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Working Paper

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Introduction

Usually, the phrase “sustainability” is used in *two* ways: (a) as a *technical term* for analyzing certain characteristics of *specific* biological systems, such as coral reefs or wetlands (Munasinghe / Shearer, 1995); and (b) as a *programmatic statement* for a diffuse philosophy of development. This second context of the sustainability debate is far more prominent; numerous conferences, commissions and workshops organized by UN agencies, NGOs and scholarly organizations have dealt with or even promoted this idea of “sustainability” in development.

The following discussion will deal only with this *second* context. I will argue that the phrase “sustainable development” has largely remained a catchword of political debates and international conferences. Its definition is extremely vague, if not ambiguous, despite numerous publications and commissions which tried to clarify it. The concept also lacks generally accepted empirical indicators. No wonder that there is fundamental disagreement on the right way towards “sustainable development”.

Before anything useful can be said about “*indicators* for sustainable development” it would be necessary to define the concept in *precise* and *operational* terms. The definition has to clarify - at least - six aspects:

- It is essential to specify a **time horizon** - for taking into account problems of *inter-generation* equity and exchange.

- The concept of sustainability has to deal with the **fundamental diversity of interests**, for instance, with the fact that for many people and governments sustainability is (and probably has to be) a low-priority issue.
- Sustainability is **scale-dependent** and must therefore be defined for a specific reference group or system. It has to be clear whether we talk about the sustainability of a village society in the amazon rain forest or the survival of mankind.
- We have to specify which **dimensions** should be included in a concept of sustainability. Are we dealing with economic, demographic, cultural, biological or cultural "sustainability" -- dimensions which are not necessarily compatible.
- The definition has to indicate a **methodology of measurement**. It must specify *specific* indicators of sustainability (not just catalogues of existing statistical measures). Any scientifically useful definition of sustainability should also indicate how the numerous aspects of sustainability (and their measurements) can be combined into a *compound* measure.
- The concept of sustainability implies that some conditions (which yet have to be specified) are somehow *better* (in the long run) than others. So the concept obviously incorporates **value decisions**, which must be made *explicit* in a scientific debate.

I will not bore the reader by reviewing the various published definitions of sustainable development. A most extensive collection of 33 different definitions (including well known definitions by Lester Brown, Robert Repetto, Robert Allen, Peter Bartelmus and William C. Clark) can be found in the Appendix 1 of Pezzey, 1992. To my knowledge, however, there is no definition of sustainability available today that would meet all (or even a few) of the requirements mentioned above.

Many international activities for studying and promoting "sustainability" have not even bothered to define what they are talking about. For instance, in its "Work Program on Indicators for Sustainable Development" the United Nations Division for Sustainable Development has not included a single line of text that would specify what they consider "sustainable" (United Nations, 1995). Below I will discuss ten arguments which could help to clarify the concept of "sustainable development". These arguments are intended to question some of the *biologistic* assumptions, which underlie the sustainability debate.

Argument 1

What is sustainable for the *present* generation is not necessarily sustainable for *future* generations - and vice versa.

Not much thought has been given to the problem of *time horizons* in the debate on sustainability. For instance, are we talking about the life span of a few human generations, the survival of the human species or the time scale of the global biosphere?

For many generations people in Europe and North America were able to sustain (and even improve) their living conditions. Usually they are wealthier than their great-grand parents, they are better educated and enjoy a much longer, healthier life (life expectancy has almost doubled since pre-industrial times). Their environment is *less* polluted in many respects. While people in the early Industrial Age suffered from incredible air pollution, toxic waste disposal (such as lead) and poor sanitation, the current generation mostly has safe drinking water, proper sanitation and waste collection, clear skies, and (sometimes) even clean rivers and lakes for swimming. Isn't this a good indication that economic, social, political and cultural conditions in Europe and Northern America are, in fact, very sustainable? Isn't it quite likely that these societies and economies can maintain (or even improve) living conditions for their citizens in the foreseeable future?

However, we know that the present generation is borrowing some of its wealth and well-being from future generations. We not only consume *non-renewable* resources (such as coal and oil) and degrade the environment; but through our way of life and production we also destroy many plant and animal species, thus reducing a valuable gene pool for the research of future generations. It was often said that the western societies have plundered the globe (preferably its Southern hemisphere) to generate their prosperity. Do they also exploit the children and grandchildren of their citizens?

Economists have calculated inter-generation flows of wealth and demographers have dealt with the generation contract of pension systems. But not much is known about the *inter-generation* aspects of technological and economic change. Sketchy evidence suggests that *pioneer generations* have often done the dirty work of first-stage economic development (including a crude and dirty industrialization) -- while it was the privilege of later generations to enjoy the luxury of environmental concerns. For the post-war generation in Europe smoking chimneys were a sign of economic

recovery -- only the generation of their children disliked this first source of their wealth. Chinese government officials, supported by many Chinese scientists, have argued that (economic) development is a *multi-stage* process in which an inherently "unsustainable" phase of crude industrialization is *necessary* to kick-start a subsequent period of more sustainable economic and social development.

