distorted, subsidized prevailing alternatives are ineffective, inefficient and non-sustainable.

### 4.1.2 The Overall Performance of Partner Countries with PRSPs

Many present and former Norwegian partner developing countries had submitted full or interim PRSPs by June 2004, according to Bojø et al (2004). Furthermore, many of these partner countries scored high, with **Zambia** taking first place with a score of 2.4, followed by **Mozambique** in shared second place (with Ghana and Cambodia) with a 2.2 score. Then followed **Sri Lanka, Bolivia and Nicaragua** in places 9 and shared 10$^{th}$ with score 2.1 and 2.0 respectively, with **Kenya and Viet Nam** in 12$^{th}$ place and a score of 1.9, before **Cameroon and Madagascar** in 14$^{th}$ place with score 1.8. Malawi, and Ethiopia also scored slightly above the average, whereas **Bangladesh and Pakistan** came below the average with score 1.4 in 36$^{th}$ place, followed by **Uganda and Nepal** with a 1.1 score in 41$^{st}$ place , and finally, **Tanzania** with score 0.9 in 44$^{th}$ place. All of these, except Kenya, were full PRSPs, and the Kenya report was rated the best among the interim ones.

*However, submitting a well-worded PRSP with the help of external experts in order to please donors, does not secure ownership, of and commitment to, the expressed ambitions.* The available check on consistency is found by comparing the PRSP ambitions in the form of explicit proposals in the PRSPs and implementation of these found in the PRSP progress reports. The PRSP response scores on proposal for implementation averaged an impressive 2.1 as compared to a much less impressive 1.4 average score derived on the basis of the PRSP Project reports, see Bojø et al (2004), table 7.

Bojø et al (2004), pp 25 – 30, highlights the **Sri lanka** PRSP of 2003 as a good practice case which they present as a demonstration case because they consider it as reasonably successful in mainstreaming key environmental issues following the National Environment Action Plan and a State of the Environment Report in 2001 which had identified six priority environmental issues from a poverty perspective. This PRSP established poverty-environment linkages quite well, particularly in the areas of environmental health, the importance of land tenure in property rights, and issues related to gender and environment. As a response to these problems the country had identified the need to strengthen environmental management capacity and recommended a series of regulatory and legislative changes that would promote more effective environmental management[99].

*In the case of Norwegian partner countries the performance from this perspective is not at all impressive, since they all are found to perform significantly poorer on implementation than on promises, reflecting then unsurprising tendency to be overly ambitious where there is hardly any penalty for not performing*.

**Nicaragua** came out with an overall progress reporting score of 2.0 for 2001-02, which was slightly less than their 2.3 score on the proposal dimension in their PRSP, but their implementation performance then dropped significantly to a low 1.3 in their progress report for 2002-03. **Mozambique**, on the other hand, with a highly impressive proposed MDG7 program in it's PRSP (score 3.0) only scored 1.7 on implementation in it's 2003-04 Progress Report, but this implementation score had after all increased dramatically from a low 0.6 in their 2002-03 Progress Report. Against a proposal score of 1.6, **Uganda**'s implementation score increased marginally from 1.2 in the 2000-01 PRSP Progress Report, to 1.4 in the 2001-02 Progress Report and further up to 1.5 in the 2002-03 Progress Report. Also for Tanzania with a below average proposal score of 1.5, improved it's poor implementation performance score from a low 0.8 in the 2000-01 Progress Report to 1.2 in the 2001-02 Progress Report. For the remaining three Norwegian partner countries for which implementation performance scores have been computed there is no change over time. **Ethiopia**'s implementation score falls behind the 2.0 proposals score of 2002-03 with a 1.5 implementation performance (after all slightly above the average over all countries in the sample), whereas **Viet Nam** – with a 2.3 proposal score – ends up with the same implementation score for the same period. Finally, **Malawi** – with an impressive proposal score equal to that of Viet Nam – reached no higher than 0.8 in performance in 2002-03.

As regards environmental mainstreaming in PRSCs of Norwegian partner countries, Bojø et al (2004), p.24, presents aspects of good practice for **Nicaragua, Tanzania and Uganda** as follows:

- Although the **Nicaragua**n PRSC is a Structural Adjustment Credit (SAC), a separate annex provides details concerning environmental linkages to other World Bank investment projects; several environment and natural resources sectors are discussed and actions are summarized.

[99] With the recent escalation of the civil war, it is hardly reasonable to expect this promising trend to be sustained.

- In **Tanzania** the World Bank used the PRSC to push the environmental management process forward. There were specific indicators associated with the natural resources sectors. There was close collaboration with UNDP. Environment and natural resources sectors were included in the policy matrix. Environmental specialists in the country office participated regularly in the PRSC.
- There was inclusion of environmental specialists in the **Uganda** PRSC team which progressively tended to accept environment as an integral part of the operation. There was donor support of environment and natural resources focus and persistence in pushing the PRCS team on this. An existing investment environmental management project provided parallel support to such PRSC initiatives. There was inclusion of key environment indicators in several sectors and the policy matrix was increasing the involvement of environment and natural resources with sequential operations.

## 4.2 Water Supply and Sanitation in PRSPs

### 4.2.1 The Global Trends

Water and sanitation is reported by Bojø et al (2002), (2003) and (2004) op.cit. to be the environmental dimensions getting most attention in the PRSPs. This is not surprising since lack of safe water and adequate sanitation constitute by far the most important of the environmentally induced causes of loss of DALY, with some 7% of the total loss of DALY in developing countries, see D.W. Pearce (2005) op. cit.

During the 1990s significant improvements in access to safe water were reported in Asia, and the MDG-target for water supply is likely to be achieved in several countries. However, universal access still remains a distant goal, and Sub-Saharan Africa continues to hold almost one third of the world population without access to safe water supply.

UNDP's "Human Development Report 2006" (HDR2006) provides striking illustration of the likelihood of reaching these vital MDG targets, see table 4.2 below.

Comparing the two right-side columns in table 4.2 shows that on a global scale (the bottom line in the table) a "business as usual" development would be close to providing access to an "improved water source" by 2015. However, this global pictures covers over dramatic variation between regions. On the one hand, the table shows that while Asia and Latin America were well on their way towards reaching this MDG-target given the rate at which people access from 1990 to 2004, the gap was widening at an alarming rate in Sub-Saharan Africa, indication an annual average increase in the gap of some 12.5 million people between 2004 and 2015.

For sanitation (the bottom half of table 4.2) the situation is a lot more alarming for three reasons.

