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Environmental/Social Cost-Benefit Analysis: The Integration of Sustainability
The Cases of the Narmada Valley Project and the Three Gorges Dam

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ABSTRACT

Environmental/Social Cost-Benefit Analysis: The Integration of Sustainability
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Daniele Erik Saracino

A large number of mega-development projects have yielded poor economic results as well as having had a disastrous impact on the environment and, at times, on the social fabric of the societies concerned. However, despite the proven lack of sustainability of this development pattern, governments and international agencies continue to support and design large-scale projects. On the other hand, the increasing politicization and internationalization of environmental and eco-politics and the development of green economics have managed to introduce new variables, in particular an environmental/social cost-benefit analysis, into the traditional design of development projects. In this thesis while I provide a brief summary of the diverse and opposing camps of environmental supporters and their criticism of conventional economic models of development, I review the basic tenets of the environmental/social cost-benefit analysis which has had the most influence in the arena of developmentalism.

Despite the attraction of the model and its theoretical acceptability to international and often national development procedures, in practice, environmental/social cost-benefit analysis has had little influence, in part due to the lack of political and ideological commitment among most development policy makers and governments. The major problem, however, lies in the absence of a comprehensive and workable framework for environmental/social cost-benefit analysis.

Focusing on major mega-dam projects in two case studies, namely the Narmada Valley Project in India and the Three Gorges Project in China, I underline, in this thesis, the theoretical and conceptual problems with cost-benefit analysis and the comprehensive environmental, social and economic impacts of each project. Contemporary evaluations fail to address the complexities and interconnectedness of the ecology-economy cycle and underestimate actual projects costs. Based on the findings of these two case studies I suggest that the evaluation of development projects with an improved environmental/social cost-benefit analysis could be more effective at bringing about comprehensive sustainable economic as well as human development.

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Abbreviations

BJP	=	Bhartiya Janta Party
CIDA	=	Canadian International Development Agency
CBA	=	Cost-Benefit Analysis
CPPCC	=	Chinese People's Political Consultative Committee
CUPDI	=	Chinese Urban Planning Institute
CYJV	=	CIPM (Canadian International Project Managers ltd) - Yangtze Joint Venture
DOE&F	=	Department of Environment and Forests
EIA	=	Environmental Impact Assessment
EPCO	=	The Environment Planning and Coordination Organization
FPL	=	Flood Pool Level
GDP	=	Gross Domestic Product
GNP	=	Gross National Product
GPI	=	Genuine Progress Indicator
GW	=	Gigawatts
HDI	=	Human Development Index
IUPDC	=	Institute of Urban Planning and Design
IIS	=	Indian Institute of Science
IREE	=	Institute for Research on the Environment and the Economy
LDC	=	Less Developed Countries
MAF	=	Million Acre Feet
MFP	=	Minor Forest Produce
MW	=	Megawatts

NBA = Narmada Bachao Andolan (Save the Narmada Movement)
NGO = Non-governmental Organization
NPL = Normal Pool Level
NSP = Narmada Sagar Project
NVA = Narmada Valley Authority
NVDA = Narmada Valley Development Agency
NVP = Narmada Valley Project
POCRB = Planning Office of the Changjiang River Basin
RIS = Reservoir Induced Seismicity
SIA = Social Impacy Assessment
SSP = Sardar Sarovar Project
TGD = Three Gorges Dam
TGP = Three Gorges Project
UFSI = University Field Staff International
UN = United Nations
UNCED = United Nations Conference of the Environment and Development
UNHDR = United Nation Human Development Report
WCED = World Commission on the Environment and Development
WTA = Willing to Accept
WTP = Willing to Pay

CHAPTER 1

INTRODUCTION

Although we have witnessed growing popularity in the global arena, of the link between ecology and economics in recent years, we have also seen a world order increasingly focused on market development which has historically dismissed the environment. Dealing with export agriculture, debt repayment, structural adjustment programs, the consumption natural resources and the pursuit of mega development projects, have all combined to hurt third world ecosystems (as well as ecosystems in the first world). For these reasons, many scientists now believe it is urgently essential to fortify linkages between the environment, development, economic growth and industrialization. The world, particularly developing countries, can no longer afford to allow economic growth to supersede the pressing environmental and social needs since this kind of development has undercut its essential human and long term economic development (Adams 1990, Goldsmith 1972, Meadows et al. 1972, UNHDR[1] 1992).

Although there has been some progress in environmentally sound development recently, no country has yet managed to evolve into a "sustainable"

society. The Dutch have made great strides in recent years with their National Environment Policy Plan to stop environmental decline (de Graaf & Hamann, 1996) Their attempt at greater sustainability is a model for other countries, but generally speaking all modern developed economies are still supported through the consumption of natural capital. It is this depletion of our natural resource base which is responsible for a large part of our standard of living. Increasing amounts of scientific evidence makes dubious the claims that such actions are sustainable over the long term (Meadows et al. 1972, Commoner 1971, Suzuki 1996).

> In a joint statement in 1992, the National Academy of Sciences and the Royal Society of London said, "If current predictions of population growth prove accurate, and patterns of human activity on the planet remain unchanged, science and technology may not be able to prevent either the irreversible degradation of the environment or the continued poverty for much of the world... ...the future of our planet is in the balance. Sustainable development can be achieved, but only if irreversible degradation of the environment can be halted in time. The next 30 years may be crucial." (Nelson, 1996)

The relationship between the environment and economic development merit further research because one is inclined to judge the reasons given by the scientific community to be more plausible than they are alarmist. The gravity and probable urgency of this topic has generated growing interest for academics and researchers. Third world development (in many cases underdevelopment), global consumerism and environmental pressures have made the question of environment, a matter of political and social consciousness but also a subject under intense academic investigation in both the developing and developed

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[1] UNHDR - United Nations Human Development Report. 1992.

societies. Clearly, the resolution of this environmental and development problem is of paramount importance to all those concerned with long term sustainable development. Development workers[2] in the field continue to work towards a solution, a solution which should include the planning of a practical framework for social, environmental and economic assessing of development projects.

To shed light on some of these issues and concerns, this thesis reviews two mega-dam projects: the Narmada Valley project in India and the Three Gorges Project in China. I examine the difficulties and practical obstacles which lay in factoring in environmental and social costs into conventional development approaches. Through reexamining the economic viability of two large scale hydroelectric dams in the light of green economics[3], I determine if a more accurate cost/benefit analysis will be possible. Such reexaminations could bring about comprehensive sustainable economic as well as human development.

The major questions that I address in the thesis are: "To what extent will a cost/benefit analysis which includes green economics be more effective than traditional frameworks of cost/benefit analysis, at evaluating the viability of development projects?"; "Does conventional economic analysis adequately factor in costs, like environmental degradation and human dislocation, into its cost/benefit equations?"; and "To what extent have the governments and large developmental institutions like the World Bank, CIDA, NVA or CYJV,

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[2] He/she can be part anthropologist, economists, engineer, environmentalist, hydrologist or sociologist.

[3] Here green economics refers to an economics which is considerate of both environmental and social impacts.

incorporated concepts and approaches of environmental groups, into their designs of projects and environmental feasibility studies?"[4]

If we aim to improve cost-benefit analysis, we are confronted with a series of questions which must be addressed. The first is, 'How do we measure costs?'. When evaluating and judging alternatives individuals as well as governments need to be able to quantify and compare the positive and negative impacts of any project. We can use either monetary or non-monetary measures to assess the cost or benefits of specific actions or impacts. Those who favour non-monetary measures (Stirling 1993, Waring 1988) can be described as representing a more ecologically-centered approach. Apart from questioning the scientific and technical difficulties of attempting to 'price' the environment, they also raise the issue that this type of valuation is fundamentally flawed. Any attempt at measuring the immeasurable is invalid.

Other authors (Meadows et al. 1993, Goldsmith 1972) share this aversion to conventional economic theory and analysis but they put their energies toward shaping new development paradigms. These authors propose the abandonment of development policies which center on economic growth and have pushed for more ecologically sound development. Like environmentalists, they see long term human development endangered by environmental decline.

The current practice in conventional economic analysis relies on the monetary evaluation of all 'recognized' variables. Authors like Mikesell (1992),

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[4] CIDA - Canadian International Development Agency; NVA - Narmada Valley Authority; CYJV - CIPM Yangtze Joint Venture.

Common (1988) and Adams (1990) are sensitive to environmental concerns, yet they suggest that an improvement in the evaluation procedures could introduce sustainability into flawed conventional cost-benefit analysis. More accurate monetary measures of environmental and social impacts could be the most practical way to achieve sustainable human development. Those who favour such monetary measures, represent the market-centered approach.

Initially those who favoured traditional cost-benefit analysis (CBA) and dismissed both social as well as environmental concerns, were representative of the market-centered approach. However with the transformation of conventional CBA, this group is no longer dominated by orthodox economists. Pushed by environmentalists and economists, an improved environmental/social CBA has meant that all those who believe in sustainable development: scientists, activists and economists, can work within this market-centered approach. These are issues I raise and elaborate in chapter two of the thesis.

Using a new environmental/social cost-benefit analysis to assess viability, raises another question, 'Who should have the power to assess viability?'. Depending on the openness of individual countries, the decision-making authority can be monopolized by the few or diffused to the many. It can either be concentrated in the hands of a few powerful political leaders; legislatures; state bureaucracies or shared with local communities and individual citizens.[5] Ideally, if all those who are affected by a particular project were given a voice in the assessment of its viability there could be a greater likelihood that more issues

[5] Most nations place their power to assess viability somewhere along this continuum.

would find their way into the evaluation process. However, can we open up every project to democracy? This is a difficult and complicated question which raises numerous ethical issues and which has the potential to stifle development projects in both the developed and developing world.

Clearly, the democratic process and the transparency which it delivers to decision-making is a benefit to cost-benefit analysis, yet all societies have the obligation to work for the 'greater' good. In the democratic North, we too entrust our governments with such power and have experienced the construction of unpopular (for some) projects. If local communities are allowed to veto development projects (assuming they are adequately compensated), they could hold up regional or even national development which could benefit the majority of individuals in their respective nations.

Finally, these issues beg the question: 'What is the aim of development and development projects?'. This thesis concerns itself with human development and the idea that mega-projects should be geared toward facilitating this type of development, because often times mega-projects are almost entirely focused on boosting economic development. The economic growth model assumes that economic development will benefit all citizens and bring about social development, but this is not necessarily so. Although important, economic growth is only one element of human development. As a result, development projects may prove to be more successful if they are devised to contribute to human development rather than simply benefiting the economy.

Chapters three and four attempt to raise these issues not in abstract but in the context of two major developing countries, each with their own very distinct development path. The considerable prominence that I have given to these case studies stems from the fact that in the real world of development what translates to practice or addresses effectively a practical problem supersedes ideals that are difficult to employ in the field. These two chapters should demonstrate the extent to which terms like 'sustainability' and 'green development' are more than just overused catch phrases, where very different concepts are lumped together. In order not to lose site of the limitations developing countries must continually endure, I have chosen to tie this thesis to concrete examples of development in the field.

Furthermore, we acknowledge the decision-makers' vested interests. In part it is the underlying motivations of these actors which reinforces their adherence to such development projects and to conventional economic analysis. Therefore, any attempt at altering development practices in the field will likely fail, if we are unable to demonstrate that newer sustainable approaches are beneficial and to the advantage of vested interests. These decision-makers can be encourage to adopt a more sustainable perspective when they witness actual examples of economically successful sustainable enterprises. The economic viability of such environmentally sound projects will help prove to decision-makers that the introduction of these 'green' practices is not a zero-sum game.

Finally, the quantified evaluations present in cost-benefit analysis cannot dismiss the fact that evaluation procedures can also be described as essentially

qualitative. Quantified 'scientific' methods may appear more legitimate, yet they are highly dependent on the skills, training and prejudices of project planners. An attempt to research deep into the technical, mathematical economic calculations of cost-benefit analysis would require another book and is outside the scope of this thesis. There has been a lack of input from disciplines like sociology and project appraisal is still dominated by the hard sciences (engineering, hydrology, etc.) and by economics, which happens to be the most technocratic discipline in the social sciences (Adams, 1990:152). Other disciplines, like anthropology, ecology or sociology are essential to an environmentally and socially sound CBA, yet these 'soft' sciences are marginalized from the formulation of development schemes. Increasing the contributions these disciplines bring to project planning and training people with multidisciplinary skills, could produce more sustainable development because they would be better able to appreciate the gravity, environmental and social factors have on human development.

The methodology of this thesis is essentially based on library research. I have relied on sources of data available in the public domain, notably library books and journals, newspapers and several documentary films. Of these films, Cadilac Desert was especially informative and provided technical information and much insight into studies in hydrology. The Internet has also provided me with much information and was a great help in accessing the latest developments in both mega-projects. I contacted, via the Internet, two Canadian

based international agencies: Probe International and the International Rivers Network and they too were able to provide me with essential data.[6]

The reader should be made aware that both case studies involve contemporary mega-projects which are still under construction. There has been much analysis conducted on the dams in India, but on the other hand, the recent commencement of the Three Gorges Dam and the peculiarity of Chinese information dissemination has limited data collection. This is so primarily because channels of public participation in major decision-making bodies continue to be limited despite much reform. Nonetheless, at times the absence of diverse voices and studies on a matter as significant as the Three Gorges Project [which effects the lives of tens of millions and can change the face of the region forever], can be just as telling for those interested in the expansion of sustainable development and environmental protection.

Furthermore, I found one has to interpret the treatment of official data for the Indian project with much caution because the government has not been adverse to manipulating the statistics and studies to render favorable conclusions. At times the Indian government even used laws to limit access to information. On the other hand, the political opposition also tried to present studies and calculation that support their own views. Thus I had to learn to contrast, compare and glean information out of what was contradictory as well as what was missing.