Entrepreneurs know that you have to invest for *future* returns. So it might be smart to "borrow" some resources and some animal and plant species from future generations, because with this investment the present generation might be able to reach a stage of development from where these future generations can proceed on a more sustainable path. In other words, it could be a terrible mistake, to *slow down* industrial and economic development today in countries such as China for fear of an unsustainable growth. Wouldn't it be better, if China had started its industrialization and modernization of economy 45 years ago when the population was less than *half* the size of today? Today Africa has 630 million inhabitants. In 2050 it is projected to have more than three times as many people (2 billion) who will demand their share of wealth and economic growth. The slow-down ideology of sustainability advocates is in effect a measure to **postpone responsibility**. If the present generation will not develop Africa and parts of Asia (for fear of ecological damage) future generations will have a much tougher job with much greater risks for the global environment.

Argument 2

The concept of "sustainability" ignores the fundamental diversity of interests

A very powerful metaphor has influenced the discussion on global (environmental) change, including the idea of sustainable development: the "lifeboat" paradigm, which states that we are all in the same boat to fight for the survival of mankind. Of course, this is nonsense. We are *not* all in the same boat. Some of us have private yachts with radar navigation while others cling to a piece of wood in a menacing sea, hardly able to see beyond the next wave -- metaphorically speaking.

There is a fundamental discrepancy of interests in our world. The desire for fresh air and green forests among European intellectuals is *not* shared by impoverished campesinos who fight for survival on a day-to-day basis in the squatter settlements of Mexico City or Rio de Janeiro. Their immediate

concern is to get paid work and food, even if it means laboring in the dust and smog of old-fashioned industries or cutting down rain forest for cultivation. Not only the poor of the Third World often disagree with what "western" academics and politicians consider to be in their best interest. Governments of developing and (post-) industrialized countries have also divergent priorities: While the *reduction* of (unnecessary) crop areas and their transformation into "natural (forest-) land" is a major objective of Germany's agricultural policy -- both in terms of economic efficiency and environmental protection -- it would be an absurd goal in Nigeria or China.

It is true: we all want a better life for ourselves and our children and most of us even share some interest in the survival of mankind (albeit some extremists have argued that it would not be a great loss for the planet's ecosystem to get rid of Homo Sapiens). But this is where the shared interest ends. There are people who feel absolutely happy in the urban jungle of Manhattan Island in New York City, while others think it is almost hell on earth with unbearable sound pollution, traffic jams, high crime rates and the complete lack of a *natural* landscape and ecosystem. Those who spend most of their time in the rather artificial environment of a stock exchange, live in a 50th floor Penthouse and *relax* with roaring sound in a smoke-filled discotheque will hardly understand why they should spend money and effort to protect some swampy mosquito-infected area which is considered essential by some biologists and green activists.

People who have lived all their life in close contact with a *natural* environment can better appreciate the concept of "sustainability" -- right? What about the fishermen of Norway and Iceland who cannot understand why they should stop slaughtering seals. What about the slash-and-burn farmers of Africa and Latin America -- are they just ignorant of their unsustainable activities? The whole world -- it seems -- is outraged by the killing of whales -- except most people in Japan (notably the Japanese fishermen) who think that the consumption of whale meat is *absolutely essential* for the Japanese way of life (and their personal economic survival).

A gross diversity of interests not only exists between different cultures and between people of affluent (post-) industrial societies and the millions of poor in the developing world. There is also a conflict of interest within these countries. For generations a few dozen rich families of Latin America have exploited the subcontinent - often in rather unsustainable ways for the rest of the population. But their own way of life proved to be rather sustainable.

But isn't it some kind of ultimate goal for *anyone* to live longer and get educated? I am afraid -- it is not. Unfortunately, in our world people often live under conditions which are so horrible and depressing that they have given up all hope. Hundred thousands of street children in Asia and Latin

America are harming their health in prostitution, drug consumption and dangerous activities. They cannot waste their energy for something so useless as reading and writing; they need to be street-smart for surviving the urban jungle. And there are those 10 *million* people in Africa (and projected 40 million worldwide) who are (or will be) HIV infected or are already suffering from AIDS. They often live in absolute poverty and they *know* they will die soon, because even if there will be a cure for the AIDS disease it will be most likely too expensive for them. There are also people in highly developed societies who have no special desire to get old or educated. They are living a fast and risky life, which revolves around drugs, promiscuous sex and all kinds of self-destructive activities.

