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Natural Capital and Sustainable Development in Africa

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Executive Summary

This paper underlines a paradox: although “pro-poor” development assistance policies pay little attention to natural capital, the fact is that such resources are of great practical importance for the poor. The paper proposes an approach that would add a specific focus on the conservation of renewable natural resources to the current poverty reduction paradigms, especially as they are applied to Africa.

The current paradigm of development assistance policies is that of “pro-poor growth”. That paradigm does not have much to say about natural capital. On the other hand, some “global public goods” (GPGs), namely climate and biodiversity, are clearly environmental goods. Preserving natural capital is key to producing these public goods. Yet the natural capital that produces GPGs is frequently a victim in the conflict between local short-term objectives and global objectives.

The paper goes on to discuss two recent studies that demonstrate the link between poverty and renewable natural resources, as well as the results of the World Bank report, “Where Is the Wealth of Nations?”, on the components of wealth in African countries. These studies show how important natural capital is for the poorest countries. Using the example of Africa, we examine the diversity of the economic functions of natural resources. We then suggest

a typology summarised schematically in the “Natural Capital Triangle”. Finally, we outline a model of the relationship between natural capital and development, the “Elastics Model”.

We then show that in Africa, the fact that the great majority of poor people have no ready alternative or substitute for natural capital calls for a more “natural” approach to development.

The conclusion stresses the need to take much greater account of renewable natural capital and its conservation in development policies in Africa. The current Poverty Reduction Strategy Papers (PRSPs) and “Marshall Plan” projects are too heavily focused on human capital and on physical capital. NGOs that are dedicated to saving biodiversity, such as the Worldwide Fund for Nature (WWF), Conservation International (CI) and the World Conservation Union (IUCN), have begun to supplement their biodiversity commitments with concerns about enlisting social capital for conservation, or building on the economic potential of protected areas. Donors should keep pace by earmarking more of their funding for natural capital, and investing for example in the conservation of soils, fisheries and forests. This change is a call for more actions that enhance the institutions for a better management of natural assets.

1. Introduction

In the transition to a stabilised and sustainable world, the hundreds of millions of people who today are heavily dependent for their survival on renewable natural capital could well be left behind. If they are forced for their own survival to degrade their renewable natural capital, such as soils, forests, water and fishery resources, they will remain caught in the poverty trap. Not all of them will be able to escape that trap by migrating to the cities, and those that make this move may find that conditions are no better than the ones they left in the countryside. If we are truly committed to “pro-poor growth”, we must do what we can to break these vicious circles whereby the exhaustion of natural resources further impoverishes people.

If we are to shoulder these responsibilities, we must consider the productive capacities of ecosystems that provide the flows of renewable resources, and we must do so not only for the sake of future generations but also for the poor who today are still heavily dependent on those resources, particularly in the least developed countries (LLDCs) of Africa.

Unfortunately, renewable natural capital is little understood and poorly measured, both at the theoretical level and in the current approaches to measuring resource stocks, assessing the capacity of those stocks to produce benefits, and appreciating the massive externalities they can generate.

This paper underlines a paradox: although “pro-poor” development assistance policies pay little attention to natural capital, the fact is that such resources are of great practical importance for the poor. The paper proposes an approach that would give priority to the conservation of renewable natural resources in the current poverty reduction para-

digms. The paper is organised as follows:

In section 2, we show that the current paradigm of “pro-poor growth” takes little account of natural capital. Some “global public goods” (GPGs), namely climate and biodiversity, are clearly environmental goods. Preserving natural capital is key to producing these public goods. Yet the natural capital that produces GPGs frequently falls victim to the conflict between local short-term objectives and global objectives.

In section 3, we begin by highlighting the contradiction between the failure of pro-poor growth policies to consider natural capital and the evidence revealed in recent studies. We cite the conclusions of reports demonstrating the link between poverty and renewable natural resources, as well as the findings of the World Bank report, “Where Is the Wealth of Nations?”, on the components of wealth in African countries. These studies show how important natural capital is for the poorest countries. Using the example of Africa, we examine the diversity of the economic functions of natural resources in various countries. We suggest a typology that can be summarised schematically in the “Natural Capital Triangle”. Finally, we outline a model of the relationship between natural capital and development, which we call the “Elastics Model”.

In section 4, we show that in Africa, where the great majority of poor people have no ready alternative or substitute for natural capital, a more “natural” approach to development is needed.

The conclusion stresses the need for development policies in Africa to take much greater account of renewable natural capital and its conservation. We propose a set of initiatives for moving in this direction.

2. The current paradigm of development assistance policies

2.1 “Pro-poor growth”

The current paradigm of development policies, and hence of Official Development Assistance (ODA), is “pro-poor growth”. This approach is presented and justified, for example, in the World Bank’s 2006 World Development Report, “Equity and Development”, based on previous work of its vice president and chief economist, François Bourguignon, on “the poverty-growth-inequality triangle”.¹ This paradigm generally points policymakers in the following directions. The first thing is to “clear the ground” so that the poor can take full advantage of their productive capacities, however weak they may initially be. This requires two broad thrusts:

- 1) promoting the development of competitive markets, and
- 2) identifying the poverty traps, and analysing their causes and the ways of avoiding them by paying greater attention to specific local circumstances. In practice, the approach is a pragmatic one. The idea is to work out empirically the “right mix” between support for growth and specific support for the poor.

The poverty traps identified by the theoretical literature and cited in the poverty reduction strategy papers are essentially these:

- 1) imperfect credit and insurance markets,
- 2) imperfect access to education and health services; and
- 3) geographic isolation (for example, lack of transport facilities for delivering farm products to urban and export markets).

In sectoral terms, this last point highlights the need for investments to improve agricultural productivity and infrastructure, especially transportation facilities. Consistent with the recommendations of J. M. Cour and M. Arnaud², this should logically entail promoting “investments in urban settlement” as well, targeted at people who leave the countryside for the cities because of rising agricultural productivity and improved transportation. Naturally, investment in

human capital, especially education and health, always heads the list of priorities, although it is now admitted that the efficiency of such investment is often very low, and that steps must first be taken to address that fact.