- First, the MDG target measure used in the HDR2006 is "*access to improved sanitation*". In 2000 it was estimated that this shortfall was 400 million. However, if one were to apply "*adequate sanitation*" as the MDG target, this year 2000 shortfall would be somewhere between 850 and 1130 million[100].

[100] Hansen, Stein and Ramesh Bhatia (2004), op. cit., p.4

- Second, the global annual gap with a "business as usual" (1990 – 2004) development from 2004 to 2015 for access to "improved sanitation" would result in an annual gap increase of some 43 million people.
- Third, this alarmingly growing gap is concentrated in the world's two poorest regions; namely Sub-Saharan Africa with an average annual gap of 20.5 million, and South Asia with an average annual gap of 17.8 million.

**Table 4.2 The Millennium Development Goal Target: Past Performance and future Targets for Water and Sanitation**

People with access to an improved water source (millions)

| | | | | Average annual number of people | |
|---|---|---|---|---|---|
| | 1990 | 2004 | Target 2015 | Gaining access 1990–2004 | Needing access to meet the target 2004–15 |
| Sub-Saharan Africa | 226.6 | 383.8 | 627.1 | 10.5 | 23.1 |
| Arab States | 180.1 | 231.8 | 335.8 | 4.7 | 6.5 |
| East Asia and the Pacific | 1,154.4 | 1,528.2 | 1,741.2 | 22.9 | 24.3 |
| South Asia | 840.6 | 1,296.4 | 1,538.1 | 32.5 | 22.1 |
| Latin America and the Caribbean | 334.3 | 499.0 | 627.8 | 9.0 | 6.1 |
| World | 2,767.7 | 4,266.4 | 5,029.5 | 79.5 | 82.4 |

People with access to improved sanitation (millions)

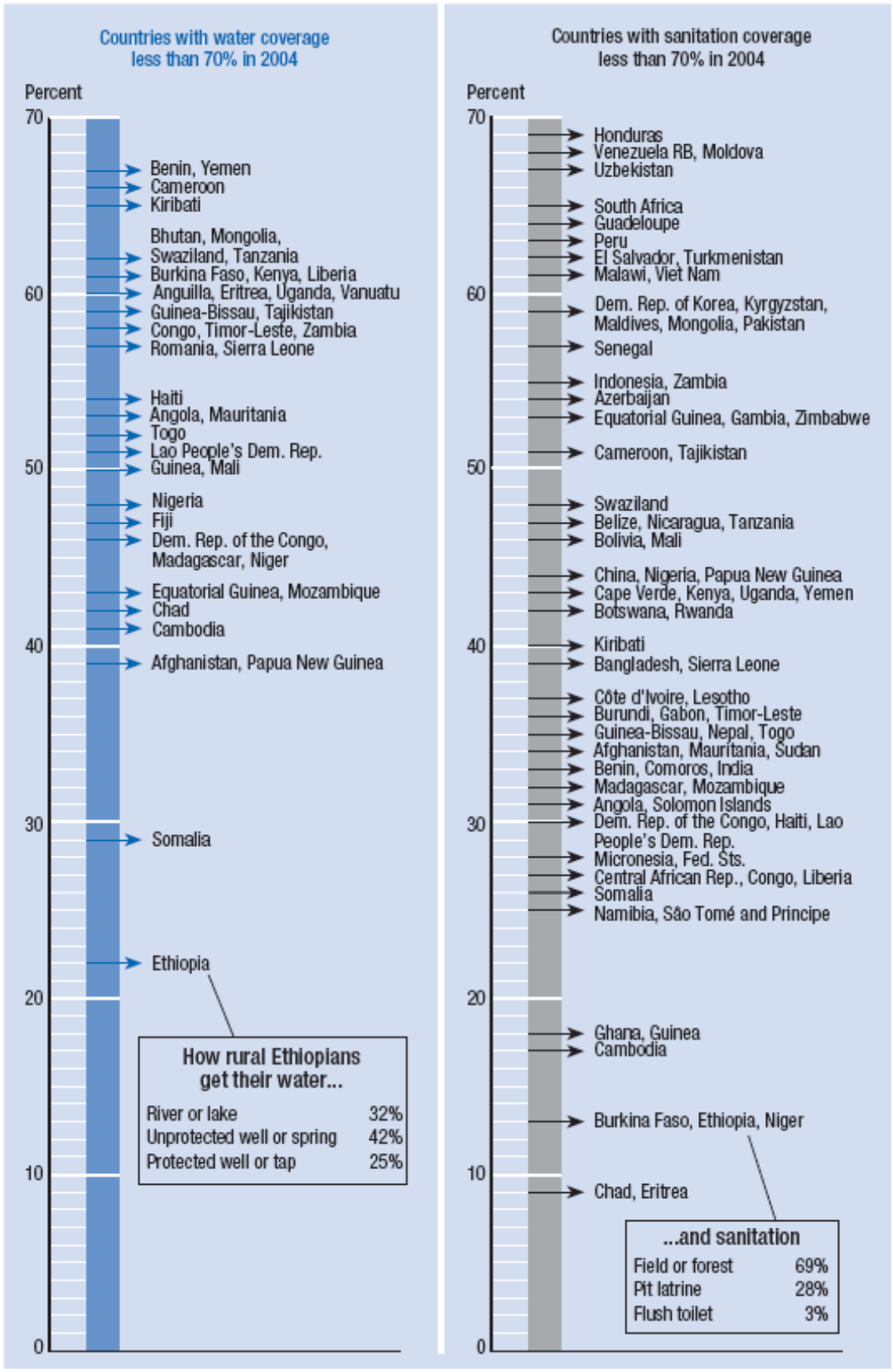
| | | | | Average annual number of people | |
|---|---|---|---|---|---|
| | 1990 | 2004 | Target 2015 | Gaining access 1990–2004 | Needing access to meet the target 2004–15 |
| Sub-Saharan Africa | 148.4 | 256.5 | 556.0 | 7.2 | 27.9 |
| Arab States | 120.6 | 196.0 | 267.2 | 4.9 | 6.9 |
| East Asia and the Pacific | 467.0 | 958.2 | 1,284.9 | 32.0 | 33.6 |
| South Asia | 242.9 | 543.8 | 1,083.3 | 24.7 | 42.5 |
| Latin America and the Caribbean | 279.6 | 423.2 | 492.2 | 8.6 | 8.4 |
| World | 1,456.9 | 2,663.9 | 3,994.0 | 77.5 | 120.4 |

Source: Calculated on the basis of WHO and UNICEF 2006 and UN 2005.