The lifeboat paradigm suggests a harmony of interests and lifestyles which is a dangerous fiction of egalitarian prophets. It is one of the major characteristics of our world that people *fundamentally* disagree about objectives, values and lifestyles. Any concept of "sustainability" has to take into account this incredible diversity and complexity of real life.

Argument 3

What is *sustainable* for some groups (societies, economies) can be rather *unsustainable* for others.

Let us assume, for the sake of this argument, that all people of the world were enthusiastic followers of the concept of sustainability (whatever it means). We further assume that they all would agree on what to do to reach this goal. Would this global harmony of interests and strategies bring us sustainable development?

Of course not. It cannot work, because there is a fundamental problem, which is well known to economists and organizational sociologists: the *incompatibility* of similar actions on different (economic or social) levels and scales. For instance: A small village society in a rain forest area can achieve perfect sustainability with an integrated economy based on hunting, fruit collection and small-scale slash and burn farming. But this way of life would be highly unsustainable for Brazil's *total* population. And, of course, there is no way that China's 1.2 billion population could survive as hunters, fruit collectors and slash and burn farmers -- almost 10,000 years ago they had to switch to an agricultural economy and convert large segments of *natural* into *cultivated* land.

Increasing population (density) is probably the most well-known factor which can transform ecologically adapted into disastrous behavior. For centuries East African nomads used to live as pastoralists in (more or less) perfect harmony with their Savannah environment. But then this population doubled and tripled within a few decades due to a rapid decline of infant mortality. Economic conditions initially also improved, so that they could increase the number of cattle substantially (well beyond the growth rate of the human population). This increase in people and animals lifted the East African nomad society above the carrying capacity of their land (given their level of technology). A previously well adapted economy became a threat to the environment. Overgrazing, destruction of the grass cover due to trampling of cattle, exploitation of the scarce water resources became major problems.

Argument 4

There are big differences in *resilience* of natural ecosystems against human intervention

Some environments are far more fragile than others. Behavior and modes of production that are acceptable in one environment might be disastrous in another. For instance it is well known, that many tropical rain forests have a very thin layer of soil which -- in addition -- can have serious constraints and deficiencies (such as low cation exchange capacity). Clearing these forests for cultivation will usually cause much more harm than cutting down the same size of plot in a boreal forest. Other examples of fragile environments are savannas, perma-frost zones, coral reefs and high-altitude plateaus and steep mountain slopes.

Some agro-climatic zones are more robust than others because they obviously have a *high capacity for regeneration*. There might be a huge layer of loess (such as in the East China loess plateau) or a river which brings water and fertile mud (as in Egypt). In other places the climate conditions might be very favorable for forests and agriculture. There are regions (and natural ecosystems) which have such a high resilience that they could persist almost unchanged for ten-thousands of years *despite intense human intervention*. This is why people have managed to survive since ancient times in places like the Nile Delta or the East of China.

There are huge differences in the resilience of (eco-) systems. While some can collapse with the slightest intervention others can tolerate quite

harmful human activities. Behavior and modes of production that are acceptable in robust (environmental) systems, might be highly destructive in others. In other words: there can be no *universal* indicator for "unsustainability". It can be only defined in relation to a specific bio-geophysical system.

Argument 5

Not *all* species or ecosystems are equally essential for sustaining *human* development

Proponents of sustainable development (especially those with a strong biologicistic perspective) have difficulties to understand why not *everyone* can appreciate the *intrinsic* value of each species. They are so fascinated by the complexity of ecosystems and species interactions that they consider the whole biosphere -- and not just certain basic life support mechanisms -- *essential* for our survival. But do we really need each and every microbe or fungus? Do we even need each and every higher animal? The human species survived for millions of years without dinosaurs and without a large number of other species that died out long ago *without* human intervention.

The error of radical biologists is to focus on the survival of *individual* species, instead of functional groupings. Natural evolution was less restrictive. It created and often *eliminated* numerous species; many of these were just functionally equivalent variants within certain ecosystems. Simon Levin, for instance, has argued that microbial decomposition (which is essential for many life processes) can be performed even if the species composition of the microbial community is significantly altered (Levin, 1995). Simply put: there are - at least in certain biological systems - *multiple* solutions for sustaining vital life processes.

If there are multiple solutions for certain functions in the *non-human* biosphere, it is quite possible that there are multiple solutions for maintaining *human* life support systems. For instance, we absolutely need oxygen in our atmosphere and biomass is essential for its production. But the species composition in the biomass is irrelevant for this specific function, as long as its oxygen productivity is the same. Managed "recreational" forests might be as good in producing oxygen as undisturbed forest ecosystems.