But we must recognise that there is little space accorded to natural capital in the paradigm of the “poverty-growth-inequality” triangle and in the policies that flow from it. Quite logically, the greater portion of the Poverty Reduction Strategy Papers (PRSPs) that donors use as reference pays little or no attention to natural resources. At best, they may be addressed in environmental impact studies that are now an integral feature of any development project. Environmental protection is nearly always viewed as a constraint, and only rarely as the maintenance of essential productive capital

Yet in the least-developed countries, there are many examples of poverty traps or vicious circles in which poor people have insufficient access to natural capital, or in which the natural capital that is available is degraded. Moreover, in many poor countries, natural capital, by allowing the export of primary products, remains one of the few sources of growth - provided, of course, that export revenues can be properly managed and the “resource curse” lurking in natural rents can be avoided.

¹ François Bourguignon, 2004, « The poverty-growth-inequality triangle » in Proceedings of the AFD/EUDN Conference December 2003, Notes and Documents N°10, Agence Française de Développement, Paris. <http://www.afd.fr/jahia/Jahia/home/publications/NotesDocuments>

² Cf. for example: Jean-Marie Cour, 2005: « Investissements de peuplement et d’urbanisation, besoins de financement et implications pour la coopération internationale ». Downloadable at the IDDRI website: http://www.iddri.org/iddri/telecharge/services/05_6_cour.pdf

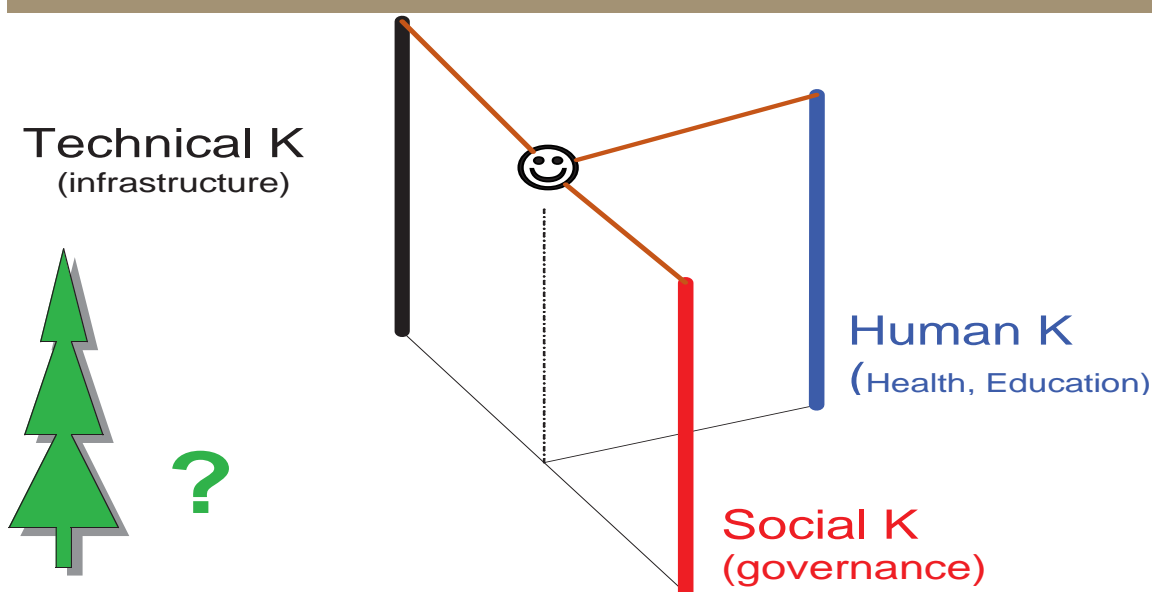
2.2 The forgotten “fourth pillar of growth”

The development process is increasingly conceived today on the basis of four-factor models. Those models describe any productive activity as involving, in varying combinations, four factors of production or what are now more commonly called types of capital: natural, technical (also called produced or built capital), human, and social. The first two have generally accepted definitions. Within natural capital, it is important to distinguish between renewable (but not inexhaustible) resources and finite stocks of exhaustible useful substances generally found underground. By human capital, we mean the knowledge and skills that individuals acquire through education and practice. Social capital consists of all those institutions and social relations that determine, depending on the “social” context, how efficiently the first three types of capital can be combined. With the same initial endowment of natural, technical and human capital, a society where economic institutions are legitimate and effective and where transaction costs are low because economic agents trust each other, will develop much faster than a society where civil strife is brewing. Its social capital will be said to be much higher. By its nature, this capital is “owned” in common by the society concerned. It is a collective good. We shall see that it is often difficult in practice to distinguish it from human capital, because we

lack data on the latter. Indeed, some recent studies, such as those of Kirk Hamilton discussed below, lump human and social capital together as “intangible capital”, which thus becomes residual capital alongside natural and technical capital.

The paradox noted earlier, i.e. the fact that pro-poor growth policies virtually ignore natural capital, can now be seen to stem from forgetting/overlooking one of the four pillars of growth. This omission is illustrated by the diagram (Figure 1). It represents the investments in pro-poor growth that are conventionally promoted by ODA and are consistent with the paradigm of the “poverty-growth-inequality” triangle: 1) infrastructure (technical K), the traditional focus of ODA, 2) health and education, which are often understood as comprising human capital (human K), and are strongly promoted by the Millennium Development Goals (MDG), and 3) “governance”, which, however vague its practical content, is much debated in allocating ODA, and it is held to build a country’s social capital (social K). Natural capital (natural K), represented here by the tree symbol, is missing from this conventional model of pro-poor growth. In section 3.4, we will propose that natural capital should be introduced and its particular features given full recognition in the modelling of growth.

Figure 1. Pro-poor growth: natural capital, the “forgotten pillar” of conventional models



2.3 The production of global public goods (GPGs)

In fact, natural capital is central to the issue of environmental GPGs (global public goods). For some development assistance policies, this consideration represents the second “acid test” of economic justification: development assistance policies will be deemed fully justified economically if they contribute to the production of GPGs.

The two major global public goods that are produced as much (if not more) in countries of the South as in those of the North are climate and biodiversity, both of them environmental GPGs. Unfortunately, in their struggle for survival poor people may be led to degrade the natural capital that produces these GPGs. Local and foreign businesses also pillage this type of natural capital, through unsustainable mining techniques for example, because ownership rights to such capital are poorly defined, poorly defended, or sold short by local elites who care little for the collective good. The cost of stopping the degradation of GPG-producing natural capital generally falls on local stakeholders, including the government, while the benefits are global.