Source: Human Development Report 2006, UNDP.

These MDG7-challenges are broken down by country in figure 4.1 below. These findings are further confirmed in analyses by the World Bank, see Bojø and Reddy (2003) op.cit. As a basis for assessing the actual progress on water supply over its 1990 baseline, they constructed country specific targets for the MDG end year of 2015 in terms of halving the proportion of the population without access to improved water source at 1990 level for the sample of 44 country that had prepared interim or full Poverty Reduction Strategy Papers having data on water supply. They converted the estimated access rates between 1990 and 2000 into annual growth rates of access. Next, they compared the estimated year 2000 access rates for each country to the country targets for 2015 and converted the gaps into annual average growth rates for each country needed to reach the MDG target access rates.

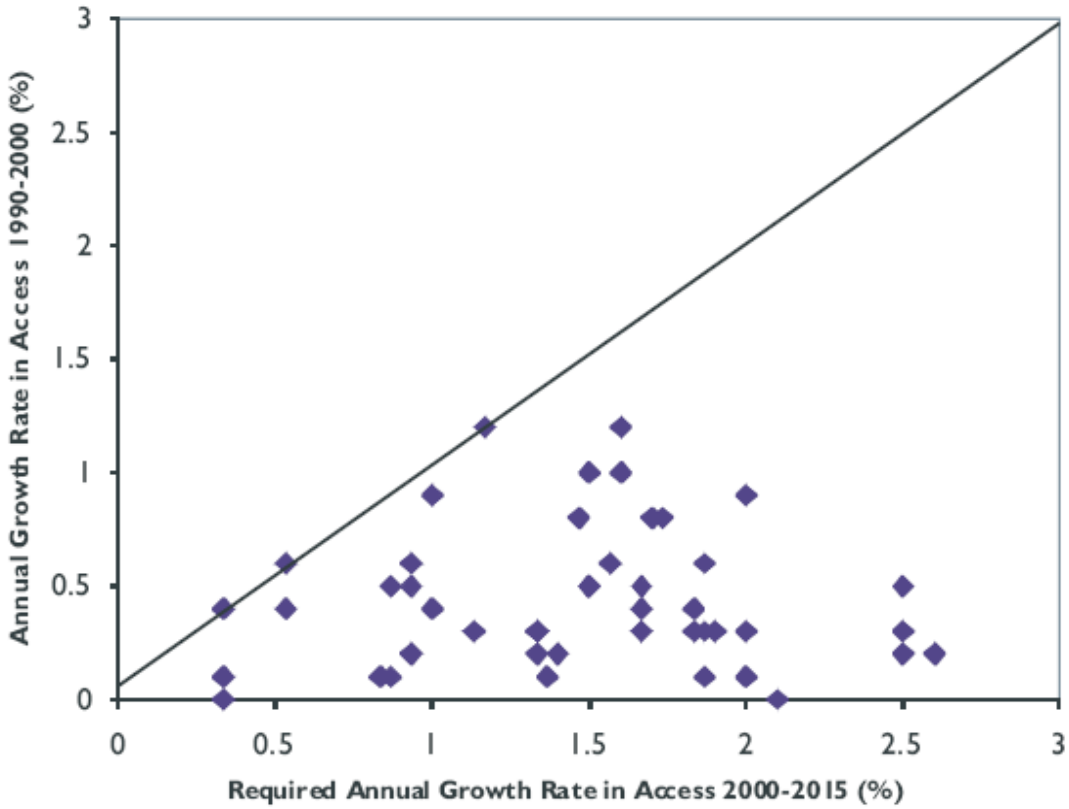
**Figure 4.1 The long road to universal water and sanitation coverage**




Source: HDR (2006), op.cit., figure 1.3

Figure 4.2 illustrates the outcome of this analysis. It clearly shows that progress towards achieving the MDG improved water access target has been very slow. Only 3 out of the 44 PRSP countries examined are in line with the required water access growth rates, and two more are close to the required growth rate. However, not one PRSP-country is *above* the required growth rate and 39 are significantly below, many of them being so far below that access coverage is likely to worsen by 2015. For these countries this MDG will be even more remote than it is today.

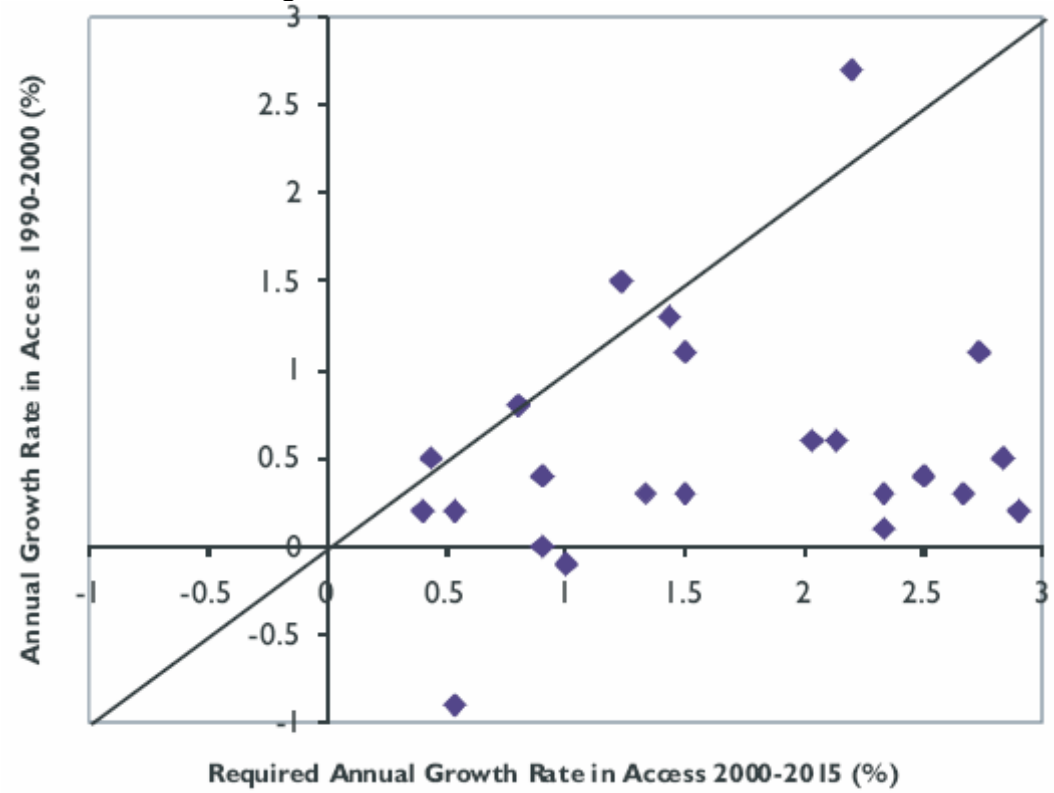
**Figure 4.2: Achieved and required access rates in reaching the water supply target**