From an anthropocentric point of view sustainable development would mean to find out, which ecosystem functions and species are *really* essential for *our* survival. For instance, do we really *need* the smallpox or the HIV virus on our planet? Do we really need each and every butterfly or bug? These, by the way, are no rhetoric questions. Only recently laboratories in the USA and Russia had to decide whether they should destroy the *last* samples of smallpox viruses, and most likely eliminate this species from earth. Radical biologists have complained that we would lose valuable genetic material by eliminating these viruses.

But is *every* loss of genetic material *as such* a bad thing? Why would evolution have eradicated numerous species (even before the existence of human beings), if it would have been better to preserve it? From cognitive science we know, that being able to *forget* things is absolutely *essential* for learning. Only when we can forget *irrelevant* information are we able to process new data -- otherwise we would be mentally paralyzed by information overload. If the natural evolution is a process of phylogenetic learning, then species extinction could be seen as a method of getting rid of redundant or unfunctional genetic material. We probably cannot prevent that human development will eradicate species and natural ecosystems -- but we should be careful not to eradicate those species and ecosystems that are really unique and essential for life support. Setting *priorities for preservation* might be a better strategy of sustainable development than dreaming of a universal harmony in the biosphere, which would probably be a harmony of stagnation.

Argument 6

Moralizing will not help to make human activities more sustainable

Nature lovers often argue that unsustainable development is a result of economic, social and political perversity and degeneration. If only those human frailties and ills could be cured the world would be a place of harmony between nature and the human species. John Holdren, Gretchen Daily and Paul Ehrlich are the most prominent advocates of this idea. In a recent paper (which has a completely misleading title suggesting it would deal with *biogeophysical* aspects of sustainability) they develop a socio-political utopia (Holdren/Daily/Ehrlich, 1995). They say: "*We think development ought to be understood to mean progress toward alleviating the main ills that undermine human well-being. These ills are outlined ... in terms of perverse condi-*

tions, driving forces, and underlying human frailties." With almost endearing naiveté they demand the elimination of those human deficiencies that cause unsustainable development - which they identify as "greed, selfishness, intolerance, shortsightedness, ignorance, stupidity, apathy, denial, corruption, misuse of technology, and mismanagement." They only forgot to tell us *how* this brave new world of good people living in harmony with nature could be brought about. It obviously requires a little more than just moralizing about social evils.

One might sympathize with a moral view of human development, but a scientific approach has to take into account that human evolution and development -- unfortunately -- at times *proceeds* despite widespread greed, selfishness, criminal activities, intolerance, shortsightedness, corruption, misuse of technology or scrupulous exploitation of nature. And there are even cases where human development is *promoted* by these evils. "Greed" (in the form of "profit orientation") is a powerful driving force to improve economic efficiency. And "misuse of technology" (in the form of artillery or laser bombs) -- unfortunately -- has a long tradition in the establishment of relatively stable political empires.

The social, economic and political world is *not* similar to a system of species interactions and life support functions (as biologists tend to believe); it is something completely different. The human world, for instance includes *intentional* use (and misuse) of economic power and physical force to dominate and exploit other human and non-human populations. It includes ideologies, fanaticism, violence. In the real human world one can find leaders, who *intentionally* put fire on oil wells to cause an environmental disaster. Societies are *not* organisms, where the parts are well *integrated* to function as a system; societies often fall apart -- fragmented by violent social, political and economic conflict (as in Rwanda and Burundi). This brings us to our next argument:

Argument 7

The concept of sustainable development reduces the analysis of social, economic, cultural and political processes to a *biologistic* framework

The concept of sustainable development tries to understand technological, economic, political, social and cultural development in *human* populations in a conceptual framework which was derived from studying bio-

logical and physical systems. What is wrong with this rather simple method of using analogies has been demonstrated extensively in the sociological, economical and political science literature of the past 200 years.¹ Unfortunately, most advocates of the sustainability concept seem to be unaware of this literature. They also seem to be ignorant of the fact that much in today's sustainability discussion is just another of the numerous historical variants of biological reductionism that have been proven to be inappropriate as a scientific method to explain development in socio-economic and cultural systems.

To a large extent the sustainability discussion is a fall-back into a *pre-scientific* approach of understanding how societies, economies and cultural systems operate and change. The debate was initiated by politicians who basically wanted to promote their political ideas and ideologies. They were assisted by natural scientists (primarily with biological background), who thought they would better understand the complexity of human societies and economies than the sociologists, demographers and economists who have studied them before. There is nothing wrong with cross-disciplinary (scientific) competition, but the newly introduced concepts should have a higher explanatory value than the old theories. So far I cannot see how the concept of "sustainable development" would be superior in explaining or predicting the complicated, ever changing social and economic structures, objectives and procedures in our societies.