Consequently, there is an economic justification for using ODA to cover the local costs of producing a GPG in countries of the South, if without that assistance the good would not be

produced spontaneously. The cost may take the form of a direct investment in the production of the GPG, or an investment in a substitute activity, if producing the GPG means abandoning consumption of the natural capital that we want to preserve. In this case there is a mutual interest, in theory, and the economic justification of the ODA is complete.

Often, however, conflicts between local and global interests in the production of GPGs are very hard to resolve. Thus, the priority that ODA and governments insist on giving to poverty reduction may conflict with the production of a GPG. Consider for example the debate over rapid growth strategies in which clearing land for agriculture is considered better for the poor than preserving natural spaces that still have a wealth of biodiversity.

Despite these obstacles, and thanks mainly to the commitment of NGOs devoted to preserving biodiversity, funding is becoming available, even if local people are not enthusiastic about creating protected areas. Yet the funding available for environmental GPGs is still limited, and is channelled primarily through specialised funds (NGOs, foundations, GEF, FFEM etc.), and this means that such issues still have little impact on the main flows of ODA.

3. The role of natural capital in development: importance, typology, and a proposed model

From our analysis of the current paradigms of development policies, we may conclude that, apart from environmental GPGs, natural capital is rarely mentioned as a way of eliminating poverty traps and promoting growth. (The same can be said of social capital, which is usually cited only in vague lip-service to the need for improving “governance”).

Moreover, in poor countries and within some development agencies, preserving the environment is still seen for the most part as a constraint and not as an opportunity. This translates into policies and programmes that ignore environmental issues or treat them only as a horizontal concern,

which is a way of relegating an awkward problem to the background.

Yet the empirical literature is full of evidence on the linkage between natural resources and poverty (3.1). The World Bank’s report, “Where Is the Wealth of Nations?” (WB 2006) also shows the important share of natural capital in the wealth of poor countries (3.2). We propose a “Natural Capital Triangle”, which defines a typology of the ways whereby natural capital can contribute to pro-poor growth (3.3). Finally, we outline an “elasticity model” that could serve as a growth model that takes account of natural capital and its particular features (3.4).

3.1 The link between natural resources and poverty

The empirical literature provides ample evidence on the linkage between natural resources and poverty. Consider these two recent reports:

- The report entitled “World Resources 2005: the Wealth of the Poor - Managing Ecosystems to Fight Poverty”³, published by the World Resources Institute, attempts to evaluate the number of poor people who depend on natural resources for their livelihood. Worldwide, some 1.6 billion people rely on forests for a significant portion of their incomes. In sub-Saharan Africa, 500 million poor people are dependent on farming and livestock. The report proposes a way to take better account of natural resources in economic analysis, by calculating the “environmental income” derived from natural resources, and its distribution. On the basis of specific examples, the report draws some generalisations and suggests that nearly two-thirds of the incomes of the rural poor are directly linked to subsistence farming, hunting, or the gathering of various natural resources.
- The Millennium Ecosystem Assessment⁴, sponsored

and published by the United Nations in 2005, takes the same tack and declares that ecosystems are becoming so degraded that the Millennium Development Goals are in jeopardy. In terms of economic calculation, the report stresses the need for better analysis of the economic to review our analysis of the value of ecosystems in their original situation of reference [meaning??], so as to alert policymakers to the consequences of their development choices.

These reports and many others highlight the phenomena and consequences of irreversibility in the evolution of natural resources. Some of these studies indulge in shortcuts, using a stylised chain of actions and reactions. For example, from the upper to the lower reaches of a watershed: the poor survive only by stripping a region’s mountains of their forest cover, thereby degrading biodiversity,

³ <http://population.wri.org/worldresources2005-pub-4073.html>

⁴ See the popularised version at <http://www.greenfacts.org/fr/ecosystemes/index.htm>

accelerating erosion and speeding the flow of water-courses, with cumulative negative fallout that is felt far downstream, including the deterioration of infrastructure (dams and roads). We may quibble with the scientific validity and the scope of these “disaster case histories”, but they are in fact receiving increasing attention in worldwide

evaluations such as that of the Millennium Ecosystem Assessment (which involved 1360 experts from 95 countries), and we need to take a close interest in analyses that may become increasingly credible and accepted, such as those of the Intergovernmental Panel on Climate Change (IPCC).

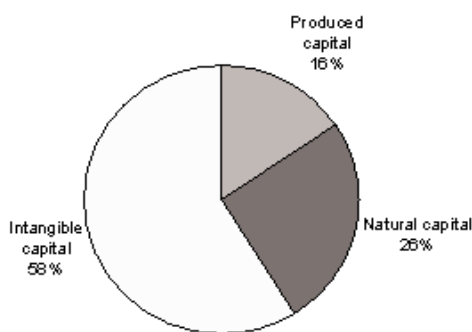
3.2 Natural capital and wealth in Africa

A World Bank team headed by Kirk Hamilton has published a report, “Where is the Wealth of Nations?”⁵, that analyses the components of countries’ wealth and compares results per capita. It demonstrates the relative importance and composition of natural capital in poor countries, particularly in Africa. It does not however evaluate fishery resources, freshwater and a number of environmental services, for

lack of data, and the actual magnitudes must therefore be even greater.

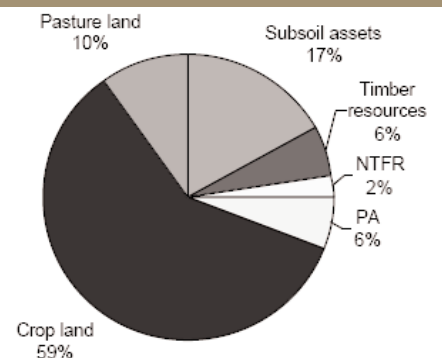
Figure 2 shows the importance of natural capital for non-oil LLDCs: it accounts for 26% of their total wealth, compared to only 1 to 3% in rich countries. Moreover (Figure 3), the share represented by land (crop and pasture) is estimated at 69% of natural capital.