Source: Bojø, J. and R. C. Reddy (2003), "*Poverty reduction strategies and the Millennium Development Goal on environmental sustainability – opportunities for alignment"*. Environment Economic series paper No. 92, the World Bank, Environment Department, Washington D.C. Calculation based on WHO (2000), "*Tools for assessing the O&M status of water supply and sanitation in developing countries.*" World Health Organization, Geneva, and WHO and UNICEF (2000), "*Global water supply and sanitation assessment report 2000."* WHO, Geneva.

This suggests a significant under-investment in improved water supply relative to what would be optimal from a societal perspective. Considerable increase in investment, policy support and private sector interventions are required to enable these countries to be on track and to proceed towards the targets. So far – it is now almost half way from 2000 to 2015 – there are very few signs that the required changes in investments and policy commitment that would facilitate such investments are forthcoming.

**Figure 4.3: Achieved and required access rates in reaching the sanitation target**




Source: Bojø, J. and R. C. Reddy (2003), "*Poverty reduction strategies and the Millennium Development Goal on environmental sustainability – opportunities for alignment".* Environment Economic series paper No. 92, the World Bank, Environment Department, Washington D.C. Calculation based on WHO (2000), "*Tools for assessing the O&M status of water supply and sanitation in developing countries.*" World Health Organization, Geneva, and WHO and UNICEF (2000), "*Global water supply and sanitation assessment report 2000."* WHO, Geneva.

Access to improved sanitation refers to the proportion of the population disposing human waste through facilities such as flush latrines, sewer, septic tank, and simple pit or improved pit latrines properly constructed, maintained and used, see WHO (2000). Both in isolation and jointly with safe water supply, improved sanitation confers significant benefits, as seen from the references above. And yet, empirical observation and access data suggests that such investments and maintenance is accorded low priority and often extreme neglect in low income countries where the net benefits could be very substantial. Unawareness of the importance of hygiene is clearly part of the explanation for the low sanitation coverage in most PRSP countries, and the poor quality of such services is compounded by inadequate water supply, improper designs, - maintenance and -operation of sanitation systems.

In spite of the low baselines (for those few PRSP-countries that have such 1990 baseline data) and unimpressive MDG7 targets for sanitation access, the large majority of PRSP countries are about to severely underachieve relative to the MDG7 sanitation target. Six such countries had an annual growth rate in sanitation facility improvements in the 1990s that – if sustained – would lead to MDG7 target

achievement in 2015, but the remaining 17 such countries would not reach this goal, and 14 of these would be far from it, and the population without sanitation coverage is expected to increase sharply, see figure 4.3.

In conclusion, even if an increasing number of PRSP countries have included data on improved access to water and sanitation in their PRSP, it does not follow that their investments are increased and sector policy reforms initiated and instituted that will contribute towards reaching the stated MDG7 targets. So far there is very little evidence to suggest that preparing and completing a PRSP has lead to any measurable increase in such investments and maintenance activities, or to policies that would promote and facilitate such initiatives.

### 4.2.2 Environmental Coverage in Partner Countries' PRSPs

Baselines (1990) and targets (varying years) in the full PRSPs of Norway's partner countries as presented in Bojø and Reddy (2003) op. cit. are summarized in the following for water supply and sanitation and compared to the water and sanitation status in table 7 in UNDP's Human Development Report 2006 (HDR2006) op. cit. Even if the Bojø and Reddy (2003) op. cit. variables and data are not identical to -, and therefore not directly comparable to those of the HDR(2006), the comparison of the respective trends from baselines (1990) to latest observation/stated target in the two reports provide a sound basis for indicating to what extent stated target have been or can realistically be assumed to be met. From figure 4.1 above one can trace the Norwegian partner countries and the length of their "road" to meeting the MDG7 water and sanitation targets (it should be noted that some such countries, e.g. Nicaragua, is not included in the water figure of 4.1 because they had already reached 79% improved water coverage in 2004, see HDR (2006), table 7).

**Bolivia**
The Bolivian PRSP provides no 1990 baseline for *access to safe water or adequate sanitation*, and no explicit actions with regard to safe or improved water provision. The PRSP briefly refers to a program for constructing wastewater and solid waste treatment plants.

**Ethiopia**:
The baseline average *access to safe water*[101] is 30% coverage according to Bojø and Reddy (2003) op. cit. The PRSP-targets stated is 31% rural- and 82.5% urban coverage by 2005. Clearly, these targets were highly unrealistic, since – according to HDR2006, table 7, the overall *percentage of the population with sustainable access to an improved water source* had dropped from 23% in the baseline year 1990. to 22% in 2004. At this rate of investment it is highly unlikely that this MDG7 target for 2015 is within reach.

[101] Although different authors use different definitions, this is used interchangeably with "improved water source" as defined by the MDG7 target in the following.

For *access to adequate sanitation*[102] the baseline was 29% as the national average, whereas the target was 35% by 2005, according to Bojø and Reddy (2003). Again, this target was clearly overambitious. The HDR2006 states that *population with sustainable access to improved sanitation* was only 3% in 1990 (in other words, a very much lower baseline) and had increased marginally to 13% in 2004. It is highly unlikely that the target in the PRSP report of 35% national coverage for 2005 was anywhere near being within reach.

**Malawi**:
The 1990 baseline average *access to safe water* is 65.6% coverage according to Bojø and Reddy (2003) op. cit. The MDG target stated is 84% coverage by 2005. This was to be achieved by rehabilitation of rural gravity fed piped water schemes and multipurpose earth dams. According to HDR2006, table 7, however, the overall *percentage of the population with sustainable access to an improved water source* was only 40% in the baseline year 1990. and had increased to 73% in 2004. This achievement is rather impressive. If it reflects reality and is sustained, it is not unlikely that the improved water access MDG7 target of 2015 is within reach.