- It does, for instance, *not* deal with the fundamental social problem of **power imbalance** between societies and social groups (a major obstacle in environmental negotiations)
- It does *not* identify the **social, economic and political structures and processes** a society would need to better handle "sustainable" development (whatever it is).
- And it does not explain how **development objectives** are generated and modified in a *social* process involving politicians, mass media, scientists and ordinary people. All it does is to *postulate* objectives and demand activities - as if they would follow automatically from the bio-geophysical diagnosis of our environment.

One thing, however, is obvious. The concept is soaked with value judgements about what is good and what is bad - not really what one would expect from a scientific concept.

¹ It would require a separate paper to spell out all the evidence which has been accumulated in order to prove that social, economic, political and cultural systems do *not* function like complex biological systems. Of course, it is possible to analyze and model *certain* characteristics or dimensions of socio-cultural systems with the help of biological analogies. While these might explain some specific aspects, there can be no doubt that some of the most important structures and processes are *not at all* similar to those in animals or ecosystems. A book which is highly relevant in this context is: Etzioni, A. (1968).

Argument 8

The concept of sustainability is based (without saying so) on a concept of *communalism*; this ignores the fact that human development is often driven by fierce *competition*.

For years, biologists have studied systems of animal and plant species which show a striking compatibility of their components: Individual species of these systems obviously provide some kind of "assistance" or "service" to others, thus creating a complicated network of dependence. One species, for instance, would produce products, which are absolutely necessary for other species to survive in the same environment. A well-known example is the "service" of insects for the fertilization of plants, which in turn provide food to the insects. There are, of course, much more complicated chains of "services" between species -- often extending over many different levels from higher animals down to "primitive" bacteria and fungi (Schoener, 1989). Research on food-webs has uncovered thousands of these interdependencies in natural ecosystems (Elton, 1958; Levin/Levin/Paine, 1977; Levin, 1989; Odum, 1983; Paine, 1980). Sometimes, it seems that the species can even "learn" behavior which is of *mutual benefit* to them all. There has also been much research on the topological structure of those food webs (Cohen, 1977; Cohen, 1989; Pimm, 1982; Sugihara, 1982; Yodzis, 1989)

Based on this research some scientists have drawn the conclusion that the whole world, including the human species, is a network of dependencies, in which mutual benefits stabilize the system. This is the idea that humans are not only part of a global ecosystem but are also intimately linked into these networks and *depend* on them for their own survival. Therefore we not only have a moral obligation for the well-being of the other species, but a vital interest. In its most extreme form this concept assumes that the human species is *responsible* for the survival of *all* other life forms on earth (Elliott, 1996; Norgaard, 1984). At least, we should not have the arrogance of putting human well-being first (Ehrenfeld, 1978).

While this is certainly a noble idea it does not explain many features of human behavior which evolved as a product of fierce *competition* with other species (and with fellow humans). Many great achievements of mankind were based on the *destruction* of previously existing stable (eco-)systems. Without the invention of agriculture and animal breeding -- which destroyed the ecosystems of many wetlands and forests as well as

numerous animal species -- the human race would not have been able to increase its number above a few hundred million individuals (not to talk about achieving the nice advantage of stable food supply). The human species never lived in total harmony with nature or itself - otherwise it would not have been necessary to develop a voluminous neo-cortex, tools, language, social organization, division of labor and many other things which are unique to humans.

Let's face it: most human action in history was targeted to achieve a comparative *advantage* over other species and the forces of nature to make us *independent* of specific conditions in our environment. We learned to make fire, so that we could live in dark caves and colder climates. This also gave us a comparative advantage against coli bacteria, mosquitoes and wild animals -- thus saving many human lives (cooking food kills dangerous bacteria and parasites in raw meat; smoke drives mosquitoes away; wild animals shy away from fire). Whenever archaeologists dig out a resting place of stone-age men they find two things: charcoal from fires and tools to kill animals (and probably other humans). Who ever has doubts about the competitive nature of the human species should visit the collections of anthropological museums: usually, there are endless rows of spearheads and arrowheads and hand-axes on display. It is hard to believe that our ancestors used these weapons just to perform folk dances -- they used them to expand their food chain to anything they could hunt and to fight for dominance of (and in) their own tribe. Krech has reported archaeological evidence that warfare and genocide were known in North American tribal societies even before Columbus arrival (Krech, 1994).

Using tools (and the brain) to fight and to improve the food supply *at the cost of other species* has been a dominant trend in human evolution. We already mentioned the invention of agriculture and animal breeding which transformed huge natural ecosystems in *cultivated* land. But the human race invented many other "tricks", such as pesticides, fungicides, nitrogen fertilizers and food preservatives. For centuries we are already changing the genetic structure of crops and domestic animals through breeding. Without routinely killing rats and mice and fighting crop pests a 5.5 billion world population simply could not survive. It is probably inevitable that we will have to *directly* modify the genetic structure of crops, vegetables and domestic animals in order to feed an almost 10 billion world population projected within the next 55 years (or the 11 or more billion people by the end of the next century).