Figure 2 Shares of total wealth in low-income countries, 2000



Note: oil states excluded.
Source: World Bank 2005

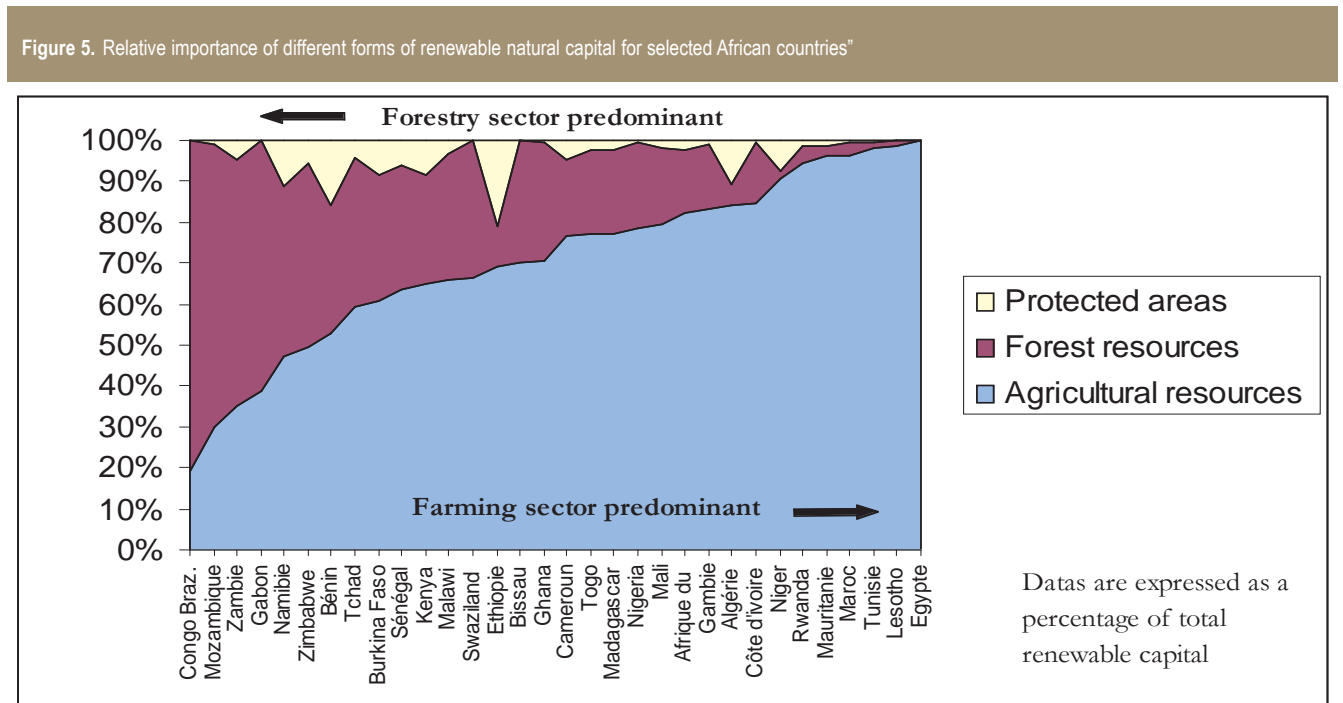
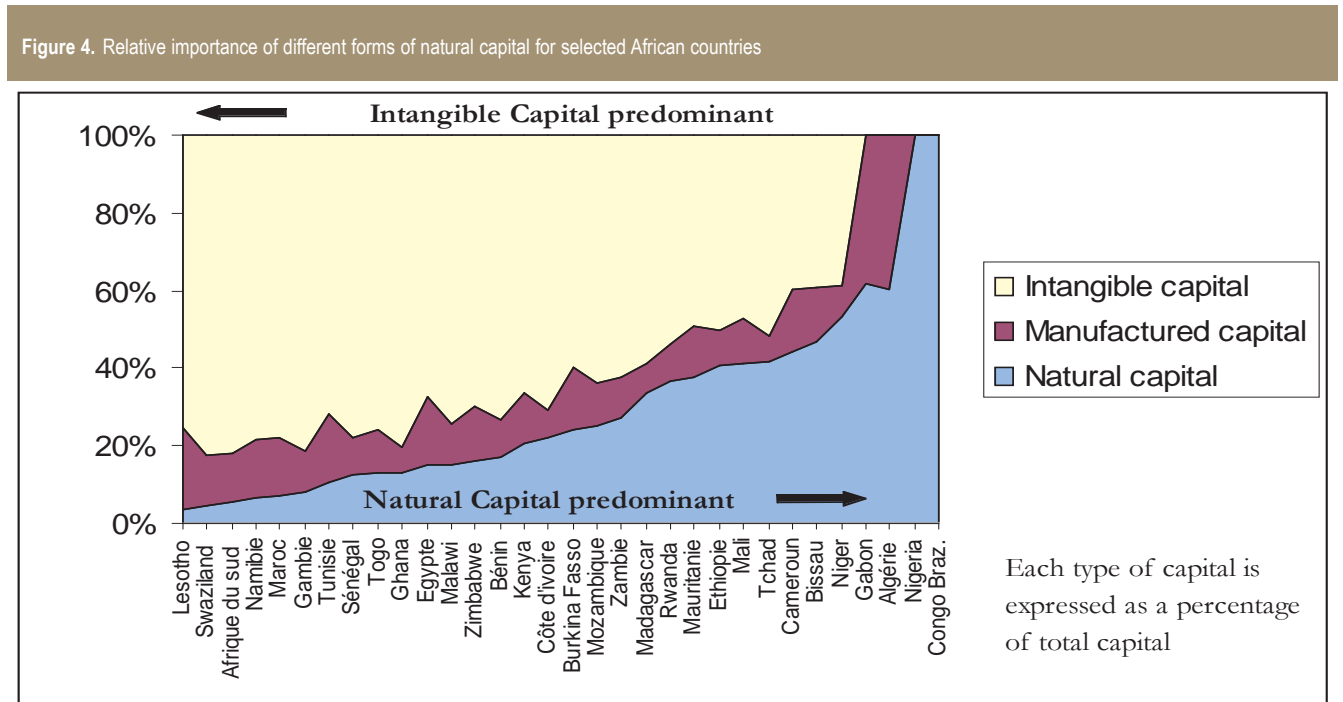
Figure 3. Composition of natural capital in LLDCs (2000)



NTFR: Non-timber forest resources. PA: Protected areas.
Note: oil states excluded.
Source: World Bank 2005

⁵ Available at the sites <http://www.worldbank.org/sustainabledevelopment> and <http://www.worldbank.org/environmentaleconomics>

These characteristics are accentuated in the numbers for Africa (Figures 4 and 5):



Source: *Where Is the Wealth of Nations?*, World Bank, 2005.

NB. Forest resources include timber resources and certain services provided by forests (hunting, recreation, watershed protection etc.). Agricultural resources include cropland and pastureland.