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[6] They can be reached at http://www.nextcity.com/probeinternational/index.html. and at http://www.irn.in.org/index.html.

CHAPTER 2

THEORETICAL PERSPECTIVES

Introduction

During the last five decades there has been an evolution in the economic models for development. The earlier economic growth models have demonstrated their inclination towards short term returns and have not appreciated the ecological linkages with the economic cycle. The disillusionment with this model has brought about a move to alternative models, notably the model based on the sustainable development approach. This approach encourages a pattern of development that is inherently concerned with long term viability of development policies and projects. This pattern of development coupled with a deepening awareness that ecological disasters in diverse parts of the world can have important implications for all people regardless of whether individuals live in the developed or developing countries, has created an atmosphere or at least a theoretical willingness on the part of development policy makers to consider environmental principals and engage in socially sensitized cost-benefit analysis. However in practice such evaluation has proven to be far more complicated, not only because political and ideological

commitments are often lacking among policy makers, most of whom are trained with the "economic growth model", but also there is still a need to develop a practical framework within which development and evaluation of development policies are possible. In this chapter I intend to provide an overview of some of the most important issues and aspects of these debates that relate to this thesis.

Economic Growth Model

The economic growth model is centered on economic development and concentrates on the expansion of the cash economy. In the northern industrial countries it has created employment, income and a greater output of goods and services and as a consequence many economists (and countries) have adopted the view that economic growth is not only necessary and beneficial but that ever increasing growth regardless of other factors, should be the goal (UNHDR, 1996:43). Western economists have been inclined to view development in strictly economic terms and so any nation which could manage to expand its economy (by increasing GNP per capita) would then be able to improve its standard of living. This type of development could be seen as an evolutionary process where developing countries try to copy the more advanced industrial countries of the North (Harrison 1983:23; Harrison 1987:47-60).

There are many facets to development such as political, human, economic and social, all of which reflect some measurement of the quality of

people's lives (UNHDR 1992, UNHDR 1996). Yet up until the recent past, development experts emphasized economic growth as being the key avenue toward overall development for less developed countries. The 'economic growth' model proposed to developing nations, for achieving modernization and development, has encompassed neoclassical, Keynesian, Post-Keynesian and Marxian economics. Although different, each of these economic models are examples of expansionist economics and can be described as conventional (Institute for Research on Environment and the Economy IREE, 1993:21). The Orthodox approach[7] has dominated the field of economics and development this century and its objective has continually been to maximize the growth of every country's Gross National Product (GNP). This conventional economic growth model, sees no limits to growth because, "All technical constraints can be overcome or circumvented through human ingenuity and initiative." (IREE, 1993:13)

In more recent years, the simple logic of the economic growth model has been criticized for several reasons. First, the economic growth model has ignored other aspects to development, like social and political development which also contribute to 'quality of life'. In conventional economic theory, development has been measured exclusively with economic figures. Often times countries or regions that scored high on other aspects, like democracy,

[7] In this thesis Orthodox economics is interchangeable with the capitalist economic growth model.

education or health-care, were not considered developed.[8] It took much criticism and decades of discussion, before new human development indices were devised and internationally recognized. Today there is a greater awareness within the development community and international bodies like the UN of the multidimensional nature of development and that it is more than just economic (Schumacher 1973, Adams 1990, UNHDR 1992, UNHDR 1996, UNHDR 1997, Elliot 1994).

A second shortcoming for the economic development model is that it assumes that social and political development will follow. This has been so because economic development has been assumed to follow the Western industrialization path. The Western European experience has been held up as the model for all other developing countries to use even though it is not quite clear under what conditions there would be a causal link between economic growth and an improvement to people's quality of life. Particularly in the 'Development Decade' of the 1960s[9], Western economists thought that the only way for a developing country to modernize was to follow the growth model as experienced by the industrialized West.[10] This glosses over the fact that the technical change that took place over two and a half centuries in Western

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[8] Costa Rica, Cuba or even regions like Kerala in India (UNHDR 1996:81) made great advances in education, healthcare and democracy (excluding Cuba) but could be seen as less developed than countries with larger GNPs per capita such as the Gulf States, even though they provided a better quality of life for their citizens.

[9] The 1960s were labeled the Development Decade by the United Nations.

[10] The Soviet model was the only other alternative, yet its repressive nature and Cold War realities made prospective nations hesitant on using such a model, even though it too was capable of producing rapid growth and industrialization (Baumol, Blinder, Scarth, 1985:820,828).

Europe, is now happening in a space of a couple of decades as technology can be imported in a variety of ways. This by itself has enormous consequences for economic and social change.

Furthermore the assumption that other advances will spring from economic development, as in the West, has glossed over at least two important realities. The first is that, although we have the tendency to group the countries of the developing world together for the purposes of generalization (ex. the Third World, the South), these countries are incredibly diverse. They differ; in geographic size and population, in their natural resources, geography and even their weather. They can also have different political and social institutions, cultures, customs, religions and their own history. For example Soto (1992) describes how past colonialism still continues to have an adverse effect on capitalist development in the Third World. Unequal access to land and education in some less developed countries ensures the continuation of poverty and inequality. This may harm agricultural productivity which is a prerequisite for successful development. Furthermore some cultures espouse greater community control over resources and decision-making and this may not be as well suited for free market economics (Soto, 1992:47). It is simplistic to disregard all these variables and their possible impact on a Western European model of development.

The second issue which must also be addressed is that of 'time'. The quest for economic development by present developing countries has been

occurring in a period of time much different from that which had accompanied the modernization of Europe North America and even Japan. The evolutionary economic development and modernization in these societies spanned almost two centuries (less for Japan) and was filled with suffering as these countries adapted to the changes brought on by capitalism (Moore, 1966). Can we expect success from developing nations applying the foreign experiences and policies from another era in history, in present circumstances? There are differences in the present historical period which raise new (or different) obstacles to economic development (Andre Gunder Frank 1967, Moore 1966).

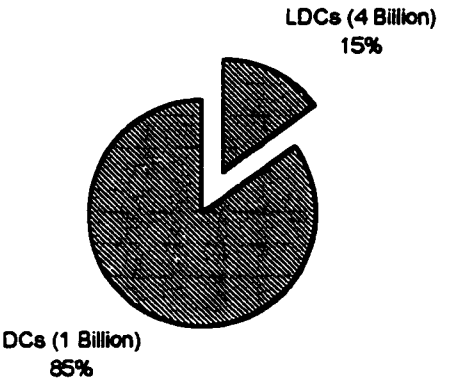
Developing nations face different obstacles and a very competitive interdependent global market. These nations live in a world with much greater disparities in wealth and power and face highly unequal terms in trade and finance. It is also apparent that economic growth and development are linked to a country's share of the global economy. If global economic disparities (see Chart 2.1) between the industrial North and the developing South, are not reduced or even taken into account by economists, the influence of unequal economic relationships on development may not be addressed.

Presently economic growth is distributed unequally and this has contributed to a widening of the income gap between the developed world and the less-developed countries. When compared to the bottom four fifths of the world's population (4 billion), the top one fifth (1 billion) holds 82.7 % of global GNP, 81.2 % of world trade, 80.6 % of global domestic savings and receives 94.6 % of the world's commercial lending (UNHDR, 1992:35). These measures

are combined in Chart 2.1, to represent the share developed countries have in the global economy. We find in Chart 2.1, that less-developed countries account for 15 % of the global economy while the developed nations enjoy an 85 % share of the global economy.

Chart 2.1

Share of Global Economy and population size



Source: UNHDR, 1992

While there has been some progress in development in absolute terms, it has been unequal within and outside countries.[11] So, while the poorer countries have managed to increase the size of their economies, the industrial northern countries have made even greater progress. The UN's Human Development

Report in 1992 and 1995, has made reference to the widening gaps between countries and within them, too. Even though developing countries tried hard to close the gap between them and the more modern North, they lagged further behind. Over time some countries may have come to the conclusion that the current time period called for a different strategy and a development model more closely related to their own particular circumstances and needs.

Another problem with the economic growth model is in its use of natural resources and its perception of the environment as valueless in its natural state. The environment was seen a repository for natural resources, which could be extracted and consumed, all the while adding to national income even though such non-renewable 'income' was a net loss to the country's natural assets. This important shortcoming of the original economic growth model espoused by economists stems from their fantastic assumption that the environment has zero monetary value. Economists have argued that, attempts at calculating environmental costs would be unscientific and would reflect personal value judgments. Surprisingly, today some of the advocates for the protection of the environment share this view.

Authors like, Stirling (1993), Waring (1988) have describe the theoretical problems in environmental valuation from the environmentalist point of view. These environmentalists consider the ideology of economic development as deeply flawed, because any attempt at characterizing a multidimensional

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[11] Poverty and development are relative terms, when viewed in absolute terms it should be noted there has been progress from conditions of the past. For example economic figures show an absolute increase even in the developing world.

variable like the environment with a one-dimensional (monetary) index, is not possible. "Rather than making spurious claims to objectivity, policy-makers should acknowledge that calculation is subordinate to judgment." (Stirling, 1993:100) Again this similarity between the arguments of environmentalists and economists, even though originating from opposite poles, are striking. Both camps decry the theoretical difficulties of valuation.

The zero monetary value often assigned to the environment by economists, is itself a value judgment. Assigning no monetary value to environmental attributes, is a conscious decision by economists, which fails to provide an appropriate value for the environment in cost-benefit calculations. In practice, by withholding a value for the environment for whatever ideology, results in the environment having zero monetary value and this has been problematic for viable long term development (Cobb, Halstead & Rowe,1995).

This perspective also fails to recognize that economic development in the West had a negative impact on the environment. It missed the relationship between industrial pollution and the fact that farmers had to work degraded land. The ecological decline of rivers, oceans and the air had an impact on industries which depended on a healthy environment, like the fisheries, and it increased mitigation costs for societies in the case of air pollution.

This dismissive view towards the environment has its roots in the early development of capitalism, where Adam Smith, in The Wealth of Nations (1776), encouraged the pursuit of economic growth. Other classical theorist like Thomas

Malthus, while equally oblivious about environmental issues and decline, questioned notions of unending growth. Malthus had not considered the destruction of the environment but he did express concern over the limits on existing natural resources relative to the number of people. Because of continual technological improvement the economy grew and people dismissed his arguments. Classical economists and scholars did not further his ideas which could have led to people looking at the impact of economic growth on the environment. In response, J. S. Mill and others looked at technological advancement as a way to compensate the potential shortages of natural resources. This impact was positive and production increased but it once again ignored the destruction of the environment.

In the twentieth century, the Depression and World War Two led to Keynesian economics[12] and the expansion of the global economy. During the post war era, economic growth fortified the optimism of many economists whose 'modern' analysis of economics ignored the environment. By the 1970s, questions on the feasibility of unlimited economic growth arose from outside the economic arena (Commoner, 1971)[13]. Some (Meadows et al. 1972, Goldsmith 1972) forecast the collapse of the economic system and suggested that the pursuit of growth be abandoned. This idea of zero growth is supported in Mishan's, The Economic Growth Debate (1977). As more of these economists,

[12] J. M. Keynes (1883-1946) is credited for his introduction of macroeconomics to economics (Common, 1988:10).

[13] Commoner analyzed the environmental crisis and suggested that we understand the potential future consequences of our short sighted economic behaviour.

authors, scientists (Commoner, 1971) and Neo-Malthusian environmentalists like Ehrlich and Ehrlich, (1972)[14], popularized the opposition to increased economic expansion on environmental grounds, the economic profession returned to the environmental issues it had wrestled with a century and a half before.

Environmental Politicization & Environmental Models

In 1962 Rachel Carson's book Silent Spring, helped usher in the modern environmental movement, however the reader should be made aware of the eurocentric and americocentric nature of the literature on environmentalism (Adams, 1990:15). In the following decades a greater awareness of the fragility of nature grew in the industrial countries as the services it provided for economic growth became inadequate.[15] Alarmed by the effects of environmental degradation an environmental movement took root in the developed world and there was a growing politicization and globalization of environmental concerns. In turn scientists, governments and popular culture began to discuss the issues concerning the looming "environmental crisis". Why did the environment become a national and international political topic?

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[14] Although better known for their work on population, The Population Bomb, (1968), their Neo-Malthusian arguments were a strong element in environmentalism in the 1970s. Even though their theories on population are unproved the Ehrlichs are relevant because they were instrumental in popularizing environmental concerns, which put pressure on the economics profession to address these problems.

[15] In developing countries like India environmental awareness grew in the ranks of the poor, who went on to mobilize environmental movements like the Chipko movement (Sheth, 1994:171).

Apart from growing scientific knowledge, the environment became a national and international concern because its continued degradation was having a negative impact on the citizens of the developed world. It was the environmental threat posed to the self interest of the upper and middle-classes of the North which politicized these issues even more than the public's growing education concerning environmental issues. In the developed countries the environmental movement was initially supported by the upper and middle-classes. These sectors of society had achieved a measure of economic security and had the opportunity to further improve their quality of life by reducing environmental pollution with a myriad of environmental laws. Other members of society were less enthusiastic about such anti pollution policies because they feared the economic trade-offs involved in protecting nature. The working class was (and is still at times) resistant to such eco-policies because they could hinder immediate employment opportunities as the costs of doing business rise.