The whole evolution of the human species indicates that *we are not happy just being part of a sustainable ecosystem*. We want to dominate. Through all kinds of inventions we try to *shape* our environment for *our* benefit -- even if it is at the cost of other species and our human neighbor. We are a

"competitive animal". The concept of sustainability implies that our actions should not unbalance the ecosystem of which we are a part. But precisely this is what the human species has always been doing.

But are there not people living in relative harmony with their natural environment, happy with their way of life? What about those small groups surviving peacefully in the remote forests of Papua New Guinea, Kalimantan, Sulawesi or the Amazon? Their lifestyle may be less violent and more benign to the environment; but their impact on global human matters is quite minor. They have not invented those airplanes that are used by the anthropologists who visit and "study" them; they lack the skills (and resources) to build computers, which are -- among other things -- necessary to analyze the CO₂ concentration of the atmosphere; they do not have the (agricultural) technology to feed their children, if some "heavenly force" would reduce their infant mortality to a modern level (It is, by the way, a fiction that only *natural* methods of family planning keep their numbers in line with their limited food supply. They can only stabilize their population at a sustainable level because of high infant mortality, rude methods of abortion and infanticide, occasional famines or frequent tribal fighting.) But even if these small groups were the ultimate role model for a sustainable economy and life style -- does anyone really believe it would be possible for 10 billion or more people to lead such a life?

There is no obviously *benign* path of development. Only "ex post" we know for sure what worked. The concept of sustainable development is a classical form of teleological social philosophy. It pretends to know what is *good* for the evolution (which *includes* social, economic and political developments planned and carried out by humans). In reality, however, we are usually "groping in the dark". But that is not necessarily a straight way to disaster. In fact, so far, "muddling through" was a most successful evolutionary strategy for the human species -- and not those grand overall designs for improvement of man-nature relations suggested by supporters of the sustainability concept.

Argument 9

What is *environmentally* sound may not be acceptable for our social structure, our economy or our culture.

We have already mentioned the *diversity* of interests, time horizons and physical environments which make it impossible to define "sustainability"

as a universal concept. But the most serious obstacle to a universal concept of sustainability is the fact that human life not only has to deal with *one* dimension. The stability of our ecosystem is only *one* of many concerns.

For instance, we have to deal with the stability and efficiency of our social and political systems. Large sections of the African population are struggling to survive civil wars, rapidly spreading epidemics of lethal diseases, extreme poverty as well as social and cultural disruption. Corrupt dictators and military regimes terrorize and exploit the population. Millions suffer from malnutrition and complete lack of education. Under these conditions few people can afford to think about the "sustainability" of their agriculture or industry.

Many measures to minimize environmental degradation (which probably could be seen as a first step towards "sustainability") require a stable and efficient political and economic system. They need educated and healthy people as well as functioning social structures for their implementation. But these do not exist in large parts of the world. Therefore it might be necessary to improve the social, economic and political situation, *before* one can even think about "sustainability". First things first!

For instance, shouldn't we support a *rapid* modernization of agriculture everywhere in Africa, Latin America and Asia, including the development and use of bio-technology (for instance, to develop high-yield draught resistant crops)? It might be the *only way* to feed the projected 11 billion world population (I hope everyone agrees that sufficient nutrition for everyone is a basic condition for sustainable development). Some people might argue that it would be "sustainable" *not* to have a 11 billion world population; but as every demographer knows this is a non-option, because the demographic momentum -- no matter what -- will (at least) add another 3 or 4 billion to the present world population (Lutz, 1994). Most demographers, however, believe that a doubling of the world population by the end of the next century is quite likely. The hard decision might be, that we either use high-tech agriculture (including some *local* environmental degradation due to over-use of fertilizers and pesticides) and double or triple food production in Africa and Asia or just sit there and watch hunger camps on our TV monitor.

We have a taste of what might happen, if we follow the sustainable advocates in agricultural development: Most countries in Africa south of the Sahara (with the exception of South Africa) have failed to modernize their agriculture during the last three decades -- fertilizer and pesticide use is a *small fraction* of what is typical in Europe or Asia (or simply non-existent) and there is almost no mechanization. This stagnation might have been more sustainable for the environment than Asia's rapid agricultural modernization, but it was also a demographic, social, economic and public-

health disaster. Millions of Africans were harmed by long periods of under-nutrition and famine. The rural social structure eroded in many regions, because a large section of the rapidly growing population could not live from the land (given the low level of agricultural productivity) and had to migrate to the cities.