This analysis suggests some conclusions, which we may summarise as follows:

- In many African countries, natural capital accounts for between 30% and 50% of total wealth, compared to 26% on average for non-oil LLDCs, and 1% to 3% in rich countries, even those that are major primary product producers such as the United States. Within natural capital, the share of renewable resources (which is underestimated because fishery resources, freshwater and environmental services are excluded) is preponderant (greater than 80%) in non-oil countries.
- There is a group of African countries for which non-renewable resources (oil and mining) represent an important share (from 19% to 88%) of their natural capital (Algeria, Gabon, Congo Brazzaville, Nigeria, Egypt, Mauritania, Tunisia, South Africa, Zimbabwe and Cameroon). Tests are performed to determine the “Genuine Savings Rate” of these countries and to see whether they follow the Hartwick rule. That rule stipulates that development will only be sustainable if a country invests all its resource rents in the other three forms of capital, which are all assumed to yield the same marginal social returns in equilibrium. The finding

is that, in general, countries do not do this, and they must therefore expect a serious decline in incomes once these non-renewable resources are exhausted. The same holds when renewable natural resources are overexploited.

- Biodiversity tends to be submerged in this type of exercise, and it would be useful to examine a group of countries more thoroughly so as to assess zones of great biodiversity.
- Marine fishery resources, in the case of Africa, pertain primarily to a group of six countries (Madagascar, Mauritania, Morocco, Mozambique, Namibia and Senegal), where they generate between 12% and 30% of export revenues.
- Finally, water resources should be evaluated from this viewpoint, especially in countries where water availability is a major constraint on human development.

The importance of natural capital in the wealth of African countries stands out very clearly in this World Bank report. A more detailed analysis of its components shows significant disparities, confirming that development policies must be adapted to specific national and even local conditions.

3.3 The “Natural Capital Triangle”

Natural capital is an essential factor of production in two areas:

- Primary production: natural capital is closely complementary to human and technical capital, which will lose much of their value if they are not combined with a sufficient volume of natural capital.
- Beyond the commercially-traded goods and services of primary production, nature also produces non-marketable services (which do not have, or not yet, an explicit market price) but which 1) generate positive externalities that benefit other activities, or that add directly to human well-being (for example, hydrological, climatic and recreational services provided by a forest); 2) have an “option value” (for example, Amazonian bacteria as yet undiscovered that might provide a miracle cure for cancer); and 3) have an “existence value” in the eyes of many people (for example, whales or gorillas).

In LLDCs, we need to distinguish, within the primary sector, between those resources that produce for the world market and earn export revenues, and those that produce for self-consumption and the local market, particularly in the cities. In fact, from the viewpoint of governments and development agencies, support policies for these two sectors do not generally have the same objectives nor do they use the same means. Policies of the first type are designed to achieve and maintain world-scale productivity of an activity that provides growing revenues and foreign-currency earnings. Those of the second type are designed essentially to reduce rural and also urban poverty. If subsistence farming, for example, can be made more productive this will improve the lot of farmers, but it will also help to reduce the urban cost of living, and to open new markets for the goods and services produced in the city.

These differences suggest that, again from an operational point of view, we should distinguish between three types of

developmental effects from the preservation or increase of natural capital:

- The production of local and global environmental public goods (LEPG and GEPG).
- The development of a primary export sector as a factor for growth.
- The elimination of poverty traps, particularly rural ones.

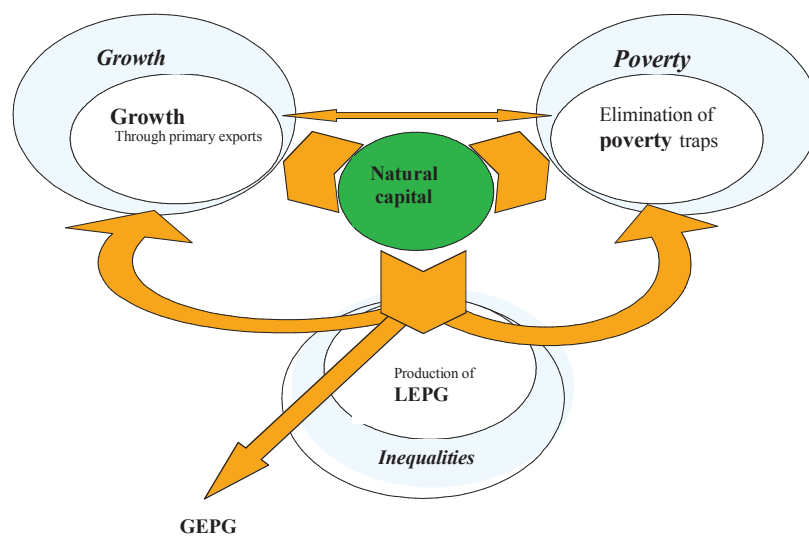
These traps form when the pressure that poor people, relying mainly on natural resources for their livelihood, exert a pressure exert on natural capital in the course of extracting their livelihood on natural capital that leads to vicious circles : poverty-destructive use of natural capital-growing poverty-increased pressure on natural capital, until that capital is finally depleted. The poor who depended on these resources are then obliged to find other employment for their human capital, generally in town. If they are able to find there a livelihood that provides the same income as they had before, their loss is confined to the costs of adjustment. But if this is not the case, their human capital loses value. The fact is that to be a farmer, a shepherd or a fisherman requires the acquisition of specific human capital. A portion of that human capital can be used only in combination with natural capital, and if this has disappeared, that portion will be worth nothing on the market. The person concerned is left with only the value of his unskilled, generic human capital, provided he can find a way to use it. This typology is illustrated by the graph in Figure 6: the

Natural Capital Triangle. Investment in the preservation of natural capital acts directly on: 1) growth, 2) poverty reduction, and 3) the production of local (LEPG) and global (GEPG) environmental public goods. When natural capital produces LEPGs, it also generates beneficial effects for growth and for poverty reduction. Moreover, these positive externalities can extend beyond the local territory, as regional public goods (within a watershed, for example) or global ones (climate, biodiversity), which we call GEPGs.

Over this natural capital triangle we have superimposed as well the return effects of growth on poverty and vice versa. This makes our natural capital triangle a specification for Bourguignon's growth-poverty-inequality triangle. It is equipped with an engine: the conservation of renewable natural capital, the working tool and livelihood of many of the poorest. That is why, in Figure 6, we have shown the growth-poverty-inequality triangle as the backdrop to the natural capital triangle.