Increased activism and protest to combat ecological decline put pressure on northern governments and contributed to placing the environment on the political agenda in the North. The growth of such pressure groups within the populace of individual countries was instrumental in politicizing and later globalizing environmental issues. In Global Ecology, A New Arena of Political Conflict, Sachs (1993) acknowledges how at first, protests were localized and isolated and they were more easily contained by commercial and industrial interests. However, overtime alliances were formed between formerly isolated movements and as a result the once marginalized environmental movement

forced its way into mainstream political discourse. Governments as well as corporations were threatened by lost votes or lost markets and could no longer disregard growing public outrage over their actions (Hildyard, 1993:26). It is only when governments and vested interests were confronted and pressured, that they were willing to divert enough effort and investment toward improvements in technology and methods to satisfy public demands. Government officials have been pressured to respond because of their growing fear of the activism of environmental groups, "the U.S. Environmental Protection Agency has described America's 'environmental justice movement'... ...as the greatest threat to political stability since the anti-war movement of the 1960's" (Hildyard, 1993:28). In The Coming Anarchy, Kaplan (1994) notes that theorists like Thomas Homer-Dixon have raised concerns among governments that environmental decline will lead to unprecedented disease, crime and military conflict over environmental resources (Lorne Gunter 1997, David Johnston 1996, R. D. Kaplan 1994). The former director of the CIA, John Deutch, also called for the environment to be part of the intelligence agenda (Norton-Taylor, 1996). It is this agitation and pressure which led to the politicization of the environment and which ultimately resulted in environmental issues being discussed internationally.

However, along with such political developments it must also be admitted that there have been considerable scientific and technological reasons contributing to the evolution in 'environmental' discourse. It is mostly in recent years that scientific ecological research moved to include not only the study of "local" level ecosystems such as forests, but to study large scale phenomena

like the biosphere. Viewing the planet as a single ecosystem has been a relatively recent practice for science. Complimenting such changes which have occurred in the scientific community, has been the creation of new equipment and technology. New satellites and sensors now enable data collection on a planetary scale and have facilitated this paradigm shift in ecology. Such developments coupled with the political realization that environmental problems (acid rain, the ozone hole, the greenhouse effect) transcend geographical and ideological barriers, fundamentally altered or simply reawakened the vested interests of the citizens in the developed industrial countries.

Activists in the developed world understood the interdependent nature of the biosphere and far-off events like the destruction of the Brazilian rain forest or the Chernobyl nuclear accident drove home the message that political borders did not immunize countries from environmental problems. The quality of life for citizens in the developed world would be forever dependent in part on the circumstances and actions happening worldwide. Attention and emphasis was now directed toward the environmental actions of third world governments, as Sachs describes somewhat cynically, "(the developing world) suddenly entered the stage as agents of environmental destruction" (Sachs, 1993:11). The populations of the developing countries were now being perceived as having the potential to exacerbate the crisis of the environment. The focus has shifted somewhat from the negative effects of the growing affluence of industrial man toward a more general concern with the growing economic development in the South.

In the developing South, environmental activism has undergone its own evolutionary process. In developing countries like India, Sheth (1994) describes how it was the poor along with the tribals and women who dominated the environmental movement. In the South, the middle class is not at the forefront of ecological activism (Sheth, 1994:191). This may be due to the distinct history of the environmental movements in the developing world which tend to spring from struggles against large scale construction projects or particular environmental disasters which have direct negative impacts on individuals.

In many circumstances environmental destruction disproportionately impacts the marginalized populations and it is they who often times develop an environmental consciousness. Such has been the case in northern India, where timber clear cutting exacerbated landslides and this in turn created the ecological 'chipko' movement.[16] Here it was women who had directly suffered from the environmental degradation, who provided the essential political communication and mobilization (Sheth 1994:171, Guha 1989, Bandyopadhayay 1992). The Union Carbide disaster in Bhopal India, is one more example of how it is often those marginalized populations in the developing world who after having been negatively effect from ecological disasters, become politicized.

The fires in the Indonesian forest during the fall of 1997, underline the present nature of environmental destruction. Although the forests are found in Indonesia, other countries in the region like Malaysia have had to share the negative impacts. It is precisely these types of circumstances which had already

[16] The chipko movement is further discussed in the following chapter.

convinced activists in the developed world into acknowledging that it would be futile for pollution to be addressed solely at a national level. The global nature of pollution required an international effort. Attempts to combat environmental decline would fail if other countries could not be enlisted into an organized global effort. An international alliance between industrial and developing nations is now in the process of becoming a reality and is reflected at international conferences concerning the environment. The coming together of the international community with Stockholm '72, Rio '92 and even Istanbul '96 is a culmination of the growing politicization and globalization of environmental and social issues.

In addition, the growing perception of vulnerability by Northern governments to the interdependent nature of the Earth's environment and life support system helped to usher in a number of global organizational events. The Stockholm Conference in 1972 and more recently the Earth Summit in Rio de Janeiro in 1992, were two such events where issues concerning development and the environment were center stage (Sheth, 1994:186, Adams 1990, Rich 1994). The earlier UN conference held in Stockholm recognized the link between development and the environment. It was Stockholm '72 which expanded the political discourse of the time to include issues like ecology into the development lexicon. The United Nations Conference of the Environment and Development (UNCED), held in Rio in 1992 has generally been a repetition of the earlier UN Conference in 1972 (Finger, 1993:38).

Both Sachs and Finger propose that Rio '92 was far from successful because the conference ended with the same "North vs South, or environment vs development cleavage" (Finger, 1993:38). Even more distressing, "the governments at Rio came round to recognizing the declining state of the environment, but insisted on the relaunching of development" (Sachs, 1993:3). However it can also be said that Rio '92 was the first global conference which openly discussed the conflicting views of development and environmental priorities between the developed and the developing world. It was therefore no small feat by activists, pressure groups, NGOs and even the leaders of more than 170 countries to participate in an international debate which aired the basic North-South cleavage concerning the politics of environment and development (Sheth, 1994:188).

Recent decades have shown that there is an enhanced awareness of our environment, where air pollution, water pollution, waste disposal, the degradation of farmland, coastal areas and other ecosystems, have all become important issues. This has raised the issue of how are we to deal with the negative consequences (like acid rain, nuclear accidents, waste-disposal and water scarcity) of economic development. These issues have generated three schools of thought on how to respond to environmental degradation, one calls on an end to economic growth, another seeks to accommodate both growth and the environment and the last proposes monumental change in the existing world system.

Elliott, 1994, identifies three contrasting approaches to sustainable development :

1) ecological-centered approach: economic growth and environmental conservation are contradictory. Anti-growth

2) market-based approach: growth and technical advancement in a free market are the keys to sustainable development.

3) neo-marxist approach: sustainable development is not achievable within existing world system, need a fundamental restructuring of world economy.

Each of these three approaches view sustainable development[17] as inherently desirable, yet their solutions are radically different. The ecologically centered approach favored by some ecologists and environmentalists (Commoner 1971, Goldsmith, Allen, Allaby, Davoll & Lawrence 1972) proposes zero growth, to preserve the environment.[18] This approach opposes the views of the World Commission on Environment and Development (WCED), "which believes that the technical solutions to environmental degradation can be found through economic growth" (Elliott, 1994:109). Such a strategy is deeply unattractive to developing countries and would be next to impossible to implement. It is impractical to ask the developing world to forgo growth no matter how idealistic we feel. However the ecologically-centered approach sensitizes us

[17] Sustainable development, is "development that fulfills the needs of the present without limiting the potential for meeting the needs of future generations" (UNHDR, 1992:17).

[18] Economists like E. J. Mishan have also questioned the desirability of economic growth (Mishan, 1973).

to ecological limitations, and concepts like carrying capacity[19] or viewing earth as a closed system[20], are given more prominence within the debate (Meadows et al., 1972).

The ecologically centered 'no growth' approach is highly problematic for several reasons. First, to stop economic growth while populations continue to increase and desire to follow Northern patterns of consumption would result in a deterioration in the quality of life for millions of people, especially in the developing world. Like all people, these individuals have aspirations for more secure and better lives and to suggest that they forgo such development in order to protect the environment is not practical. People have an inherent interest in protecting the environment because it enhances their lives. If protecting the environment ruins their lives, there would be no logical rationale for them to pursue such a strategy.

Another problem with this approach is that developing countries tend to view this approach as colonial if not racist in nature. Asking the Third World to stop economic growth for the sake of their environments has little credibility when it is recognize that the North has done just the opposite in the past. After having consumed a large proportion of their natural resources for their own development, now these activists (like Ehrlich, 1996) which are primarily in the

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[19] Carrying capacity is defined as, how many organisms of a particular kind can a particular environment support without undermining its capacity to support them in the long term, also described as the maximum number of persons the environment can support (Suzuki, 1996).

[20] Closed system means that except for the sun's energy the Earth has finite resources and so, an increase in the number of individuals will be detrimental to the environment (Berreby, 1990:42-49).

developed countries, propose that developing countries should not follow the same avenues to development because of precarious state of the global environment (Dyer, 1994; Soto, 1992). Lost in all this is the fact that it has been Northern industrial pollution which has contributed most to the impending ecological crisis and what is being ask of the Third World is that it pay the price for the development which has taken place in the First World.

The market based approach suggests that growth and technical advancement in the free market is the path to a more sustainable development. It sees development as the best way to preserve the environment and is more in tune with what the World Commission on Environment and Development (WCED) proposes. This would necessitate the ability to place a market value on the environment and this could be done with a reform of economic valuation procedures like cost-benefit analysis. If an accurate market value can be applied to the environment, inefficient waste and environmental degradation would decline as the price of negative impacts rose. This approach avoids the fruitless argument put forward by earlier doomsday prophets, that we will exhaust our resources. Julian Simon and Paul Ehrlich have been engaged in such a debate and are no closer to solving this question (Suzuki, 1996). Even so the central issue is not whether we will run out of resources but how long can the environment absorb the pollution we are creating. Whether or not our resources will be exhausted is of secondary importance, because what is truly important is nature's ability to absorb wastes. By using a newer natural resource economics, "sustainable development economists focus on the limited capacity of the

environment to absorb wastes created by economic activity" (Mikesell, 1992:142) and not whether doomsday scenarios are legitimate.

However, this approach to protecting the environment while allowing growth, also raises a different set of problems. First of which is that it stresses the introduction of newer, less polluting technologies which are expensive. Developing countries like China and India are at a stage in their economic development where they are able to produce goods using less expensive older technology but they are persuaded by activists and governments in the developed countries to convert to more environmentally sound technology which happens to be monopolized by the West. This is very unattractive to such developing countries because such technology is expensive and it means that fewer members of their populations will be able to afford such goods. Developing nations reject this model as it is, unless this modern technology is made available to them at the price they could produce the old technology. Without concessions or compensation from developed countries, the South will be reluctant to give up its more polluting technology.

In conjunction with this debate it has been suggested by the more developed countries that there be a division between issues which affect the international community and those which affect local communities (Soto, 1992:12,22). Local environmental problems could be handled by national governments, but international laws and treaties would be set up to deal with global problems. This has raised the issue of who is to decide who has jurisdiction over particular environmental problems (Shiva, 1993:153-155). Is the

destruction of rain forests a global problem and if they are, why is the river pollution of the Ganges in India caused by industrial production only a local problem?[21]

Another suggestion has been to categorize all the environmental damages and to permit (initially) each country to produce a limited amount (see UNHDR, 1992). If any nation exceeded its allowable pollution it would have to pay a fine to the international community. However some third world countries took issue with equating large countries like China and India with smaller first world countries, in terms of environmental damage produced. The environment is 'common'[22] to all human beings and every person should be entitled to an equal share of the production of pollution. Therefore it had been argued that the unit of analysis should not be countries but individuals, thus developing nations have suggested that pollution could be measured on a per capita basis.

In theory countries would be permitted to produce a specific amount of environmental pollution depending on their population size (see Chart 2.2). In this scenario an international authority could issue such pollution permits which would be internationally tradable. In practice, countries who did not fill their quota (usually less developed) would receive financial rewards. Countries that generated too much pollution because of either inefficiency or over consumption,

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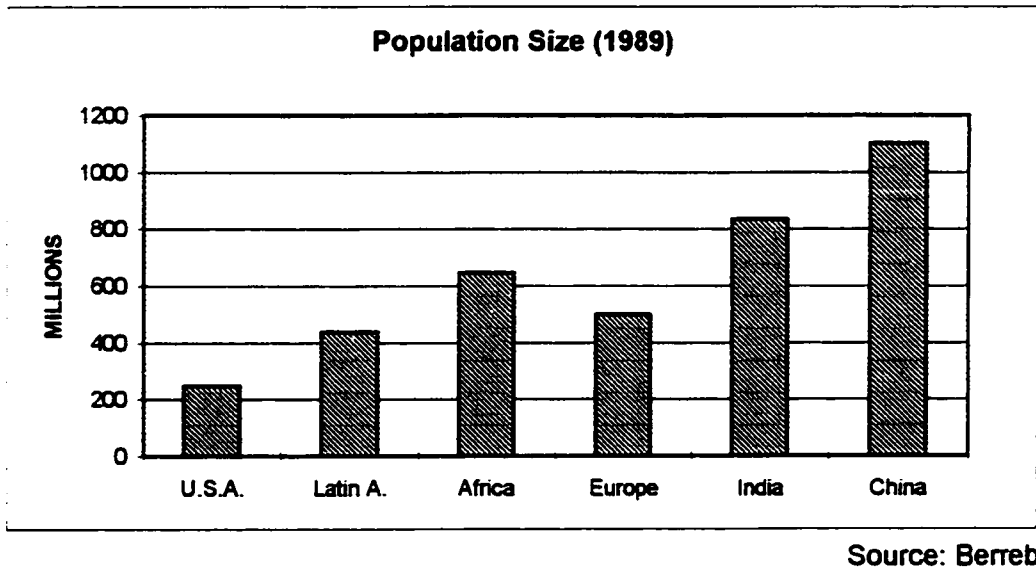
[21] See the Gazette, October 22, 1994 for more information on the state of pollution in the Ganges River.