China, on the other hand, radically modernized its agriculture. The consumption of nitrogen fertilizers increased 10 to 12 fold since the early 1960s and has now reached a level that is higher than in some European countries. They use high-yield varieties of crops and modern methods of livestock production. But they also *tripled* grain production, and the production of slaughtered meat rose substantially. This made it possible that China's population was saved from large-scale famines during the past two decades. Infant mortality is down and life expectancy is up to almost "western" levels. China's present economic boom, which is mostly driven by its rapidly modernizing industrial sector, would not have been possible without the stable basis of a modernized agriculture.

Argument 10

Currently, there is no methodology available to measure and rank "sustainability".

Using just words to describe conditions which we consider more or less "sustainable" is inadequate for a scientific approach. We need *quantitative* measures to identify "sustainability". These are not in sight. So far, the most ambitious effort to develop "Indicators of Sustainable Development" was launched by the United Nations Division for Sustainable Development in collaboration with the World Bank, the World Resources Institute and many Global Change research centers. Unfortunately, this UN initiative completely ignored the scientific discussion on the issue of "sustainability" and focused on the compilation of a "shopping list" of existing statistical indicators (which all of a sudden became indicators of sustainable development).

Some indicators in early versions of this list were just *absurd*, such as: "Total Population". Is a *large* population good for sustainability, or a *small* population? Which population is *more* sustainable: the 1.2 billion Chinese or the few million Massai of East Africa? It is obvious that these questions cannot be answered, because the *size of a population* doesn't correlate to

anything that could be defined as "sustainability" (by the way, the new indicator: "Population Density" is not much better). It is not acceptable that *compilations of conventional* statistical indicators are just re-defined as indicators of sustainable development. This label switching does not solve any of the above mentioned problems.

I believe that the concept of "sustainable development" is often just used as a nebulous development ideology. But let us assume it could be developed into a scientific concept, then it would be necessary to use empirical indicators that are compatible with the following methodological requirements:

- Before we begin to measure "sustainability" we have to say what we intend to measure; that is, we have to *define the concept*.
- Any indicator for "sustainable development" has to *specify the context, scale, and domain*, because it can make a big difference if something is sustainable for the environment, a specific economy, a political system, a certain ethnic group, the human species or the world's biosphere.
- Every measure of sustainability must explain whether a high value in that indicator means *low* or *high* sustainability. (It is almost comical that "population size" was suggested as an indicator, without the slightest intent to explain whether a large population is good or bad for sustainability.)
- Any indicator of sustainability must be based on *valid (reproducible) empirical data*.

Conclusion

Preparing the ground

Should we then conclude that sustainable development is just a naive socioeconomic fiction of natural scientists or the ideology of "green" politicians? Certainly not! There is, of course, the imminent danger that various technological, demographic, economic, social or political developments might destroy *essential* life support systems of our planet and thus undermine the biophysical basis of our own existence. But -- contrary to widespread propaganda -- it is not clear which trends will be more or less harmful to the *natural* environment *in the long run*. Most important, however, we have not even begun to understand, how various measures intended to promote *environmentally* sustainable development will affect the *demographic, economic, social and political* sustainability of the human species.

It is, for instance, not at all clear which environmental changes will affect *which section* of the human population to which degree and *in which period of time*.

The decisions we have to make are not simply between good or bad, sustainable or unsustainable. They are in all shades of gray. We often face painful tradeoffs between short term damage and long term development towards a more "sustainable" economy (Becker, 1982; Coase, 1960). China's exploding CO₂ emissions from industrialization are certainly a reason for concern, but should China wait another 60 years with its development and remain an agricultural society? Is that possible? Can the Chinese agriculture be modernized to feed another 400 million people *without* industrialization (such as building up the chemical industry for fertilizer production)?

There is a tremendous *uncertainty*, not only in our understanding of the biophysical mechanisms in global life support systems, but more important, in our anticipation of possible consequences and side effects of different development paths. What can we do in this situation of uncertainty and divergence of interests? **Preparing the ground** for a development that has greater awareness of (global) environmental problems is all we can do. From a social scientist point of view there are three clear lessons for us to learn:

- First, it is of paramount importance to **establish structures, institutions and mechanisms to handle conflicts of interest and judgment** concerning social and economic development. Since we cannot - and should not hope to - eliminate divergent interest and judgments we must feed them into a process of global - but also regional and local - discussion and negotiation. Organizing mammoth Environmental Conferences, where thousands of sustainability advocates are flying to exotic conference centers - burning valuable fossil fuels - is not the right way. Some promoters of sustainable development believe a sustainable future could be achieved through a combination of scientific research and "re-education". They think that we only have to generate "objective" scientific evidence (on global warming, ecosystem destruction or on species reduction) and educate people (and governments) about the disastrous consequences of their activities. Enlightened people would live sustainable. This naive naturalistic approach is an attitude of the 17th and 18th century. It ignores the fact that our future (as a species) *is open* and a product of competing development strategies. *Multiple* paths of development are possible and only "ex post" will we know if one was sustainable in the long run. Even if our scientific knowledge about life support systems was complete and undisputed, people would not automatically agree what to do. Development is a

matter of priorities, values, styles -- and therefore, inevitably, a matter of conflict and competition.