For *access to adequate sanitation* the national baseline was 81.4%, with no stated target for 2005, according to Bojø and Reddy (2003) op. cit.. The HDR2006 states that *population with sustainable access to improved sanitation* was 47% in 1990 (in other words, a very much lower baseline) and it had increased marginally to 61% in 2002. If it reflects reality and is sustained, it is not unlikely that the improved sanitation access MDG7 target of 2015 is within reach.

**Mozambique**:
The baseline *access to safe water* is 12% rural coverage and 44% urban coverage according to Bojø and Reddy (2003) op. cit. The targets stated is 40% rural coverage and 50% urban coverage by 2004. Legislation reforms to support private participation in water supply were to facilitate this achievement. According to the HDR2006, overall *percentage of the population with sustainable access to an improved water source* was 36% in 1990, and this had increased to 43% by 2004. If it reflects reality and is sustained, it is unlikely that the improved water source access MDG7 target of 2015 is within reach.

For *access to adequate sanitation* there was no national baseline, but a stated target for 2004 to increase the system of improved latrines by 50%, according to Bojø and Reddy (2003) op. cit. The HDR2006 states that *population with sustainable access to improved sanitation* was 20% in 1990, and had reached 32% in 2004. While this is a quite impressive progress, it is unlikely that the MDG7 target for 2015 is within reach.

**Nicaragua**:
The baseline (1990) *access to safe water* is 39% rural coverage and 66.5% urban coverage according to Bojø and Reddy (2003) op. cit. The targets stated is 100% coverage by 2015, to be achieved by means of increased national potable water

[102] Different authors us this interchangeably with " improved sanitation" as defined by the MDG7 . The statistics used in the following are taken from table 7 in the HDR 2006 which is the same as in the World Development Indicators database of the World Bank, and appear to reflect "improved" as opposed to "adequate" (which is more restrictive in what is acceptable), but Bojø and Reddy (2003) op.cit. are not clear on what they actually use.

coverage by 1.4% per year and 2.4% per year in rural areas. HDR(2006), table 7, reports improved water coverage to have reached 79% in 2004, up from 70% in 1990. This means a much slower growth rate that listed in Bojø and Reddy (2003), op.cit., but even starting from a much higher coverage level, sustaining the modest coverage growth rate of the 1990s, is unlikely to achieve the stated target.

For *access to adequate sanitation* the national baselines were 70% for rural – and 64.8% for urban areas, with a stated target for 2004 to reach 95% coverage, according to Bojø and Reddy (2003) op. cit. The PRSP states that the national target is to increase access to sanitation by 4% per year, and that this growth rate for urban areas is to be 1.7% per year. The HDR2006 states that *population with sustainable access to improved sanitation* was 45% in 1990, and had reached 47% in 2004. This is hardly any progress. It is therefore unlikely that the MDG7 sanitation target for 2015 is within reach if the same rate of investment continues.

**Sri Lanka**:
Sri Lanka is presented as a PRSP "good practice case" in Bojø et al (2004), op.cit. The baseline (1990) *access to safe water* is 74% rural coverage and 97% urban coverage according to Bojø and Reddy (2003) op. cit. The targets stated is 100% coverage by 2015. HDR(2006), table 7, reports improved water coverage to have reached 79% in 2004, up from 68% in 1990. This means a relatively slow growth rate and sustaining the coverage growth rate of the 1990s, is unlikely to achieve the stated target.

For *access to adequate sanitation* the national baselines were 72% for rural – and 91% for urban areas, with no stated target for 2015 coverage, according to Bojø and Reddy (2003) op. cit. The HDR2006 states that *population with sustainable access to improved sanitation* was 69% in 1990, and had reached 91% in 2004. This is impressive progress. It is therefore likely that the MDG7 target for 2015 is within reach if the same rate of investment continues.

**Uganda**:
There is no baseline (1990) *access to safe water* coverage according to Bojø and Reddy (2003) op. cit. and no coverage goal by 2015. The PRSP states that boreholes are being drilled, springs and wells are being protected in order to secure quality of water sources. HDR(2006), table 7, reports improved water coverage to have reached 60% in 2004, up from 44% in 1990. This means a relatively modest growth rate and sustaining the coverage growth rate of the 1990s, is unlikely to achieve the stated target.

For *access to adequate sanitation* there is no national baseline and no stated target for 2015 coverage, according to Bojø and Reddy (2003) op. cit. The PRSP refers to sanitary facilities being set up in schools and markets. The HDR2006 states that *population with sustainable access to improved sanitation* was 42% in 1990, and had reached 43% in 2004. This is hardly any progress, and clearly insufficient to reach the MDG7 target for 2015.

**Viet Nam**
There is no baseline (1990) *access to safe water* coverage according to Bojø and Reddy (2003) op. cit. but there is a coverage goal of 85% by 2015. HDR(2006), table

7, reports improved water coverage to have reached 85% in 2004, up from 65% in 1990. This means a reasonable growth rate and sustaining or slightly increasing the coverage growth rate of the 1990s, is likely to achieve the stated target.

For *access to adequate sanitation* there is no national baseline and the stated PRSP-target for 2015 coverage is 100% for wastewater treatment and 100% for solid waste disposal in cities and towns, according to Bojø and Reddy (2003) op. cit. The HDR2006 states that *population with sustainable access to improved sanitation* was 36% in 1990, and had reached 61% in 2004. This is impressive progress, and could prove sufficient to reach the MDG7 target for 2015.

**Zambia**
The baseline (1990) *access to safe water* is 37% rural coverage and 89% urban coverage according to Bojø and Reddy (2003) op. cit. The targets stated is 75% for rural areas and 100% coverage by 2015. HDR(2006), table 7, reports improved water coverage to have reached 58% in 2004, up from 50% in 1990. This means a rather slow growth rate and by sustaining the coverage growth rate of the 1990s, it is unlikely to achieve the stated target. Their PRSP reports on indicators such as number of water points, distance to water supply, volume of water treated, and number of people trained in the water supply sector.

For *access to adequate sanitation* the national baselines were 68% for rural – and 73% for urban areas, with targets for 2015 coverage being 80% and 100% respectively, according to Bojø and Reddy (2003) op. cit. The PRSP reports on the volume of water treated. The HDR2006 states that *population with sustainable access to improved sanitation* was 44% in 1990, and had reached 55% in 2004. This is moderate progress. It is therefore unlikely that the MDG7 target for 2015 is within reach if the same rate of investment continues.