[22] In this sense common alludes to 'the commons'. In the past, 'the commons' were areas or resources where no formal ownership could be claimed. Today many indigenous societies continue to view 'the commons' as areas subject to collective ownership, which bring on both benefits and responsibilities. In theory such resources are to be managed for the good of the entire community as well as for future generations (Soto, 1992:26-28).

would exceed their quota and pay a penalty. More importantly others suggested that permits should be tradable and polluting countries may purchase the unused portions of the permits of developing nations at a price determined by the market[23]. To be mutually beneficial the price would have to be more than the fixed reward and less than the penalty. In this way there can be a direct transfer of financial resources from the industrial to the developing world which could develop in the latter an interest to purchase the newer technologies or possibly enable them to develop their own environmentally friendly technology.

Chart 2.2



Source: Berreby, 1990

[23] Efficient developed countries who attain targets below their quotas because of conservation and other measure can also sell their unused permits.

Finally, the neo-marxist approach is also not very practical because it argues, success will only come about if the global economy is fundamentally restructured. However, this perspective does have merit, because it forces those involved in development to come to terms with the inequality which exists between the North and the South. The inequitable access to resources threatens sustainability because it, "confines large numbers of people into poverty which often leaves them with no choice but to degrade and destroy the resource base on which their future livelihoods depend." (Elliott, 1994:19) This perspective on sustainable development argues that besides being morally wrong, such inequalities destroy the environmental basis for livelihoods and development. Degradation of local environments because of poverty requires future sustainable development patterns to push for the elimination of poverty.

Abandoning economic growth (the ecological centered approach) or calling for nothing less than a revolutionary change in the global economy (the neo-marxist approach), is a non-starter because it would be economically and politically impossible in both the North and the South. I concur with Mikesell (1992) that the idea that abandoning growth is politically impossible. Therefore we should attempt to include sustainability into development theory through resource accounting and environmental cost-benefit analysis (including social cost/benefit). "The environmental costs for all industrial and agricultural projects need to be estimated and internalized by the project producers. This means the cost must be paid by the producers, which will induce them to avoid or mitigate the adverse environmental costs in an effective way" (Mikesell, 1992:23).

This type of pragmatic environmental economics occupies the middle ground and is assailed from both sides of the debate over the pros and cons of including the environment in cost/benefit analysis. Orthodox economics has been reluctant to include the environment into its simple economic models for fear of raising short term costs and because of the difficulties in using 'unscientific' valuations, as I have already mentioned at the beginning of this chapter. At the same time, some environmentalists like Andrew Stirling[24] (1993) oppose monetization of the environment. Economics is too dominant and attempts at monetary valuation of the ecology, including such valuations into cost/benefit analysis, would be detrimental to the environment.

These ecologically-centered opponents to environmental economics are critical of the very environmental cost-benefit analysis I prescribe in the proceeding case studies. Working towards a more environmentally and socially sound cost/benefit analysis, as I do in my thesis, is counter to the views of environmentalists who cannot reconcile economic growth with environmental conservation. "Just when environmentalist have largely succeeded in discrediting such procedures, well motivated environmental economists risk presenting a new and more attractive opportunity to industrial special pleading." (Stirling, 1993:102)

Whether this is an accurate statement or not it does not detract from the logic and motives of more pragmatic activists who are concerned with remaining

[24] Andrew Stirling was the coordinator of Greenpeace International's Campaigns against the nuclear industry .

(or becoming) relevant. By not presenting a workable and comprehensive model that can be incorporated into economic development projects, we may miss an opportunity to make governments and developmentalists listen to environmentalists. This opportunity has only come about after decades of political and scholarly activism.

Sustainable Development

The flaws in conventional economic development (Seers, 1977) has generated the questioning of the purpose of development (Goulet 1971)[25] and a redefining of development. Criticism about the shortcomings of orthodox economic development arose increasingly from environmentalists who, "added concerns about the environmental impacts of development" (Adams, 1990:5). The purpose or goal of development as describe by the United Nations, is to achieve 'human development'[26] not simply economic growth and so human development is the framework I write under. Human development and sustainable development are closely associated because they give priority to human beings and can even be described in the single term 'sustainable human development' (UNHDR 1992:18, see also Pearce, Barbier & Markandya 1990).

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[25] Recreating the modern industrial world in less developed countries, through urbanization, industrialization and evolution of democracy was the expressed goal of international development (Goulet, 1971).

[26] Once again, human development refers to the improvement of peoples' lives with better healthcare, education, political freedom, environment conditions and opportunity. It is, "a process of enlarging choices" for individuals so that they can maximize their potential (UN Report, 1992:12).

The legitimacy if not the emergence of current sustainable development theory, owes a great deal to the rise of the environmental movement in the 1960s and 1970s.[27] The perceived ecological crisis in the North and environmentalism in general, greatly affected the debates about the role of the natural environment in development. The ideas and activism of many environmentalists, scientists and economists opposed to growth (Meadows et al. 1972, Goldsmith et al. 1972, Mishan, 1977, Commer, 1971) brought forth with some urgency, the basic tenets sustainable development.

The term sustainable development (Pearce, Barbier & Markandya, 1990) can bring to mind different ideas, so I prefer the definition used by the World Commission on Environment and Development (WCED), which defined it as "development that fulfills the needs of the present without limiting the potential for meeting the needs of future generations." (UNHDR, 1992:17) This simple definition would require that all policies, economic, fiscal, trade, energy, agricultural and industrial, be formulated to create development which is economically, socially and ecologically sustainable. Current rates of consumption would be deemed unsustainable if they are financed by incurring debts, not just economic but social and ecological as well, that future generations must repay. So, sustainable development as described by the

[27] It became more evident that the conventional development model had failed many in the developing world and conditions "steadily worsened in the course of the immediate post-war years" (Frobel et al., 1985:114). The shortcomings of the conventional economic model had given way to many different approaches; such as development from below, appropriate technology, and basic needs approach. All these have contributed and led to the evolution of sustainable development (Harrison 1983, Woodhouse 1992:97-115).

United Nations, is not simply a call for environmental protection, it is a new concept of economic growth and development (UNHDR, 1992).

The continuing lack of development found in the developing world in the 1970s and 1980s has impressed upon us the failure of conventional development schemes (Mikesell, 1992). The need to find new strategies for development has also come from improved understanding of the environmental non-sustainability of contemporary development. In response, development policies and programs need to be altered in order to be more in sync with sustainable development principles. There is no fundamental difference from conventional development economics, only that the ecological and natural resource implications must be included in both policy and project evaluation.

Environmental cost-benefit analysis owes much to sustainable development theory, which introduces inter-generational concerns, resource accounting and the notion of ecological limits. This new environmental economics, integrates the natural resources cycle with the economic cycle. Although there has been resistance from economists for a long time, conventional economics has begun to accept the criticism levied by environmentalists, that it has failed to internalize all impacts brought on by development activities.[28] Projects and programs need to be evaluated in terms of

[28] Organizations like the World Bank have made efforts to 'Green' themselves by creating departments for the environment. Changes have occurred at the UN. it now debates environmental issues and works with measures like the Human Development Index (see p. 54) which only a decade or two ago was considered very radical.

their full social cost. It is for this reason that sustainable development is the best approach for working within the framework of human development.

North-South Perspectives, Development and the Environment

Sustainable development may be a relatively new concept for western capitalism, whose values of consumerism and consumption are antithetical to sustainability. However, it is supported by some traditional knowledge and resource-management systems. Such systems, have been learned and passed down over generations and have proven to be sustainable even though they were often dismissed by colonial powers in the past and nowadays by multinational corporations. The interests of these players as well as the international market, lay in the satisfaction of Western economic wants and the effect this had, on the ecology of the developing world was, excluded from their economic equations.

Even today the legacies of colonialism continue to thwart sustainable development. Many of the Third World elite have either forgotten or never learned traditional resource-management strategies, since most were educated in the West (Soto, 1992). Very often the result has been the implementation of economic and industrial policies which brought about severe ecological degradation and are now beginning to prove unsustainable in the long term. Within developing nations themselves, economic development has resulted in

the subservience of more sustainable rural policies to industrialization, whereby the environment is sacrificed to achieve rapid economic growth.

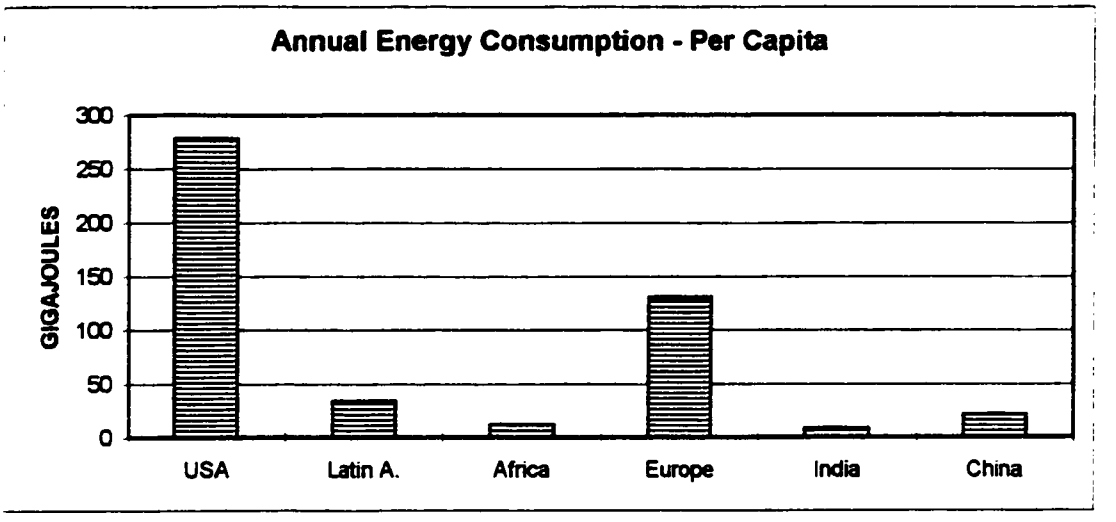
The developing countries of the south have their own view on the global environment/development crisis and on both the national and international causes of this crisis. In fact, these developing countries tend to see it as a single socio-ecological crisis.[29] 'Western' development policies are accused of causing both the socio-economic and environmental crises that have occurred in the less-developed countries commonly located in the South. These problems, "are a result of unsustainable systems of production and consumption in the North, inappropriate development models in the South and a fundamentally inequitable world order" (Soto, 1992:17).

In Chart 2.3, we find evidence of high energy consumption for the developed world. The consumption of energy is one of the leading cause of environmental pollution (e.g. acid rain, global warming) and on a per capita basis it is developed countries who are responsible for most of its negative effects. Europe's annual energy consumption per capita in gigajoules is 130 and the United States it is 278. By contrast the developing world consumes far less energy per person: Latin America 34, Africa12, India 8 and China 21 annual gigajoules per capita. It is no wonder developing countries like India and China feel they have the right to increase energy production. How can they be asked (in the name of environmental protection) to forgo greater energy consumption

[29] It has been suggested (Soto, 1992), that we should add this Southern perspective to our Northern analyses of environmental problems.

as one means to increased industrial development, if the North is not asked to curtail its own extravagant energy use. This has generated momentum within both the Indian and Chinese governments, for mega energy projects like the Narmada Valley Project and the Three Gorges Project.

Chart 2.3



Source: Berreby (1990)

In trying to understand the environment/development crisis, we should acknowledge that the developed northern countries have dominated the global environmental agenda. The North (developed countries) and South (less-developed countries), have different pressing priorities with regards to the environment. The actions and policies of most developed countries reflect a greater concern with global warming, biodiversity and the ozone layer, while less-developed countries worry about more immediate front-line matters, like desertification and the lack of clean drinking water. It can be argued that

developed countries have displayed a lack of interest in sustainable development because their overall interests lies in continuing economic growth and in the maintenance of Northern consumption levels through a techno-fix approach. The perspectives of less developed countries have yet to be integrated into the global agenda and have been ascribe the dubious position of 'local' problems (Soto, 1992:chp.1).

As I have already discussed, the debate between these different ecological concerns has led to an artificial ranking which may often hide the international dimensions of 'local' environmental problems (Soto, 1992:12). How do we assess what merits 'global' status ? The developed countries have tried to, "separate out from the global agenda those environmental problems that manifest themselves locally and regionally." (Soto, 1992:25) As a result, responsibility is then placed solely on the nations (mostly Southern) in which these problems occur and so the developed world effectively frees itself from any obligation to act. However when the governments and citizens of developed countries believe that their interests are threatened by some environmental problem which they would normally have considered to fall under the jurisdiction of the nation state, they are not above reversing themselves (Shiva, 1993:149-156).

"Until recently, the concept of global commons has been primarily reserved for those regions or resources over which no individual or state ownership could be claimed ...the atmosphere, the open oceans" (Soto, 1992:26-28). Where local or national ownership can be claimed resources, then

it is the nation-state which assumes responsibility. The Brazilian rain forest is no longer seen as a national or regional resource but as a global resource because it affects people in other parts of the world. Forests are considered national resources yet in this case Brazil is pressured by some in the international community to change its forest practices for the benefit of the global community. The developed countries thus expand their definition of the global commons to include, not only those regions and resources over which no individual or state ownership can be claimed, but also those environmental regions and resources which are vested in particular nation states. The result is that resources such as the Amazon tropical rain forests in Brazil are increasingly perceived as global resources (Soto, 1992).