The production of LEPGs cannot be exactly identified with actions to address inequalities: in the graph, this can be seen in the fact that the production of LEPGs also acts on growth, and in some cases may act only through growth. Yet in many other cases, particularly when the poor are massive consumers of natural capital, maintaining the "public" services produced by natural capital can actually reduce inequality, because the rich will generally have the private means to find substitutes and to do without them.

Figure 6. The natural capital triangle and the growth-poverty-inequality triangle"



3.4 The “Elastics Model”, an example of modelling the relationship between natural capital and growth

We have stressed the fact that natural capital is rarely cited among the causes of the poverty trap. Yet it is always complementary to human capital in farming, and frequently in actions relating to urban concerns, such as drinking water or air quality. Consequently, an initial degradation of natural capital generates degradation of human capital, which in turn generates degradation of natural capital, and so on. In other words, a poverty trap is formed.

Moreover, some of the characteristics of renewable resources are still poorly reflected in growth models. Two characteristics in particular are neglected because they are often technically difficult to account for in the models:

- **“Irreversibly threshold” phenomena.** As examples, species may disappear, the Gulf Stream could slow or stop, or the productive capacities of the natural environment may take a long time to recover, resulting in deforestation, desertification, the depletion of fisheries, or declining and polluted water tables.
- **The impact of positive or negative externalities on other forms of capital.** These can be considerable, in particular as we approach the thresholds mentioned above. These externalities are a consequence of market imperfections. Policies designed without taking them into account may not be very effective.

These two characteristics - externalities, in particular those of natural capital on human capital, and the specific threshold effect for natural resources - are shown in box 1 and 2, with a graphic illustration of the growth model that we call the “elastics model”. It outlines a possible growth model that takes account of the specific features of natural capital. It helps to understand how and why “investing in natural capital” is an efficient, but not exclusive, way of achieving the ethical objectives (the MDGs) and the economic objectives (pro-poor growth) of ODA flows to African LLDCs. At the same time, it also shows that ignoring natural capital can compromise the return on ODA investments in other forms of capital.

The “elastics model” approach is illustrated here in box 1 and 2 with two stylised examples, one is rural and the other urban

- The rural example using cropland as the natural capital,

but there are many other examples of renewable natural resources to which it applies : a fisheries stock that is poorly managed and over-fished, the disappearance of forest cover and its downstream consequences in a watershed, or overgrazed pasturelands.

- The urban example on the consequences of an industrial pollution, but there are other examples of towns without sewage, of water tables that are polluted or overexploited and all the impacts on the urbans ...

In both examples, the impacts on human capital is a decrease in life expectancy : because of malnutrition in rural areas and because of lung disease in the urban case. “Investing in natural capital” obviously involves physical measures to preserve the environment, such as : establishing protected areas, restoring the forest cover, abatement of pollution.

But it also has to do with investing in technical capital (less polluting technologies), social and human capital that preserve natural capital (or improve it; positive externalities in favour of natural capital) instead of the usual depletion (negative externalities on natural capital).

Investing in social capital is, for example, creating institutions and regulations to manage a natural resource in a rational way, such as have the fishery co-managed by a fishermen’s union jointly with the fisheries department, introducing sustainable forestry management plans or the creation of an observatory of pollution. In the example of this industrial town of south Asia it is crucial to build the system that could switch on the red light on the consequences of the depletion of natural capital before it’s too late : this requires pollution datas, modelling and disclosure of the results, environment standard and monitoring.

This new social capital will help managing the imperfect markets and gives a more “biological” way of operating the economic development : trigger the retro-action before it is too late (decrease of life expectancy, acid rains ...). This may also require new investments in infrastructures and training. Another example is Hong-Kong where financial institutions declared recently their intention to move elsewhere due to the high level of air pollution.

Thus, the “elastics model” introduces a way of using sustain-

nable development for rebalancing the choice of sectoral investments in light of their contribution to the four kinds of capital.

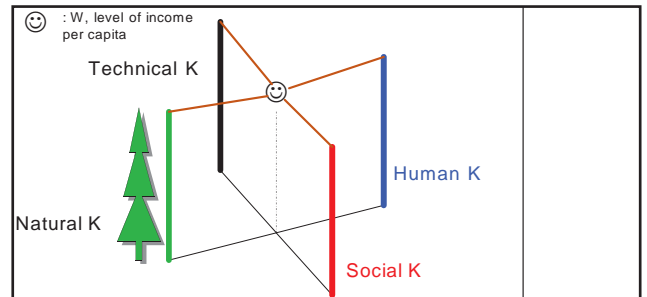
Of course natural capital is not unique in being subject to sudden collapse or in the scope of its externalities on other

forms of capital. These considerations apply to social capital as well, when wars or civil strife break out, and even to physical capital, when an earthquake or a tsunami hits. But in the case of renewable natural capital, they are generalised and, above all, they are man-made.

Box 1. The "Elastics Model" : a rural example

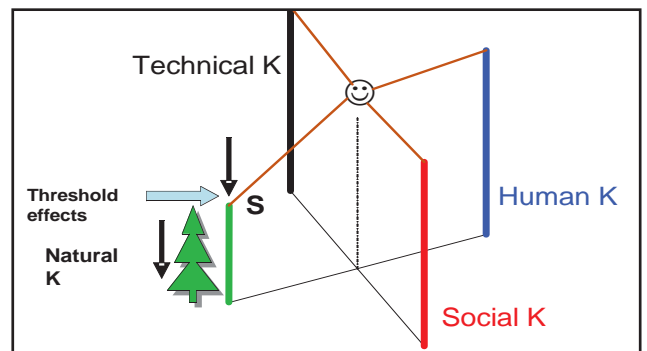
Stage 1

The production function has four factors: natural, technical, human, social. The level of income W : depends on the cumulative quantity of all four factors. In this graph, the production function $W = f(N, T, H, S)$ is represented by the fact that the level of W is held in place by "elastics" at the height of the four "pillars", which are the stocks of capital



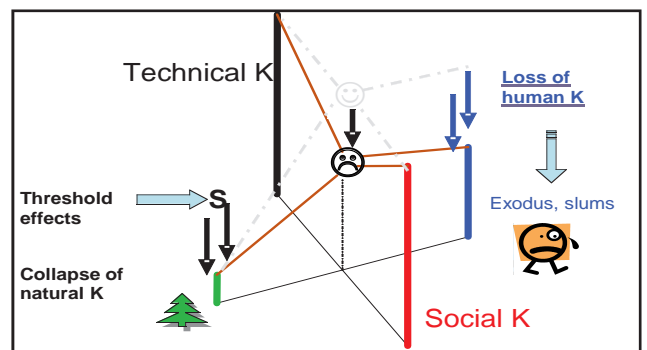
Stage 2

There are many examples of growth based on the consumption of natural capital. We take here a classic example from Africa: farming methods that are inappropriate to rising population density and that degrade soil fertility. This causes a steady decline in natural capital, and thus of yields, until a certain threshold, S , is reached beyond which soil fertility and yields collapse.