## 4.3 Change in Area under Forest Cover

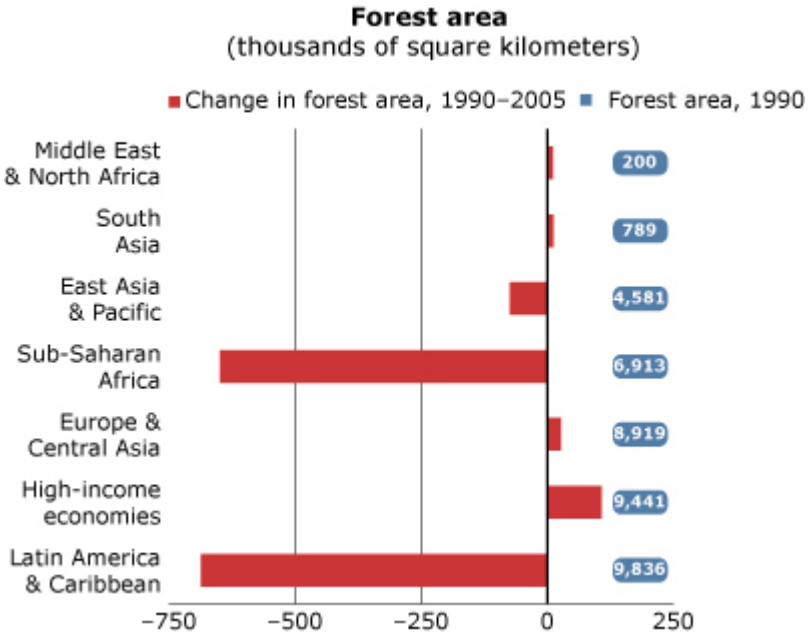
### 4.3.1 The Global Scene

One of the targets under MDG7 is to *integrate the principle of sustainable development into country policies and programs and reverse the loss of environmental resources.* Two of the indicators listed as crucial for monitoring the extent to which this target is about to be achieved is *the proportion of land area covered by forests,* and *area protected to maintain biological diversity.*

Table 4.1 above shows that there has been little change in PRSP-coverage addressing change in area under forest cover between 2003 and 2004. There is no statistics available to show whether the explicit addressing of protected land areas in full PRSPs has increased between 2003 and 2004. One more PRSP provided a 1990 baseline area under forests, and 3 more had qualitative indices/support programs on areas under forests highlighted. However, there were no new PRSPs presenting targets for 2004 – 06-PRSP horizon and 2015-MDG horizon.

However, forested area is shrinking on a global scale. Since 1990 about 1.3 million square kilometers of forests have been lost. this means on the average around 100,000 square kilometers – an area equal to almost 1/3 of Norway – each year, see figure 4.4.

**Figure 4.4 Change in Forest Area 1990-2005 by Region**




Source: World Bank Global Data Monitoring Information System, 2006

Figure 4.4 clearly shows that the losses have been greatest in the great tropical forests of sub-Saharan Africa and Latin America and the Caribbean. These are also areas with biological diversity hotspots. At the same time, the figure shows that forest areas have increased marginally in the Middle East and North Africa, in South Asia, and somewhat more significantly in Europe and Central Asia, and in the high-income economies. This means that there has been a significant loss in tropical forest cover and a small net gain in temperate forest cover.

While the indicator for land area under forest cover does not specify a quantitative MDG7 target for 2015, the MDG7 calls for a reversal of natural resource degradation. Against this call, the area under forest cover should remain stable or increase. Even though one has observed a slight decline in the average annual global rate of deforestation from the 1980s to the 1990s, the trend of rapid loss of tropical forest cover suggests that the scope for reaching the MDG7 goal on this indicator is slim.

In order to deepen our basis for assessing progress in area under forests, one would need much better and wider country data coverage on regeneration status, changes in density, species composition, and quality of vegetation. Indicators covering extent of illegal logging, area under sustainable management, and value addition from timber and non-timber sources would add further to our understanding of the trends relative to the likelihood of achieving the MDG7.

### 4.3.2 Forest Cover Change in Partner Countries with PRSPs.

Among the Norwegian "partner" countries with PRSPs only **Viet Nam** has a stated target which is to increase the proportion of the country under protected forest from

33% in 1990 to 43% by 2010. They have targeted 5 million hectares of afforestation. no other partner country with a PRSP has an explicit forest cover target. However, several of the "partner" countries have prepared 1990 baseline forest cover percentages presented in their PRSPs, see Bojø and Reddy (2003) op. cit. Appendix B: **Malawi: 21%, Sri Lanka 28%, Viet Nam 33% and Zambia 42%.** Several "partner" countries with PRSPs do not have any such baselines: **Ethiopia, Mozambique, Nicaragua and Uganda.** However, these 1990 PRSP-reported baseline percentages are in most cases significantly lower than the 1990 "percentage forest cover" reported in the World Bank Indicator Database, 2006, see table 4.3 below.

**Table 4.3 Percentage in Forest Cover in "Partner" Countries 1990-2005**

| Country | 1990 | 2005 |
|---|---|---|
| **Bolivia** | 57.9% | 54.2% |
| **Ethiopia** | n.a. | 13.0 |
| **Malawi** | 41.4 | 36.2 |
| **Mozambique** | 25.5 | 24.6 |
| **Nicaragua** | 53.9 | 42.7 |
| **Sri Lanka** | 36.4 | 29.9 |
| **Uganda** | 25.0 | 18.4 |
| **Viet Nam** | 28.8 | 39.7 |
| **Zambia** | 66.1 | 57.1 |

Source: World Bank Global Data Monitoring Information System, 2006

Table 4.3 shows how the area under forest cover (however measured) has diminished (with the exception of Viet Nam) in all the partner countries with PRSPs between 1990 and 2005, according to the World Bank Indicator Database, 2006.

Complementary PRSP programs and indicators are included in some of the PRSP, but coverage and detail varies between countries. The Bolivia PRSP reports that 1/6$^{th}$ of the forest cover is under sustainable management, that they have established a forest certification process, and they have forest management plans. Ethiopia and Uganda have nothing related to forests in their PRSP. Malawi, on the other hand, reports in their PRSP actions to control forest fires to limit erosion and lake Malawi pollution. They are introducing forest licensing, undertaking tree planting, and are preparing a forest inventory. The report on indicators show rate of tree planting, reforested area and number of rural wood markets. They also provide education and extension services directly designed for the forest sector and its operations and management. Mozambique reports on control of bush fires and deforestation in their PRSP. Nicaragua reports that the deforestation rate is 2.5% per annum. Sri Lanka's PRSP reports that the aim at halving their deforestation rate to 0.75% by 2005. At the same time, they report on active private sector involvement for value added of forest products. Viet Nam reports increase forest cover and 5 million hectares of reforestation by 2010. Finally, Zambia reports on plans for preparing a forest inventory, agro-forestry activities, joint forest management, a national and provincial forestry action program, with improved revenue collection.