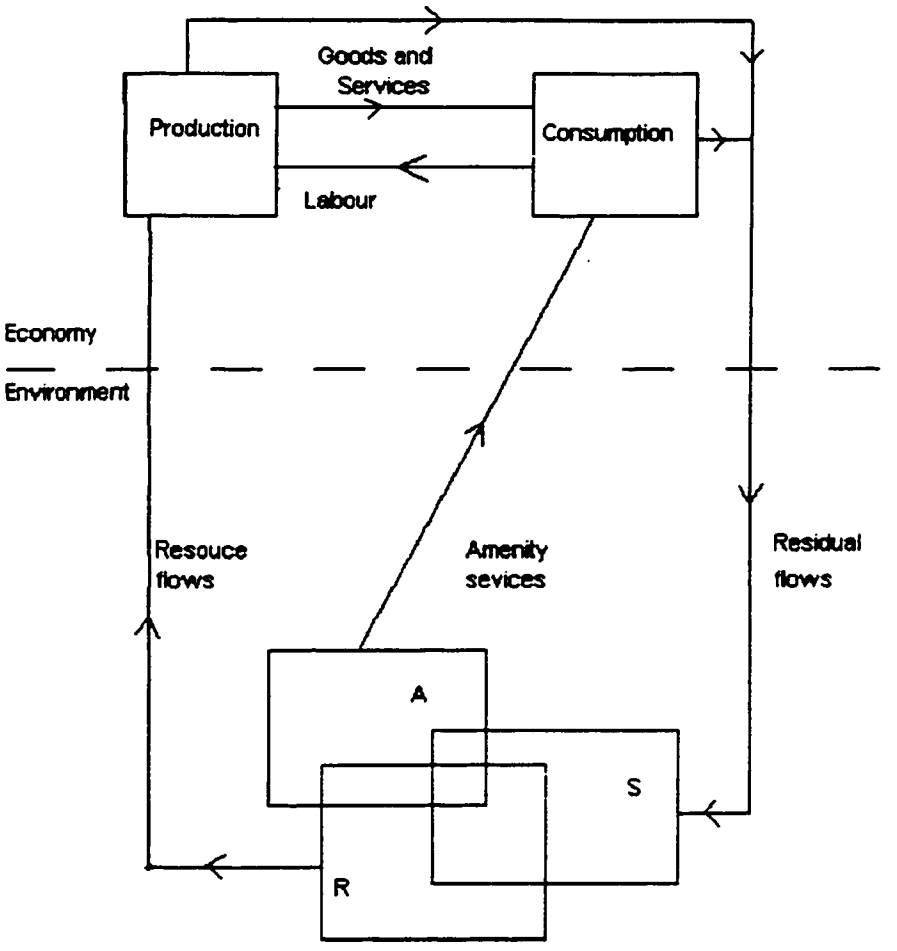
The Economic Cycle and Assessing the Environment

In response to this challenge from environmentalists, business leaders (Hanley, 1979) and some economists (Simon, 1981) believed that there was no inherent conflict between economic growth and the environment. Environmental problems could be solved without any substantial changes to conventional economic theory. Some scholars suggested (Common, 1988) environmental concerns could be accommodated within economics, with the addition of recycling and a properly functioning price system. Here recycling means, intercepting and transforming waste products into useful inputs for production and price system refers to the mechanism of supply and demand which

determines prices, within the economic system. Before I move on to examine more fully, the possible impact from recycling and an improved price system, I should first like to elaborate on the role the ecology plays for the economy, as suggested by Common (1988).

The environment serves three functions in the economic cycle (see figure 2.1), it can be a source of resources (R), provide amenities (A), or serve as a waste dump or sink (S). Thus the environment provides natural resources for use in production, like forests, mineral ores and fossil fuels. In turn production and consumption create pollution and waste called residuals which are ultimately dumped back into the natural ecology. This discharge of waste into a sink, like sewage into rivers or polluted emission into the atmosphere, represents the 'normal' functioning of economic activity. Thirdly, the environment can be directly utilized in the form of amenity services, such as recreational areas, beauty and living space (Common, 1988:13).

Figure 2.1: The Links Between the Economy and Environment



Source : Common, 1988.

The environment has three distinct functions in economic activity and they can become mutually exclusive. In figure 2.1, the three functions overlap in order to demonstrate that they are inherently linked and can at times conflict with one another. For example, pollution can reduce amenity services as well as inputs for production which are derived from nature. Without foreshadowing the later case studies, we should become sensitive to the idea, that the capacity of river

systems to fulfill all three of their functions could become compromised. It is in this manner that the ecology interacts with the economy. This interrelationship can be altered and 'refined' with the introduction of recycling or and improved price system.

Recycling and an Improved Price System - Although the above ecology/economy cycle is the framework in which the environment is viewed, some contemporary economists have become less ready to dismiss environmental pollution. These economists and scholars (Dixon et al. 1995, Common 1988) believe that environmental demands can be accommodated while the economy continues to pursue growth. In order to mitigate against environmental degradation, economists have proposed that recycling can help reduce residuals and lower the demand for natural resources. In the past recycling was rarely considered because resources were extracted from the developing countries, these resources were inexpensive and there was no incentive to introduce added costs with recycling. Short term economic gain and the minor concern for environmental degradation involved in resource extraction in both the developing and developed world retarded any desire for recycling.

Recycling, like environmental cost/benefit analysis, could be used to offset the negative effects incurred by the natural environment from the pursuit of economic growth. If such growth is to be maintained, the introduction of more systematic recycling could be one of the first changes in the ecology/economy relationship which could delay environmental decline. Recycling would also

introduce new costs to production and consumption in the short term. The positive environmental benefits from recycling are now evaluated for their cost, unlike the negative environmental effects before the introduction of recycling which were initially dismissed.

By intercepting and transforming waste (bound for the sink) into a useful input for production, the burden on the ecology to absorb waste and provide resources is reduced. In this manner recycling delays environmental collapse and allows for the economy to be less taxing on the natural environment. With such an improvement to the economic cycle, production and consumption becomes less environmentally degrading. Recycling can lower the demand for resources directly extracted from the environment reducing waste, and thereby increase the efficiency of the economy and its long term viability. The potential reduction in resource depletion and pollution due to recycling, is only one accommodation economist have come to recognize. The other is a more accurate price system.

In defense of continued economic growth, economists have suggested that as economic expansion progresses, there will be a shift toward less damaging production and consumption patterns because of scarcity (Common, 1988:16). In order to induce such a change, the introduction of a price system would ensure that as a resource or amenity service becomes more scarce, it would become more costly.

The price mechanism would facilitate the reduction in use of certain commodities or services as their costs rose. The interactive nature of the

environment's various functions within economic activity would mean that as an environment gets degraded, the cost of waste disposal and amenity services increase. These higher costs would inevitably result in a lower demand for such services and thereby demonstrates the ecologically beneficial effect of the price system. "Given a properly functioning price mechanism as part of the economic system there is, then, no problem (for the environment). Economic growth as an objective is not ruled out on environmental grounds." (Common, 1988:16) Yet, such a view assumes that prices are dictated solely by perfect market conditions. It ignores the political interference and power relations that influence prices in the world market.

The conventional economic development model holds the naïve assumption that economics in practice is a mirror reflection of it in theory. It is supposed to be logical and rational, like the mechanism of supply and demand. Conventional economics fails to take into consideration all the extra-market influences on economics. The price of wheat in the U.S., Canada or almost any other county, is not solely determined by the laws supply and demand, there are political factors which contribute to fixing prices. [30] Such interference and manipulation is standard practice in economics, yet orthodox economists have assumed that the free market exists even though many of them have been involved in designing the extra market influences.

In the past, British political, military and economic interference in colonial India, distorted the workings of the free market in many ways (Moore, 1966). For

[30] In various ways, countries can subsidize agricultural products, altering the true price.

instance it erected artificial trade barriers, tariffs and taxes squelched Indian industry by making native products more expensive than imported British goods. In recent times similar interference from outside the 'free' market, has hindered economic development in the third world. The relatively small share of the global economy (see Chart 2.1) for the developing world (with four fifths of the world's population) is not improved by unfair barriers in trade and labour. "Trade barriers are highest for manufactured goods for which poor countries enjoy a competitive advantage", while 300$ billion in agricultural subsidies and price supports in the developed world continue to distort true market prices (UNHDR, 1992:48).

It is clear the international labour market is also restricted even though the tenets of market economics espouses the free movement of labour and capital. "Immigration laws deny workers the right to equalize the global supply and demand for labour", by obstructing the free flow of labour from LDCs to the industrial world (UHDR, 1992:48). It is unquestioned fallacies like these mentioned above, that have led to a redefining of development, as we explored in the section, Sustainable Development.

In reality there is no accurate price system in place. The presence of environmental problems is a reminder that the current price system is flawed. Environmentalist have pointed out many instances where no price has been paid for the disposing of waste or the exploitation of natural resources. As I discussed previously, economists had often times assigned the environment an 'impartial' value of zero, because it was argued that any other valuation could

not be confidently or consistently calculated and would represent an unscientific value judgment. However, allotting a zero value to the environment, in economic analysis, is itself a value judgment not based on any economic reality.

Although Michael Common, a researcher in Resource and Environmental Studies, admits that a properly functioning price system does not exist, it can still be developed and further improved. This properly functioning price system could support higher levels of more efficient economic activity, to the benefit of the natural environment. The pattern of economic activity would be brought more into balance with the environment as a truer reflection of costs appeared. This price mechanism does not call for the abandonment of economic growth and if implemented, such a system will enable countries to maintain their growth oriented economic policies.

Several developing countries, including China and India will no doubt be more favorable to development models based on such a proposal since it would not call on them to abandon economic growth in order for them to preserve their environments. By utilizing a more exhaustive and accurate price system which included environmental concerns and costs, the preservation of natural resources would be pursued from within the market. Economic growth, although altered to become 'green', would still be kept as a framework. Developing countries are suspicious of highly impractical policies which call on them to abandon growth, thanks to the high demands from their impoverished citizens and the limited resources they have to meet their needs. The introduction and implementation of a more sustainable form of development would have a more

receptive audience than policies supported by environmentalists like Meadows et al., The Limits To Growth (1972) who suggest the abandonment of growth.

Social Costs - Although the thrust of this work focuses on the inclusion of environmental factors in economic calculations, social cost analysis is also essential for any successful attempt at accurate evaluation. Often the impacts from development projects have created more problems for the people involved than they have solved (Derman & Whiteford, 1985). This problem has encouraged the development of social impact assessment (SIA) in industrial countries and encouraged its application in development work. Social impact analysis, broadly refers to the study of the social consequences of planned development projects and policies. This type of analysis is useful in describing the actual or potential impacts of proposed development projects on specific communities or individuals.

The politicization and acceptance of social costs within accounting procedures has coincided with similar developments in environmental impact analyses. In the developed world the pressure to include social impacts into economic analysis, arose as a result of unresolved social problems. These problems were seen to be caused by infrastructure projects like highway construction and dam building. In developed countries public pressure helped to include social impacts into project designs and evaluations even though such measures were resisted at first by developers. Although economic predictions based on social variables are difficult to measure according to some traditional

orthodox economists, they are no more theoretical as any other economic predictions (Derman & Whiteford,1985:6).

In the following case studies I have incorporated social costs into my cost-benefit analysis. I specifically categories human displacement and resettlement as being the main contributors to social costs. Relocation and resettlement of individuals, communities and even economies, will result in tangible construction and transportation costs. This type of social disruption will also negatively impact local organizations and networks which contribute to economic productivity. Informal social networks which provide child care, medical care and nutritional support, merit inclusion into any cost-benefit analysis on economic grounds because they too contribute to productivity and quality of life.

Presently, in the developed countries social cost analysis is recognized as legitimate but its implementation can fall short when projects deal with more marginalized groups. Internationally, there is also less solidarity between North and South on this issue when compared to the progress made on environmental issues.

Environmental accounting has gone further than social accounting internationally because there is significantly less pressure for social accounting to occur in the developing world. Citizens in the developed world are less effected and therefore less concerned about the social costs experienced in the developing world. There is no clear threat to their vested interests. As a result northern activists are far more concerned with environmental degradation, which is more likely to impact their quality of life. Thus they are less inclined to press

for an expansion of social cost accounting in the developing world. The global effects from environmental degradation are far more apparent than those from social disruptions. They have also generated greater solidarity and pressure for environmental accounting on the international stage.

I too, along with Derman & Whiteford (1985), think it is important to combine economic, environmental and social analysis whenever possible because they are systematically linked. In both the Indian and Chinese mega projects there is a symbiotic relationship between the hydroelectric dams and the resettlement schemes. I consider attempts at treating social analysis separately, as misguided and artificial. Social, environmental and economic costs are interrelated, this will become clearer in the following case studies.

Valuation Debates - Now, if we move to accept the idea that both the environment and social impacts are part of the economic system, how do we assess social and environmental costs? Do we alter conventional economic indictors to better reflect environmental, social and economic realities? Could we develop totally new indices as suggested by some scholars and activists (Waring, 1988:299-301), to evaluate the national economy? In comparison, should we simply put a price on social impacts and the environment, thereby expanding conventional cost-benefit analysis?

Conventional economic indicators like Gross Domestic Product (GDP), are problematic because they cannot accurately reflect the welfare of a country. GDP fails to distinguish between destructive economic activity – like building

prisons or fighting forest fires -- and constructive economic activity -- like producing computers -- (Waring, 1988:291). As the former president of the World Bank, Barber Conable stated: "Current calculations ignore the degradation of the natural-resource base and view the sales of nonrenewable resources entirely as income...a better way must be found." (Cobb, Halstead & Rowe, 1995:68) This means that resource depletion is registered as an increase in GDP figures[31], whereas it should logically be subtracted from GDP.