- Second, scientist should have the guts to **denounce false prophets** (both in the scientific and political community) who trade in "easy solutions" to the global problems of (economic) development and environment. There is no scarcity in quick receipts from the political left to the right and from traditional natural science to esoteric nonsense. Some people (in Germany) really believe, we just have to reduce *all material flows in the industrialized world by 80% (!)* to become sustainable. It obviously escaped their attention that several hundred million people in the Third World *directly* and indirectly live with products and from transfer income produced and generated in the industrial sectors of developed countries.² "On a global basis, official remittances are ... second in value only to crude oil, [and worth] \$71 billion in 1990..." (Teitelbaum / Russel, 1994, p. 244). "Closing down" industrialized nations would not only affect *their* few hundred million inhabitants, but *billions* of people in the less developed world.
- Third, we should be aware that the sustainability concept until now, has mainly been a **social philosophy** which is packed with hidden assumptions, values and lifestyle ideals. Popular among sustainability advocates is the Calvinistic "give up" philosophy: We should limit our traveling, our eating of red meat; we should lower the temperature in our apartments and use bicycles instead of cars. This idea of development, however, is *not* shared by a great majority of people -- a fact which has to be taken into account. In the United States of America people drove 6710 billion passenger kilometers in 1992/93 (mostly using a car). Only 18% of this individual mobility was *necessary* to go to work; 44% of all individual mobility in the US was household and family related (such as driving to the shopping mall or taking the kids to school) but 38% (!) was *leisure* mobility - including 55 *billion* kilometers with the objective to "go for a ride" (which usually means driving up and down the highway just for the fun of it) (NPTS, 1990; Grubler, 1993).
- Forth, we should promote a **sense of limits**. If people *directly* feel environmental conditions getting worse and vital life support systems approaching dangerous conditions they will hopefully start to think about how to solve these problems and even modify their own behavior. This learning process, however, will not emerge, if we can just avoid being affected by the degraded environment. A good example are the patterns of urban development in many US cities: once, an inner city area gets "bad", people and businesses just move out - wasting valuable

² The majority of people in Kerala, India and a significant proportion of the population in Bangladesh and Pakistan, for instance, can only survive from the remittances of family members working in the Persian Gulf and Western Europe.

land with urban sprawl of suburbs and newly built commercial centers on the periphery instead of fixing the problems in the old area. Inappropriate land-use legislation which does not force people to "clean up" degraded settlements and commercial areas, has contributed to the excessive urban land waste in the United States. Another example is development aid to poor countries (especially to Africa and Eastern Europe) which often also has just the function of "cleaning up" the economic, social, an environmental mess created by incompetent governments. People and governments in Eastern Europe will not get more environmentally sensible, if Western countries accepts responsibility and even cover the costs of cleaning up their environmental disasters - such as nuclear contamination due to the Tschernobyl explosion. We should not easily provide outside relief from the pressure of environmental degradation. If people (and governments) realize that there is no "salvation from outside" (Abernathy, V.D. 1996) they will mobilize their creativity and good will. A core problem is the fact that certain environmental resources, such as land, air, water, or the diversity of plant and animal species, often do not have a price. They are essentially free to anyone for exploitation or as place to dump waste. It certainly makes sense to develop ideas how these valuable resources can be managed in a better way by implementing pricing and market mechanisms (tradable pollution permits and exploitation rights, etc.).

- Fifth, we should set up structures, institutions and procedures not only for the **monitoring** of natural conditions, but also for providing access to this information to the general public. This **early warning and public information system** should be based on existing sources of information, including statistical systems, scientific institutions, and mass media. Just publishing another World Bank Report on "Indicators for Sustainable Development" would not be sufficient. The key issue is that all relevant social groups get access to environmental information and have an opportunity to participate in processes of decision making concerning development options. Simply put: we should promote (environmental) universal education, unrestricted research, free press and political participation. Where these conditions were lacking we have observed the largest environmental disasters (such as Tschernobyl, or destruction of rain forests).
- And sixth, whatever we do to promote the bio-geophysical health of the globe we should **proceed with care**. Never before was the human species -- on average -- so healthy, lived such a long life and could enjoy such a broad range of goods, facilities and services. Some people don't like to hear it; but both the *relative* and *absolute* number of people who have sufficient food, housing, income and health facilities is probably higher than ever before. Only one generation ago massive famines, high

infant mortality, widespread diseases (lepra, tuberculosis, smallpox) and extreme poverty were *normal* in Africa, China, or India. We should not jeopardize the *actually increasing* overall health and prosperity of our species to prevent a mainly *projected* degradation of life support systems.

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