## 4.4 Change in Protected Land Area

### 4.4.1 Global Trends

One indicator listed as crucial for monitoring the extent to which the biodiversity target of MDG7 is about to be achieved is *the area protected to maintain biological diversity*. The proportion of land area protected to maintain biological diversity refers to the area protected under nature reserves, national parks, sanctuaries, heritage sites and other conservation statutes[103], but MDG7 does not provide any quantitative target. Short of that, "area under protection" serves as the reference point, and when this area declines, there is reason for concern.

It is encouraging to observe that the average land area under protection in PRSP countries has grown significantly during the 1990s from 4.2% to 6.1%, see Bojø and Reddy (2003) op. cit, table 7. The number of protected areas has also grown, but the growth in protected areas in PRSP countries has been slower than growth in protected area globally. In 2004, nationally protected areas constituted 10.7% of total land area on a global scale. For low- and middle income countries this percentage was 8.3%. with Middle East and North Africa along with densely populated South Asia representing the lower end of the scale with below 5%, and Latin America and Caribbean States the high end with 11.1% protected land area. The growth of eco-tourism and investments resulting from this have contributed to this growth.

However, the quality of protection and the nature of extractive dependence on protected areas vary significantly across countries. Areas designated as protected under legal statutes may continue to lack active management. Therefore one cannot assess the qualitative changes in protected land area without reliable observations on some complementarity monitoring indicators. These include:

- Change in habitat and species;
- Keystone or indicator species;
- Area and number of invasive species;
- Area supporting alternative livelihoods;
- Staff and budget allocation per unit area protected, and
- Poaching and illegal trade in protected species.

### 4.4.2 Protected Area Change in Partner Countries with PRSPs.

Among Norway's partner countries with a full PRSP, only Nicaragua and Sri Lanka have protected area baselines for 1990 presented in their PRSPs. These baselines are 7.4% and 13% respectively, according to Bojø and Reddy (2003), Appendix B. None of these countries have stated any MDG7 targets for protected area in their PRSPs., but several of these "partner" countries list complementary actions in their PRSPs. These include Zambia, Malawi and Mozambique focusing on wildlife restocking, wildlife farming and game management, and more active private sector involvement here and in Sri Lanka. Zambia, in particular, has a broad coverage of actions listed in its PRSP in this field, with an increase in game management areas from 36% in 1990 to 40% by 2004, and a program for revenue sharing with local communities. Bolivia

[103] See section 4.2 in Bojø and Reddy (2003).

has presented a national protected area system with explicit forecasts for increased funds for protected area management and for revenue from wildlife management.

According to the World Development Indicator Database, 2006, nationally protected areas as percentage of total land area in 2004 varied significantly between the "partner" countries. Ignoring possible variations in the quality of management, it was 16.9% in Ethiopia, 11,2% in Malawi, 8.4% in Mozambique, 17.8% in Nicaragua, 13.5% in Sri Lanka, 24.8% in Uganda, 3.7% in Viet Nam, and 31.9% in Zambia.

## 4.5 Traditional and Modern Fuels

### 4.5.1 Global Trends

Energy and poverty linkages are reflected in the types of energy used, their impact on indoor and outdoor air quality, and the resulting health outcomes, thus illustrating a cross-cutting energy-environment-health-poverty nexus. Bojø and Reddy (2003) op. cit. states that "*dependence on traditional fuels is an important indicator highlighting the significance of traditional energy to several MDGs such as income poverty – in terms of the time foregone in collecting biomass energy fuels (MDG1); non-income poverty – in terms of health outcomes such as acute and chronic respiratory infections (MDG4&6); and degradation of natural resources – loss of forest cover and biodiversity (MDG7).*"

Table 4.4 shows markedly diverging rates of change in biomass energy dependence between rapidly growing economies – particularly in East Asia, but also in Latin America and South Asia as opposed to the continuous high dependence on health hazardous biomass energy use in sluggish growth Sub Sahara Africa, where it is mostly consumed as domestic energy for cooking and heating. In Norwegian partner countries such as Kenya, Tanzania, Mozambique and Zambia nearly all rural households use fuelwood, and charcoal is used by over 90% of urban households. The total sample of PRSP countries clearly show that the incidence of biofuel dependency is much higher among countries with a high percentage of population below the poverty line, see Bojø and Reddy (2003), figure 2. Since these countries also have the highest population growth rates, their biofuel dependency is likely to remain high long after the MDG time horizon.

**Table 4.4 Regional Trends in Biomass Energy Dependence (Mtoe)**

| | 1995 | | | 2020 | | | Annual growth rate 1995-2020 | |
|---|---|---|---|---|---|---|---|---|
| Source | Biomass | Total | % | Biomass | Total | % | Biomass | Total |
| East Asia | 106 | 422 | 25 | 118 | 931 | 13 | 0.4 | 3.2 |
| South Asia | 235 | 423 | 56 | 276 | 799 | 35 | 0.6 | 2.6 |
| Latin America | 73 | 416 | 18 | 81 | 787 | 10 | 0.4 | 2.6 |
| Africa | 205 | 341 | 60 | 371 | 631 | 59 | 2.4 | 2.5 |
| World | 930 | 6643 | 14 | 1143 | 10558 | 11 | 1.0 | 1.9 |

Source: D'Apote 2000.

Population with access to electricity is used as a proxy for examining the improvements in the access to modern energy sources. Past trends and forecasts for future development prepared by the International Energy Agency (IEA 2002) is presented in table 4.5, which supplements table 4.4 in showing Sub-Sahara Africa lagging behind the other developing regions.

. **Table 4.5 Population with Access to Electricity Across Regions (percent)**

| *Region* | *1990* | *2000* | *2015* |
|---|---|---|---|
| North Africa | 61 | 90 | 98 |
| Sub-Saharan Africa | 16 | 23 | 33 |
| South Asia | 32 | 41 | 53 |
| Latin America | 70 | 87 | 94 |
| East Asia | 56 | 87 | 94 |
| Middle East | 64 | 91 | 97 |
| All developing countries | 46 | 64 | 72 |

*Source:* IEA 2002.