Some have proposed the creation of a Genuine Progress Indicator (Cobb, Halstead & Rowe, 1995), which would produce a more accurate picture of economic progress. In order to better represent a country's economic and social health, a new indicator which did not ignore social and environmental costs would have to be devised. Cobb, Halstead and Rowe (1995) have modified the GDP indicator and formulated a Genuine Progress Indicator (GPI). This new Genuine Progress Indicator (GPI) has adjusted GDP to include the value of the household and volunteer economy of each nation[32]. In contrast, pollution costs and other defensive expenditures like crime prevention, are subtracted from the GPI. In other words, an improvement and modification of the price system is called for (see above). For those like myself, who support an

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[31] Similarly other destructive economic activity like increased police expenditures or the construction of more prisons due to crime is also registered as a positive increase in GDP. These higher GDP figures would be interpreted as a positive sign to a society's development in economic circles, when in fact this is a decline in that society's quality of life.

[32] This has also been suggested by Waring (1988).

environmental/social cost-benefit analysis, a new GPI would better serve the purpose of this environmental accounting even if it falls short of Ideal.

It is clear that conventional economic indicators like GDP, will have to be changed to better reflect and accommodate economic, environmental and human realities. Problems with indicators such as GDP, have had an impact in development because they provide an inaccurate reflection of true development (UNHDR, 1992:19-20). Gulf countries like Oman score much higher than Costa Rica in terms of GDP, but their people have lower literacy rates and shorter life spans. It is to capture these variables that the UN has devised its own new indicator, the Human Development Index (Attwood, 1992:9-11, UNHDR 1996), so as to better reflect the level of development. The Human Development Index (HDI) ranks countries in relation each other by measuring national income, life expectancy and educational attainment. As a result, in 1992, Costa Rica's HDI is 0.842 while Oman has an HDI of 0.589 (UNHDR, 1992:20), these levels of human development would have been completely ignored by GDP. This new HDI will help to ensure that development planning is directed to people's needs and not only towards economic development. In the future the human development index can grow to include other indicators of progress, like environmental measures or other social and political indicators (UNHDR 1992:20-24, UNDHR 1995, UNHDR 1996). Thus one can easily argue that GNP (or GDP) calculations also can be modified to reflect environmental costs.

Authors like Waring (1988), however have offered alternative indices to evaluate national economies, like Cobb, Halstead and Rowe (1995). She is

critical of the economic system for its failure to attribute market value to things like the environment or social 'variables' like housework. At the same time, she decries the orthodox ideology which presupposes that only variables which can be montized have value and that all things can be monetized. Waring (1988), disagrees with those who attempt to expand cost-benefit analysis to include new variables which had been traditionally disregarded, because she thinks this would distort reality as the priceless is given a price. Attempting to, "measure the immeasurable is absurd....what is worse and destructive of civilization is the pretense that everything has a price" (Shumacher, Small is Beautiful 1974, in Waring, 1988:297-298).

Waring suggests that a country's economic activity could be measured "as 'creative' and 'destructive' production, consumption and services" (Waring, 1988:291). This means that anything which conserves or adds to life (building hospitals) would be creative, while anything designed to destroy life (building an aircraft-carrier) would be labeled destructive. She further proposes that money is not the only unit of comparison or assessment. Assessment may be described, "by volume: in terms of the labour power involved in the process (the number of workers) or the work time absorbed (number of hours)." (Waring, 1988:291) This new manner of bookkeeping and evaluation is very admirable, yet I cannot say it is practical, especially for developing countries. Developing countries are not in the economic and political position to strike out on their own with such unique and uncommon evaluations methods. We already know that even countries with considerable resources and expertise such as India, who attempted to do just

that, felt obliged to reconsider their position. This new index does not propose (as I do below) a modification of current cost-benefit methods, it entails an abandonment of fundamental evaluation methods.

I think that Environmental/Social Cost-Benefit Analysis could adequately assess current non-market variables. Putting a price on the environment and social disruption is more pragmatic than expecting the international community[33], to discard conventional monetary indices as units of comparison and to accept a new index as endorsed by Waring (1988), which refuses to condense all things down to a single monetary unit of analysis. Such an analysis also addresses the problematic nature of 'direct' and 'indirect' costs.

Direct costs are easier to estimate and may lead to clear cut outcomes, but indirect costs are often more difficult to estimate and effects are often unexpected. The more 'concrete' nature and accuracy of direct costs are a major reason why decision-makers and politicians tend to prefer more direct cost analyses. Economists, too, tend to neglect indirect costs in their projections for similar reasons. However due in part to the actors vested interests, these leanings by economists and politicians towards more reliable figures are not necessarily the case in terms of indirect benefits. In most development projections indirect economic benefits are usually included, for example the roads created during the construction of a mega-project are estimated to eventually contribute to the economic welfare of an area.

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[33] This would include all governments, businesses, individuals and economies.

Social and environmental impacts although labeled as indirect have very real costs. Evictions and the displacement of populations which result from the construction of development projects usually mean local economies may be disrupted. Production networks and economic links are severed as individuals are involuntarily dispersed (see Indian case study chp.3). Social networks are an important aspect of daily subsistence (Hassan, 1996: 134-144) and so even though negative impacts towards such networks are often described as indirect costs, nonetheless they have real consequences and can be measured. To ignore such costs in the name of 'transparency' or expediency does not contribute to more accurate assessments of the impacts of development projects and one can argue that the introduction of a new more comprehensive environmental/social cost-benefit analysis will make redundant the distinction between direct and indirect impacts.

At the same time, to ignore the motivations and vested interests of the decision-makers will likely lead to a lack of implementation of more sustainable approaches. Decision-makers may not be swayed by ethical issues, scientific data or even academic critiques of the conventional economics perspective. They may even dismiss the existence or their responsibility toward environmental degradation. When dealing with such a mindset it could be unfruitful to demand change because decision-makers and entrepreneurs 'don't fix what isn't broken' or perceived by them not to be broken. Calls by some political activists to stop projects or their attempts at embarrassing governments are not received well, especially if they fail to offer up any solutions. Therefore

we must demonstrate that new sustainable methods are to their advantage. New sustainable practices must be profitable and not just another extra cost which developers must incur.

One way to encourage reluctant vested interests is to document that in many cases a sustainable course of action is not economically inferior to conventional economic models. On the British Columbia coast there is evidence of the successful implementation of a more sustainable use of resources. Commercial fisherman and native communities had been fishing salmon without regard to impacts on the local ecology and the long term survival of this industry was jeopardized. In response, some native communities turned to conservation and instead of harvesting salmon they protected them in fish farms. They soon learned that there was a greater demand for roe covered seaweed than for salmon and began exporting the delicacy overseas at a considerable profit. This move toward a more sustainable management of resources helps to demonstrate that environmental protection need not be a zero-sum game.

Another example of successful implementation to convince decision-makers has occurred on a much larger national scale in Holland (see de Graaf & Hamann, 1996). Pollution and environmental decline in Holland, due in part to it having the second highest population density in the world and to a high concentration of industry, pushed the Dutch toward enacting a new National Environment Policy Plan. Its call for the elimination of environmentally destructive production methods would have a considerable impact on Dutch industries, but even Aarnout Loudon, former chairman of Akzo Nobel

corporation[34] admits that it has given industry a competitive boost. There have been some short term benefits for companies which have spent millions on developing cleaner technology. These companies now enjoy a competitive advantage in waste treatment and now export their more efficient technology and expertise to other countries (de Graaf & Hamann, 1996).

Decision-makers, entrepreneurs and others who have vested interests in conventional approaches may soon recognize that the inclusion of environmental and social issues do not necessarily yield less economic benefit, in fact it may yield more. In the following case studies, we may discover that sustainable alternatives may cause decision-makers to benefit politically and economically if they open up the decision-making process and get ideas from scientists as well as local people.

One can agree with, Abelson (1979), Bojo, Maler & Unemo (1992) who suggest that when it comes to the evaluation of projects, no other alternative method exceeds the cost-benefit approach (not counting for the moment Environmental/Social CBA).[35] By the 1970s, Environmental Impact Assessments (EIA) were introduced to construction projects and although these were commissioned to assess environmental impacts, they were not integrated into the decision-making process. Social Impact Assessment (SIA) has followed a similar practice. Environmental impacts were 'quantified', but they were not

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[34] Akzo Nobel is a Dutch chemical company and the world's largest producer of paint (de Graaf & Hamann, 1996).

[35] CBA has been narrowly defined by traditional economic perspectives, yet development experts have expressed that, " CBA does not need to be 'narrow' (Bojo, Maler & Unemo, 1992:83).

included in cost-benefit calculations. Often times EIAs were external to an "otherwise integrated planning process" and they were conducted in the later stages of project development (Adams, 1990).[36]

By not being part of development projects from the beginning, EIAs and SIAs have a narrow and not very notable impact on them. Others like sociologist Hammet (1970), have noted, that they were reduced to simply reacting to problems raised by engineering or technical proposals and because the EIA was carried out at such a late stage he could not initiate ideas (Adams, 1990:154). Therefore conducting EIAs and SIAs have been an important first step toward sustainable development, but I propose a move towards a fundamental integration which is to be found in Environmental/Social CBA.

Cost-Benefit Analysis

Putting a price on social impacts and the environment by expanding conventional cost-benefit analysis could be the most influential/productive way of conserving the environment and fostering sustainable development in the South. An improved price system[37] can closely approximate tangible monetary values for the environment and these values can be utilized by a new more effective environmental/social cost/benefit analysis. Let us examine the specific

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[36] "Often this marginal position is revealed physically by the existence of a separate environmental report which is not related to the rest of the project documents" (Adams, 1990:154).

[37] A modified price system is not solely responsible for recently acquired economic weight assigned to the environment, years of criticism by environmentalists and scientists have also helped.

economic and environmental valuations central to my thesis, namely Cost/Benefit analysis. Cost/Benefit analysis (CBA) has been used in the field of international development for decades and has been the mechanism in which development projects in both the developing and industrial world, have been evaluated. Used by governments, international financial institutions, development agencies and even individual persons in their daily lives, CBA has proven to be a practical tool used for comparison and evaluation, even though its current form is rife with ecological shortcomings.

All projects, including development projects in the third world are appraised through cost-benefit analysis. Governments in the developing world undertake development schemes which they hope will generate the largest possible net benefit for their countries but due to limited assets available to them, choices have to be made between rival policies and projects. It is therefore necessary to evaluate a project and its alternatives with some type of project evaluation method. Cost-benefit analysis, has been the most used method in development. Such an analysis would appraise the costs and benefits of a particular project and ascribe all relevant factors to a single unit of comparison.[38] Since all factors will be measured by a shared unit of analysis (e.g. Dollars), only when the benefits exceed the costs can the project be judged viable.

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[38] Usually the common unite of analysis and comparison is financial.

Philosophers like O'Neill (1996) challenge the rationality of this type of measurement. They do not accept the notion that a single unit of measurement exists, or that it would be able to rank everything. In reality however, we do engage in such comparisons daily, despite it being problematic. For practical purposes we all reduce a variety of goods and services to a few common measures, and increasingly to money. This reduction to a common measure in the field of development is known as commensurability. For a single all-purpose measurement to function, there has to be a specific property that all objects or events possess and it is this commensurability which allows us to rank outcomes. Critics argue that there is no rationality in attempting to commensurate all things. "The fact that I prefer A to B with good reason is not evidence that A possess more of some overarching super-value that is present in all my other potential choices as well." (O'Neill, 1996:98) Yet others, like Attfield and Dell (1989) note how such thinking and attempts at cost-benefit analysis are possible if we only demand 'weak commensurability'. This means that exact values are not necessary, all that is required is the ordinal ranking of objects and events. In this way 'weak commensurability' enables persons to determine that A is more valuable than B. In the field of development, we would like to make clearer judgments on what particular course of action would be preferable, so the ranking of options need only be ordinal. Weak commensurability would enable CBA to provide an ordering of 'betterness' between items (O'Neill, 1996:100).

The procedure of a cost-benefit analysis (Pearce, 1983, Common, 1988) can be reduced to a few basic tenets. First, a project must be defined and identified along with any possible alternatives. This is not as straight forward as one might think. Many investments can be describe as separate, yet because they are so closely linked, they really comprise a single development scheme. As Common, (1988), illustrates with his example of the construction of a new power station and the construction of new transmission lines, neither can fulfill its purpose without the other. Constructing the power station alone would serve no purpose if there are no transmission lines to carry the electricity to the users. Although these projects may be described as two different engineering projects they are not separate and embody one development scheme.

One can foresee that difficulties may arises when it is unclear how symbiotic the relationship is between mega-dams and resettlement schemes or catchment area treatment. For instance, in both the Narmada Valley Project (chp. 3) and the Three Gorges Project (chp. 4) which I have chosen as my case studies, successful resettlement schemes are an integral part of the overall projects. These resettlement projects cannot be treated as independent or superfluous projects because without their successful implementation both the Narmada Valley and Three Gorges Projects would not be viable. In India, the catchment area treatment in the form of reforestation projects, are especially tied to the success of the Narmada dams (see chp. 3). Therefore, clearly defining a project is a necessary first step prior to any analysis.

Secondly, all cost and benefits from a development project must be identified. Initially most of the economists who have conducted CBA, included only what they deemed relevant. Other factors (social costs, the environment) could be described as indirect and were either dismissed or significantly undervalued. Thirdly, the identified costs and benefits must be quantified. Whether because of efficacy and convenience, or a market-economics oriented bias, quantification results in reducing everything to its monetary equivalent. Adams (1996), Common (1988) and O'Neill (1996), all point out how difficult it is for CBA to value certain things. This has always been a dilemma for CBA, having to attach a price to a stream makes it vulnerable to critics who question the validity of such an evaluation.