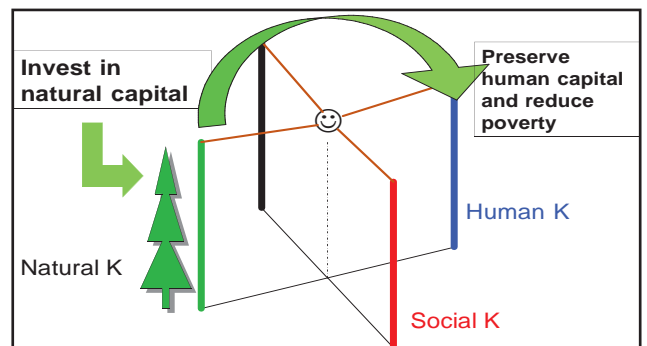
Stage 3

Beyond the threshold S , the soil becomes sterile. The poor farmer becomes an unskilled labourer and tries to find other work. His human capital loses its value: in other words, he can no longer make use of his farming skills (know-how, suitable seeds, etc.). A negative externality has left insufficient natural capital to go with his human capital, and his income is dragged downward.



Conclusion

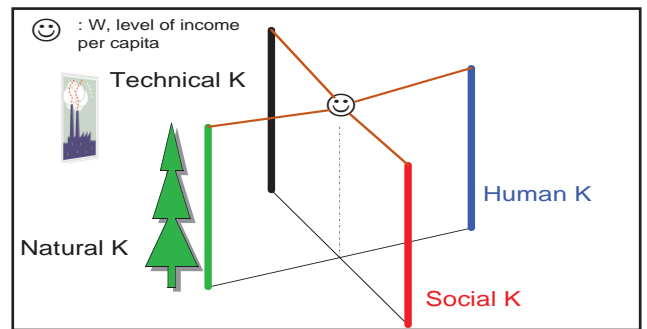
As the threshold looms, an investment that will halt the degradation of natural capital and prevent it from crossing S yields a great social return, and should be a priority. This is because the threshold phenomena induce non-linearities in the growth process, which are admittedly difficult to model.



Box 2. The "Elastics Model" : urban and industrial example

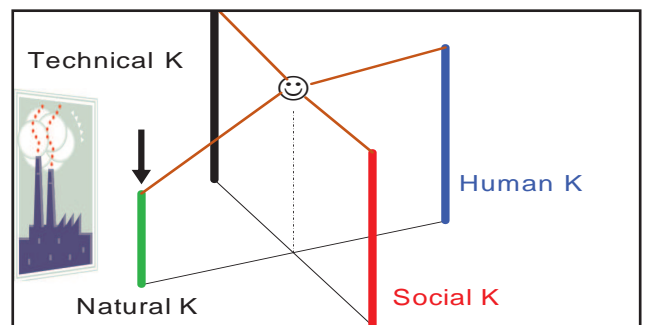
Stage 1

The production function has four factors: natural, technical, human, social. The level of income W : depends on the cumulative quantity of all four factors. In this graph, the production function $W = f(N, T, H, S)$ is represented by the fact that the level of W is held in place by "elastics" at the height of the four "pillars", which are the stocks of capital



Stage 2

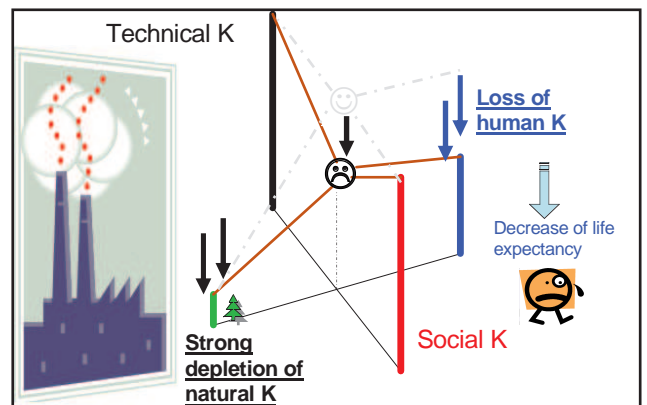
There are many examples of urban and industrial growth that leads to natural capital depletion. The example of a town in south-east Asia with coal fired electric power plants and sulfuric acid factories : a lot of SO₂ pollution emissions. This causes a steady decline in the air quality and thus bad consequences on local environment but also on distant forests aggressed by acid rains.



Stage 3

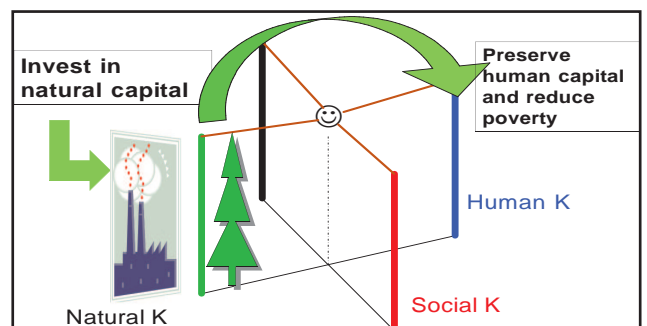
The production is increasing without respect of the environmental regulations that are considered as dragging down the growth. Without environmental warning system, the SO₂ content in the air is increasing to a level that depletes life expectancy from 65 years to 45. Human capital loses its value.

Depletion of natural capital creates a negative externality on the human capital needed for the development of the technical capital



Conclusion

An investment that will halt the degradation of natural capital and therefore preserve the human capital yields a great social return, and should be a priority. Investing should be in technical capital (industrial innovation without pollution) but more important in social capital : pollution alert devices, pollution measurements, environmental regulations.