However, the increasing gap and lagging behind of Sub-Sahara Africa in the above two tables is better understood when looking explicitly at how rural access to electricity has developed across regions from 1990 to 2000, see table 4.6 below, which shows that Sub-Sahara Africa's rural access to electricity declined from a very low 8% to an even lower 7.5% over the decade, while all other regions experienced considerable improved rural access, and thus reduced dependence on traditional solid fuels and the associated burdens and hazards.

**Table 4.6 Rural Access to Electricity Across Regions 1990 – 2000 (percent)**

| *Region* | *1990* | *2000* |
|---|---|---|
| North Africa | 35.0 | 79.9 |
| Sub-Saharan Africa | 8.0 | 7.5 |
| South Asia | 25.0 | 30.1 |
| Latin America | 40.0 | 51.5 |
| East Asia | 45.0 | 81.0 |
| Middle East | 35.0 | 76.6 |

*Source:* IEA 2002.

While dependence on solid fuels is an important variable that reflects income and non-income dimensions of poverty, supplementary indicators are collected and monitored in different countries to varying extent reflecting on e.g. the energy mix, relative proportions of household energy, extent of renewable energy use, and energy efficiency. Such supplementary indicators provide a more nuanced insight on the coarse access indicator displayed in the tables above, but there is no indication that the overall trends shown in tables 4.5 and 4.6 are misguiding.

### 4.5.2 Partner Country PRSP Energy Use Trends

Baseline information in PRSPs varies between the Norwegian partner countries. Bolivia presents a 23% rural electricity baseline for 1990, and a target of 40% for 2006. Ethiopia PRSP 1990 baselines include 76% biomass use in rural areas, and 41% in urban areas, while kerosene use in urban areas is 22% and electricity is 13%. There are no target percentages presented. Malawi presents a 4% electricity coverage baseline for 1990, and no numerical targets, but states that they are promoting solar, wind and mini-hydro projects, and is extending the grid. Mozambique and Viet Nam provide no baseline or target information on energy use at all in their PRSP, while Nicaragua states that the 1990 national baseline is 94% biomass and 47%

electrification. Sri Lanka claims that the 1990 baselines are 14% use of modern fuels and 57% electrification in rural areas, compared to 57% and 84% respectively in urban areas. No PRSP targets are presented. Uganda provides no PRSP baselines, but a 2010 target of 12% rural electrification. Zambia again has a relatively detailed PRSP on environment related issues. Aside from a 1990 baseline of 73% biomass use, their PRSP provides a 2005 rural electrification target of 22.2% and 60% for urban areas. They also targeted a reduction in biomass fuels to 63% in 2004 (from 73% in 1990). The PRSP promotes efficient wood fuel production and use to achieve 10% wood savings, and substitution of charcoal with millennium gel fuel and LPG, solar energy projects in schools, health centers and homes. Confirmation of degree of achievements of Zambia's ambitious environmental PRSP targets is awaited.

Table 4.7 shows the most recent level of traditional consumption in percent of total energy requirements and the trend since 1980 in per capita electricity consumption in those of Norway's partner countries that have submitted full PRSPs. There is clear correlation between the ratios in column 4 of table 4.7 illustrating variations in growth in electricity consumption and growth in per capita incomes. East Asia shows the best such performance, followed by South Asia, and with Sub Sahara Africa being far behind. When looking at the second part of table 4.7 one can see that the Sub Sahara African- and Latin American partner countries that have prepared full PRSPs lag behind their respective regional average performance in terms of growth in electricity consumption; with Uganda being the exception.

**Table 4.7 Energy Use in Partner Countries with PRSPs**

| Country/Region | (1) Traditional fuel consumption in % of total energy use 2003 | (2) Electricity use per capita, kWhs 1980 | (3) Electricity use per capita, kWhs 2003 | (4) Ratio (3): (2) |
|---|---|---|---|---|
| **East Asia & Pac.** | 11.4% | 329kWh | 1,418kWh | 4.31 |
| **South Asia** | 24.8 | 171 | 598 | 3.50 |
| **Latin America** | 23.3 | 1.019 | 1.932 | 1.90 |
| **Sub Sahara Africa** | 81.2 | 434 | 522 | 1.20 |
| **Ethiopia** | 96.5 | n.a | 33 | n.a |
| **Mozambique** | 95.7 | 364 | 399 | 1.10 |
| **Malawi** | 82.9 | 66 | 77 | 1.17 |
| **Zambia** | 87.2 | 1,125 | 631 | 0.56 |
| **Uganda** | 93.5 | 28 | 59 | 2.11 |
| **Bolivia** | 18.8 | 292 | 481 | 1.65 |
| **Viet Nam** | 23.3 | 78 | 503 | 6.45 |
| **Sri Lanka** | 60.4 | 113 | 407 | 3.60 |
| **Nicaragua** | 69.3 | 363 | 492 | 1.36 |

Source: Human Development Report 2006

## 4.6 Tenure and Slums

The regional comprehensive statistics and indicators for the monitoring of changes in tenure and slum dwellings/living conditions include those already presented above for access to water and sanitation and modern fuels. In addition, the U.N Human Settlements Program. estimates the percent of households living in permanent structures and percent households complying with local regulations. Among the

countries with PRSPs there are virtually no comparable reliable indicators that form baselines and for which more recent data have been compiled as a basis for analyzing development over time, see Bojø and Reddy (2003) Appendix B, and p 27. The U.N. human Settlements Program effort called the Urban Indicators Program (UIP) was the first to undertake a comprehensive assessment of slums and tenure. The results are presented in Table 4.8. Unsurprisingly, the table shows Africa to be lagging behind. More than half of Africa's urban population and one-third of Asia's urban population are estimated to be living in slum environments, and slum growth in developing countries is expected to follow the annual population growth of 2.4%. This makes it one of the most challenging targets to demonstrate progress from a MDG perspective.

**Table 4.8 Regional Trends of slum Population**

| | *Tenure index* | | *Estimate of slum population* | |
|---|---|---|---|---|
| *Region* | *Secure* | *Insecure* | *1993* | *2001* |
| Africa | 44 | 56 | 126 | 148 |
| Asia & Oceania | 63 | 37 | 423 | 498 |
| Europe | 96 | 4 | 21 | 24 |
| Latin America & Caribbean | 74 | 26 | 87 | 103 |
| Global | 71 | 29 | 712 | 837 |

Source: UN -HABITAT estimates based on Global Urban Indicators 1993 and 1998. (See Herr and Karl (2002) on methods of estimation.)

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