Even if we accept for the moment the validity of putting a price on nature, there is still a debate, on quantifying the economic value of the environment. Initially CBA pegged environmental costs at zero and environmental degradation was not factored into any economic calculation. In exploring such circumstances in Indonesia, the World Resources Institute determined that Indonesia's growth rate was actually about half the official rate (Cobb, Halstead & Rowe, 1995). Its exceptional growth rate of 7 % a year was in part due to the selling off of, "precious nonrenewable mineral wealth", and the fact that environmental and social costs were not counted in any valuations (Cobb, Halstead & Rowe, 1995:68). When these factors were subtracted from the growth rate it decreased. Such miscalculations have unfortunately contributed to the construction of several non-viable projects (The Cameroon Forestry Project, The Brazilian

Northwest Region Development Program, The Manatali Dam in Mali, The Ok Tedi Mine in Papua New Guinea, Mikesell, 1992), because they may have looked valid on paper. Once completed, their success is debatable.

The disregard of environmental costs has also contributed to the (favorable) skewing of a project's validity on paper, as in the Grand Coulee Dam and the Glen Canyon Dam in the United States (Else, 1997). Although it is debatable whether the ecological costs could have made these dams nonviable, such ecological factors would have better reflected the overall cost and benefits for comparison purposes. Ninety percent of the salmon on the Columbia river are gone because of the Grand Coulee Dam and the Glen Canyon Dam's impact down stream has been detrimental, since the Colorado river no longer reaches Mexico or the Pacific Ocean (Else, 1997). Pressure from outside the economics profession has led to a marginal improvement in the assignment of environmental values.

Fourthly, after the above stages are completed there has to be a way to gauge the results and facilitate choice. To select a project decision-makers use appropriate criteria and in CBA this usually entails the application of Net Present Value (Bojo, Maler & Unemo 1992, Dixon et al. 1986, Pearce 1983).[39] If a development project has a positive net present value it can be accepted, if it is negative, it should be rejected. Finally cost-benefit analysis includes sensitivity analysis or a risk assessment (Bojo, Maler & Unemo, !992:69, Dixon et al. 1986)

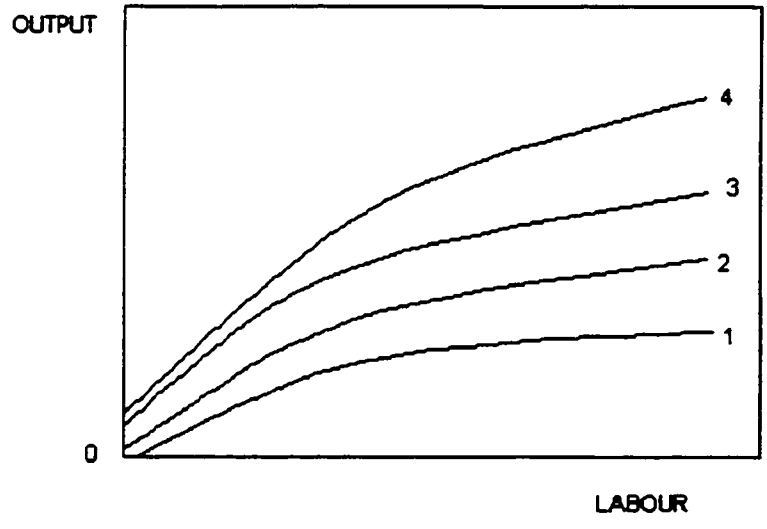
[39] The net present value reduces a stream of costs and benefits into a single number in which cost and benefits that are projected to occur in the future are discounted (Bojo, Maler & Unemo. 1992:59-62).

to deal with the uncertainty present in project evaluation. In any development project, the estimates of the variables including their costs and benefit, may not be 100 % accurate and uncertainty increases when such estimates are projected into the future. Actual values for each variable may deviate from projected figures, dramatically altering CBA results in some cases. By running through the analysis using various values, a range of results can be examined. This final stage of CBA not only makes developers more sensitive to possible outcomes but it gives them a clearer understanding of the degree of risk involved with the project (Common, 1988:272).

The introduction of such an environmental CBA along with all of its respective procedures, alters and improves upon notions of economic growth and prosperity as first described by the classical economists. Figure 2.2, is my rendition of what Environmental Cost-Benefit Analysis would have on the original ideas of Malthus, Ricardo and Mill, concerning diminishing output as described by Common (1988). It is a graphical representation of the notion of diminishing returns, it reflects economic prosperity or output over the long-run. Line 1, represents the original interpretations of Malthus and Ricardo concerning diminishing returns. Such a pessimistic view of the future was not reflected in the circumstances on the ground. The law of diminishing returns was at odds with the actual success of the growing economy. These classical economists had failed to account for technical progress which enabled output to increase beyond the expected limits. They had wrongly assumed that technology and knowledge would remain unchanged. Eventually (see figure 2.2, line 2) John Stuart Mill

proposed that diminishing returns could be overcome by technical progress, although not indefinitely (Common, 1988:2-5). In line 2 (figure 2.2) we can see that the introduction of technology raises the line representing economic output and growth and has a beneficial effect on prosperity. The new graph-line results in an increase in economic viability because the notion of technological progress introduced by Mill (1806-1873), delays reaching the economy's plateau.

Figure 2.2: Diminishing Returns and Technological Progress, *plus recycling, plus environmental Cost-Benefit Analysis*



Line 1 - reflects the original interpretations of Malthus and Ricardo concerning dimishing economic output and prosperity
Line 2 - reflects Mill's introduction of technological progress and its beneficial effect on economic output and prosperity
Line 3 - reflects the improvement to the economic cycle due to recycling
Line 4 - reflects the beneficial effect environmental/social cost-benefit analysis has on economic prosperity

Line 3 (figure 2.2) reflects the improvement to the economic cycle due to recycling. The more efficient use of natural resources not only benefits the

environment by decreasing waste and demand for resources but it also enables the economy to continue growing. Finally line 4 (figure 2.2) reflects the addition of environmental CBA, which now enables the economic cycle to approach even higher optimum levels. An efficient and environmentally sound CBA, allows economies to approach optimum sustainability and growth. Figure 2.2, is a graphical representation of a more sustainable and efficient economy which could delay environmental collapse significantly.

Even though a cost-benefit analysis is the most standard method of analysis used in development projects, it is still confronted with criticism. Most of the criticism revolves around the fact that a consensus about the morality of reducing all issues into monetary terms, does not exist. What is the 'value' of a human life? Are a project's effects on human lives a matter of simple arithmetic? Some critics argue, that no matter what the benefit derived from a development scheme, it is not worth the loss of one human life. This is admirable but is it practical?

The vulnerability of CBA is in part caused by the unsatisfactory methods of valuation for non-market factors (ecology, human welfare). In order to assign monetary values to such factors, the discipline has chosen a Willing to Pay (WTP) measurement, over Willing to Accept (WTA) measure. The willing to pay measure (WTP), refers to the sums that individuals state they are willing to pay for a benefit or to prevent a loss, whereas a willing to accept measure (WTA), refers to what they would accept as compensation for a loss. "There is no justification within economic theory for choosing between WTP and WTA

measures" (Adams, 1996:3), yet most economist routinely chose the former measure for its conservative figures.

Critics declare (O'Neill, 1996:98) that the willingness to pay is constrained by a person's ability to pay and this accounts for the lower values attained with such a measure. The poor do not have the luxury to pay very much to avoid negative consequences and this has generated a focus on the inegalitarian nature of CBA. Other economists think that the willingness to accept compensation, would be limitless since people could quote unrealistic and costly figures, or that poverty (Darmstadter, 1992:42) does not significantly affect WTP. These individuals advocate the benefits of CBA, as a pragmatic and candid method of comparison. In practice, CBA offers a systematic, transparent and rational method of evaluation to decision makers even though it is debatable whether it is scientifically or ethically grounded.

Therefore, while these inherent problems with cost-benefit analysis have urged some to call for its abandonment because it fails to settle these fundamental ethical issues, due to the lack of any workable alternatives throughout the developing world CBA continues to be used by governments and experts because it is useful in decision making. Many continue to support the methods of ecological economics (Adams 1990, Dixon et al. 1986, Mikesell 1992,) and press for the improvement of CBA, with the inclusion of environmental and social effects into its calculation procedures. Adding ecological and sociological perspectives to the formulation of development policy, could reduce imbalances and improve the viability and sustainability of

development projects. Environmentalist are not obliged to accept economics, but the least I could do, is attempt to include sociology and the environment, in project appraisal.

This new and improved CBA would more accurately inform debate on specific projects and enable participants to move beyond confrontation. At one extreme there are environmentalists who want to stop all growth and development because of impending ecological doom, and at the other, there are orthodox economists and developers who resist opening up CBA to include environmental and social factors. By utilizing a more environmental sound cost-benefit analysis on a case by case approach, a better informed, common sense debate over the project in question could materialize. "To appeal to the practical judgment which develops through such discussions is not to appeal to untutored intuition" (O'Neill, 1996:101, see also Common & Lohmann, 1992:39-40). Despite the obvious shortcomings of CBA, I tend to favour those scholar/activists of the international development community who have accepted the legitimacy of this new cost-benefit analysis, I strongly feel there is desperate need to improve its application.

Ethical Issues

There is an ethical dimension to development. Inevitably, it raises the ethical dilemma of 'who pays?' and 'who benefits?'. Although there may be other factors involved, development projects or policies are undertaken by

governments to provide an overall net benefit (hopefully) to their respective countries. However, these same development schemes can bring about negative consequences for particular populations within these countries. If we were to assess a project from a more narrow local-level point of view, it could be rejected. This is one reason why projects are evaluated using more aggregate levels of analysis. If national populations are likely to benefit on the whole, even though some citizens may not, development is seen as 'positive'.

Development projects bring on both costs and benefits, and in ideal situations, those who incur the costs should enjoy the benefits. Theoretically, this would neatly remove most of the ethical complications. However in the real world of development, those who benefit may not be asked to pay any of the cost, and those who endure the negative costs of a project might not share any of the benefits.

Who pays? In mega development projects like the Narmada Valley Project or the Three Gorges Project, there are sizable populations which will have to bear the brunt of the negative environmental and social consequences created by these dams. These individuals will lose their lands, homes, livelihoods and communities, all for the 'national' interest (see chapter 3 and chapter 4).[40] More unfair, is the fact that it is not entirely clear if they are to receive any of the new benefits derived from the projects. Who benefits? It might be that an entirely different class of people are to enjoy most of the benefits.

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[40] Concerning India in some instances, "the 'national interest' was, in fact, the electoral interests of a handful of politicians financed by a handful of contractors". (Shiva, 1993:150)

Is this unethical? The *pareto principle*[41] states that if a project's gains are greater than the losses it may incur, then it is worthwhile. According to the *pareto principle,* development is positive if benefits exceed costs and "any change that permits the winners to compensate the losers and still leaves something over is an indisputable improvement." (Adams, 1996:3) Originally this theory acknowledged that if costs and benefits were to fall on different people, a development project could only be described as a positive improvement if the losers were compensated by those who reaped the benefits. Nevertheless, Schmid (1989), describes how some economists describe 'improvement', as simply the potential (or capacity) for compensation to take place.[42] Whether compensation is carried out is a separate matter, it no longer affects the assessment of whether a net benefit exists.

At times long term benefits can only be achieved through the absorption of short term costs, so prosperity and improved human development may be the very reason why, seemingly negative policies are pursued. It is partially for these reasons that Pareto's ideas, which are fundamental to CBA, are attractive to central planners and developers.[43] Ultimately the principles he set down, "urges government to increase total production regardless of whether distribution (compensation) is altered." (Schmid, 1989:12)

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[41] This is a guideline for measuring if an action or outcome is positive or negative.

[42] In Schmid's (1989) terms the *Pareto-better compensation test* is transformed into the *potential Pareto-better compensation test.*

[43] Wilfredo Pareto, was also hailed by Mussolini as the founder of fascist theory (Adams, 1996:4).

This ethical question, of who pays and who benefits, manifests itself in the developed world as well. The right of Eminent Domain for governments, often results in the construction of airports or freeways which may require the expropriation of people's homes. In practice, so long as they are 'adequately' compensated our ethical values do not conflict with such action by the state, even if those expropriated are unwilling participants.

Compensation can contribute to the resolution of some of the ethical problems and so too, can environmental/ social CBA. By including social and environmental factors into the planning and evaluation of development projects, they are more likely to be made viable. Reducing social costs (by saving social networks from being uprooted, or not depriving individuals of their assets) and by preserving farmland, forests and other ecosystems integral to the livelihood of many communities, some of the ethical dilemma is reduced. The reduction of negative costs from development projects, through the introduction of more sustainable development will not solve the ethical question but it may reduce the size and intensity of the problem.

One can suggest that in much the same way that environmental analysis should be incorporated into cost-benefit analysis, a framework of social cost too, has to be developed to measure the social costs in a much more comprehensible manner then it has been. This by itself may address some of the ethical issues, however to deal with this aspect is outside the limited scope of this thesis.

Summary

An Environmental/Social CBA which is fully integrated into the project development process from the beginning, may help to anticipate and avoid problems, increasing the viability of mega-projects. Conventional economic growth models have not been able to fully address, the complexities of the ecology-economy cycle and momentum toward sustainable development has grown. This has been due in part to the successful politicization of the environment by activists and pressure groups. The UN now calls on sustainable development for achieving human development (UNHDR, 1992; UNHDR, 1995; UNHDR, 1997), a more broadly based development, where social services like education, health and the elimination of poverty replace maximizing the economic growth rate as the major development objective.