4. A more “natural” approach to poverty reduction in Africa

4.1 Industrialisation has not yet arrived

For African countries, industrialisation cannot be launched or accelerated without foreign direct investment, which alone has the capacity to bring in modern technologies and train the human resources needed for modern industries and services to take off successfully. Today it is Asia (and to a lesser extent Latin America) that is capturing the bulk of this kind of investment. But even if Africa could significantly improve its investment climate, there is no guarantee it could attract massive private capital inflows. The fact is that the flow of direct investment in industry and services is distorted by market imperfections, in particular the externalities imposed by very strong poles of attraction: the countries that now receive the bulk of FDI are the most attractive ones, as demonstrated by China in manufacturing or India in software and pharmaceuticals.

It is only in the natural resources field (and perhaps in tourism) that African countries hold much prospect for foreign capital to earn profits. This in fact poses a real danger, for the consumers of Africa’s natural resources, who are located increasingly in large emerging economies such as India

and China,⁶ do not seem at all eager to pay more for resources in order to slow the environmental degradation caused by their extraction, or to ensure that renewal resources such as fisheries and forests are exploited in sustainable ways. To put it bluntly, halting the further impoverishment of Africa is not their primary concern: it is not their doors that the refugees from Africa’s misery are knocking at, and they are trying hard to catch up with the rich world, for which they can hardly be blamed.

Yet Africa’s turn will come, especially when Asian firms begin to relocate or outsource their manufacturing, as they have already started to do with raw materials. Meanwhile, the informal sector ekes out a miserable living from the sluggish industrial and services economy in the cities, where wages are so low as to be unattractive even to the rural poor. Yet those rural dwellers, who are too many for the countryside’s exhausted natural resources to support, are becoming ever poorer and many are migrating to the city, where they drive down the incomes of the urban poor even further.

4.2 Preserving natural capital is a priority for poverty reduction in Africa

To break these vicious circles, all those African countries where natural capital is a significant component of wealth and could, if properly exploited, be a major source of income, need to pay close attention to that capital, recognising that it is largely complementary to the human and social capital of the poor. Unless domestic savings rates can be lifted, and unless external capital inflows in the form of private investment (direct and portfolio) and public contributions (ODA) rise above today’s levels, investments in physical capital will be persistently lower in Africa than in the emerging economies. The possibilities of substituting natural capital by physical capital are consequently more limited. Investments that will improve (or halt the degradation

of) natural capital may therefore offer better social returns than any other kind of investment, especially as countries near the threshold where the degradation of nature brings negative externalities so heavy as to destroy other elements of wealth.

⁶ These Asian countries are looking to Africa for the natural resources they now lack because their own supplies (forests, lumber) have been degraded during their recent growth. As another example, this strong growth increases demand for electricity, and Thailand is investing in hydropower in neighbouring countries (e.g. Laos), which has natural hydrological capital that is still in good shape and underdeveloped.

5. Operational conclusions

In emerging economies that are undergoing rapid industrialisation, the best way to reduce rural poverty is to promote migration to the cities. Industrialisation (which is happening all the faster with the help of under the impetus of foreign direct investment (FDI) and with the , dynamic of in part, an being partly export focused) is feeding a very dynamic urban informal sector that absorbs migrants and gives them incomes higher than the ones they left behind in the countryside. Their departure, and the new demand they create in the city for rural products, are themselves an incentive to raise productivity, and thus farm incomes. But the engine driving all this is industrialisation, i.e. the development of a sector that produces modern goods and services. And it is FDI that really “guns” that engine. If the engine can turn faster than demographic growth, the country will emerge and catch up at great speed; if not, it will sink into poverty. If industrialisation is too slow to keep pace with demographic growth, the poor who flee the countryside will only exacerbate poverty in the cities, where living standards will fall to the rural level, instead of lifting the poor out of their misery as in the previous case. Unfortunately, this is what is happening in most African LLDCs that have high demographic growth and low industrialisation rates, a situation that is likely to persist for the next two decades.

Under these conditions, and recognising that natural capital, in particular the renewable kind, still represents a major or even majority share of these countries’ wealth, policies that will conserve and upgrade natural capital, often through the construction of social capital, deserve great priority. In the end, what is needed is a development strategy that is better balanced between the four types of capital described above, thereby giving operational expression to the concept of sustainable development.

This balance is not achieved, as we see it, either in the current PRSPs, which give priority to human capital in the spi-

rit of the MDG, or in the “Marshall Plan” for Africa proposed by the British government, which stresses physical infrastructure (useful as that admittedly would be).

Since the intent is to increase ODA flows to Africa, there is room for a third aspect, one that is supplementary end even essential: assisting pro-poor growth by preserving renewable natural capital, and of course making intelligent use of resource rents. A policy of this kind needs to be defined case-by-case, as the WDR 2006 points out.

NGOs specialised in protecting biodiversity, such as WWF, CI or UICN, have begun to round out their commitments to biodiversity through efforts to reinforce the social capital needed to manage protected areas, and to develop the economic impact of these parks and their contribution to growth. It is now up to donors to keep pace, by earmarking more of their funding for natural capital.

Following are five kinds of action, listed from the most conceptual to the most political, that are needed to move beyond the current experimental stage:

1. Give natural capital its proper place in development planning frameworks.

Understand and model changes in natural capital and their impact on growth, poverty and inequality. Using our natural capital triangle and our elastics model, we have tried to show that this is possible, and to indicate the directions that could be taken.

2. Improve understanding of Africa’s natural resources.

Carry forward the work of Kirk Hamilton’s team at the World Bank: pay more attention to renewable resources, water and fisheries, areas that are particularly rich in biodiversity; evaluate more accurately the environmental services that constitute a public good, and more generally, positive environmental externalities; introduce synthetic indicators as a guide to sus-

tainable development policies, and set concrete objectives; strengthen environmental accounting systems and statistical agencies so as to take the degradation of natural resources more thoroughly into account.

3. Subject previous and ongoing experience in this field to an in-depth and rigorous analysis.

Draw from it all the information that might be useful to a shift of scale.

4. Speed the transfer of technology, North-South and South-South.

Especially in agriculture, using for example Clean Development Mechanisms (CDM).

5. Enlist the stakeholder elites

These are governments and political and social activists in the countries concerned, and development agencies.

Persuade them that:

- Sustainable development relies on four and not only three pillars.
- Nature is a capricious pillar that must be treated cautiously, for it has its own life and it can collapse if we demand too much of it.
- This pillar of development deserves all the more attention because the others are still weak and cannot take its place.
- Budget choices should reflect this priority, starting with the elimination of tax incentives that increase pressure on resources.