In practice, for sustainable development to function properly and for it to be more easily accepted by the international economic system, it could rely on an improved cost-benefit analysis which includes environmental and social factors. This type of analysis could recognize that changes from development projects have social, economic political and environmental implications, which could at the very least be estimated. At the international level it appears that environmental accounting has gained more support and gone farther than social accounting due to the greater interdependent nature of ecological impacts. Since my interest lies in the developing world, it is important to see how CBA is

conducted with respect to development projects in such countries. Bearing in mind that the level of democracy varies from country to country, these measures may be limited. India is a place where democracy is practiced and it has a history of community level protest, while in China channels of expression for local people are more restricted. Each of these nations could provide us with an opportunity to explore the cost-benefit analysis of development projects in the context of the developing world. In the following chapter we will examine the Narmada Valley Project, in India.

CHAPTER 3

Case Study: THE NARMADA VALLEY PROJECT (INDIA)

Could the problems which arose in the Narmada Valley Project in India, have been avoided with the implementation of environmental accounting techniques ?

Introduction

In Western India the Narmada river winds its way from Plateau of Amarkantak in Madhya Pradesh all the way to the Arabian Sea, 1 300 kilometers away. Approximately 20 million people live along its path and it provides them with drinking water, irrigation, nourishment, cultural identity and spirituality, as it is considered by Hindus to be holier than the Ganges. However this valley also happens to find itself in India, a developing nation which is determined to pursue industrial development. Since independence India has been confronted with two different models for development, the Gandhian path or the Nehruvian. Stressing self-sufficiency, Gandhi proposed concentrating India's energy and resources on the village economy, in the form of artisan production and by utilizing simple technology in rural communities in order to provide jobs and more secure

livelihoods for the majority of India's population.[44] In contrast, Nehru put his faith in rapid industrialization. He did not consider rural development a priority by any means and in fact he once wrote to Gandhi, " A village, normally speaking, is backward intellectually and culturally and no progress can be made from a backward environment." (Chandra, 1987) Nehru was convinced that economic development was synonymous with centralized industrial development, because he thought a country could not survive nor provide for its people, without a modern economy. He believed socialism and state control of large scale industries would provide the greatest good for the greatest number (Roy, Tidsell & Sen, 1992:11).

Indian technocrats and the Congress Party had accepted Nehru's ideology of 'industrialize or perish' and in 1951, they began a series of economic Five Year Plans where initially the government of India invested only 22 % of its total plan budget on agriculture, even though 75 % of the population was engaged in agriculture (Baviskar, 1995:22). While such figures may be accurate, the evidence does not support Bavikar's claim that industrial development received the greater share of public expenditure. After consulting Kohli (1987), I found that investment in organized industry and minerals (roughly 20%) mirrored that for agriculture (Kohli, 1987:64-73). This does not detract from the issues raised by Baviskar (1995), namely that the industrial sector employed only 11 % of the Indian population, while it received as much investment as the agricultural

[44] For more discussion see Baviskar 1995, Chandra 1987, Kohli 1987, and Roy, Tisdell & Sen1992. This model of development was later adopted and advanced by those who advocated appropriate technology as a means of development (Harrison 1983:130-143, Schumacher 1974).

sector, which employed 75 % of the population. This path was taken by most developing nations whether they were socialist or capitalist, since the favourite development philosophy was industrialism.[45]

Although India is the world's most populous democracy, power has been monopolized. Since independence, the Congress Party has continually ruled India and only recently has power been handed over to another political party, the B.J.P., yet Indian technocrats and the bureaucratic elite, remain. These are the proponents of this type of industrial development strategy.[46] Capitalist merchants, industrialist, the technical and administrative bureaucracy, and wealthy farmers, have critically affected the decision making in India, because they were the people who had monopolized the post colonial state (Alavi &Harris, 1989:4,14-15). Moreover, through elaborate structures, political parties and in particular, the Congress party, had effectively excluded other voices from the electoral process. As a result this community of elites, continues to play a critical role in shaping 'development' projects as in the case of the Narmada Valley Project (NVP).

The NVP provides an excellent example of the clash of the Gandhian and Nehruvian approaches. The gigantism of the Narmada Valley Project is more in

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[45] The pursuit of industrialization by these countries is justified because conventional wisdom at the time (and even today) argued that industrialization was a necessary component of development. Furthermore, there were few alternative models because both the capitalist and communist camps proposed industrial models of development. It would have been politically difficult for underdeveloped countries to pursue other possible avenues to development.

[46] Often they can be influenced by their ties to international capital, while their Western education may skew their judgments in favour of conventional western thought.

tune with Nehru's belief in large-scale industrial development, and it represents the philosophy of conventional economics. Presently this school of development, based on western economic thought is predominant in international development. Its proponents include international banks, multinational corporations, a majority of economists and most industrial countries. This type of development approach continues to overlook ecological factors. Yet environmental degradation is ever more undeniable, and it has led to the rediscovery of Gandhian economics. At one time considered impractical, Gandhi's ideas concerning non-violent economics[47] (where civilization is built on renewable resources and humans cooperate with nature), are similar to those of development theorists who acknowledge the central importance of sustainability (Roy, Tidsell & Sen, 1992:4-8). The 'new' ideas found in sustainable development or environmental economics, can find their roots in Gandhi's views on development. Therefore, those who now criticize this mega project as an example of unsustainable development can be proponents of a more Gandhian approach.

In this chapter, I will examine the environmental, social and economic viability of the Sardar Sarovar and Narmada Sagar, development projects. After reviewing the benefits and costs, using an improved environmental/social cost-benefit analysis, a more accurate evaluation of the Narmada Valley Project can be attempted. The positive and negative impacts on the environment, people

[47] Our understanding of this term would refer to an economics which was not violent (causing degradation) toward the environment nor to people, it would be sustainable.

and the economy, will also enable the reader to judge the merits of alternative development schemes more effectively.

Map 3.1

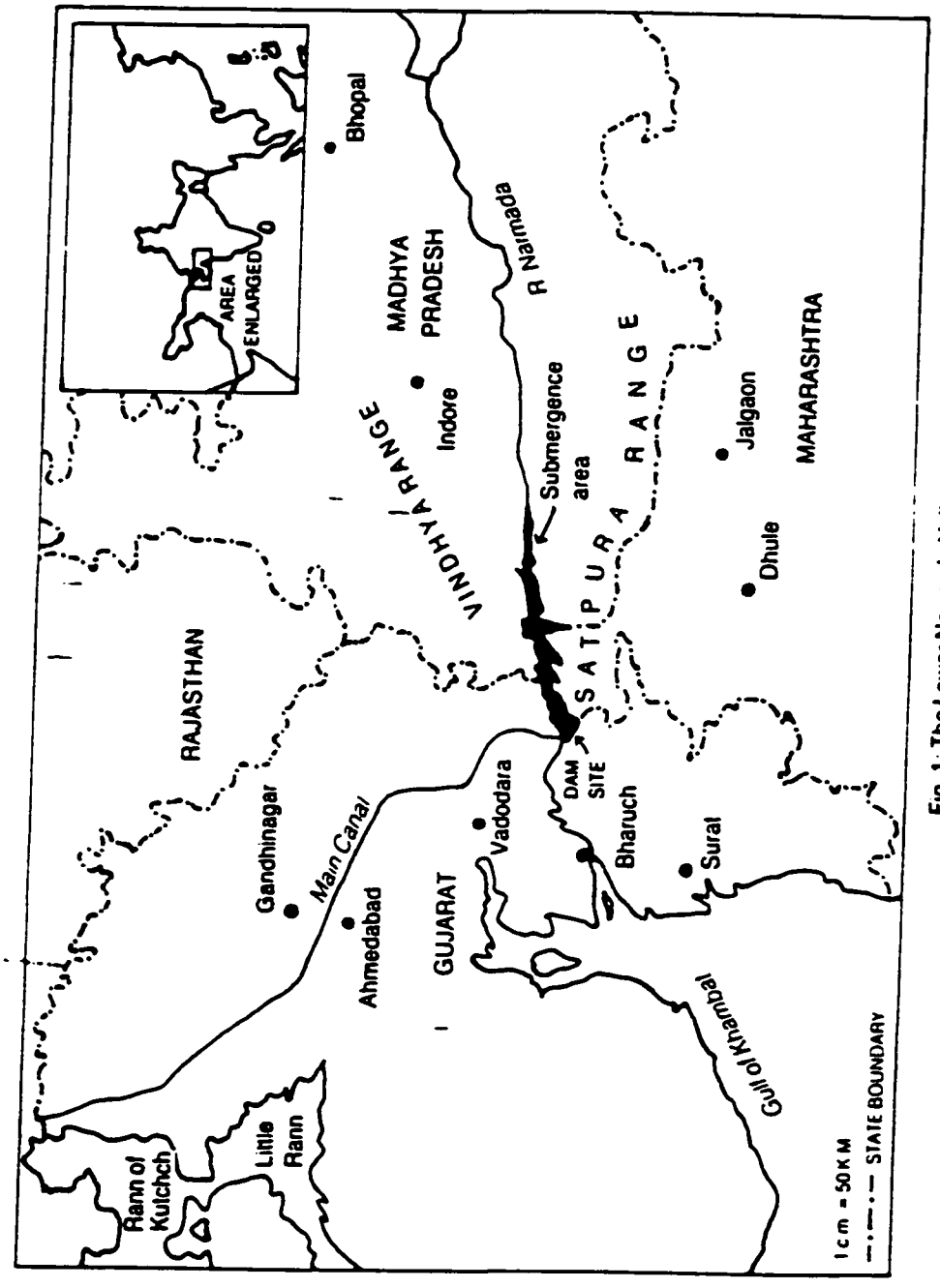
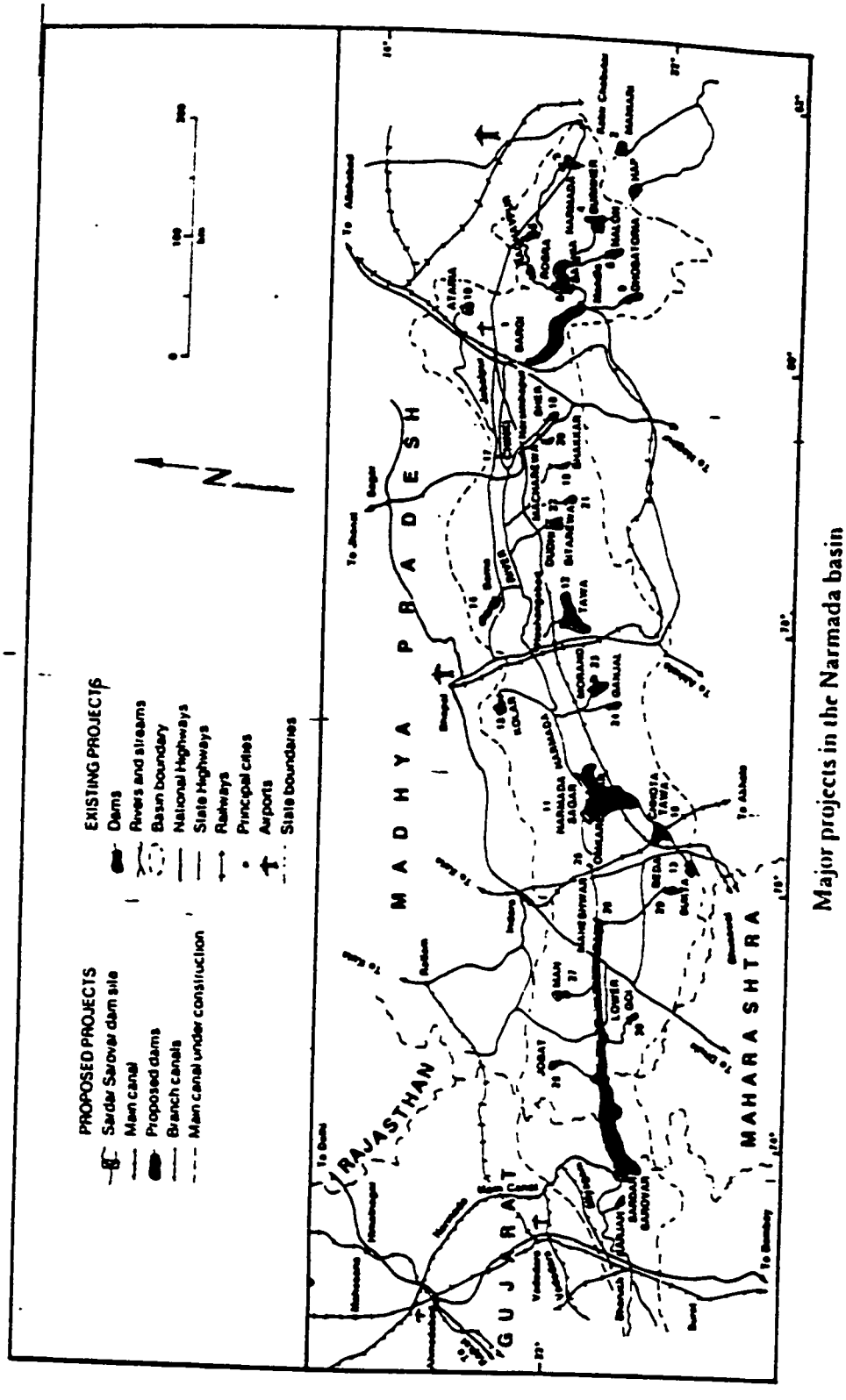


Fig. 1: The Lower Narmada Valley

Source: Baviskar (1995)

Map 3.2



Major projects in the Narmada basin

Source: Alvares & Billorey (1988)

Figure 3.1 : CURRENCY EQUIVENTS

Currency Units	= Rupees (Rs)
US $ 1.00	= approx. 17.5 Rs (late 1980s early 1990s, when most analysis was conducted)
	= approx. 37 Rs 1997
	MEASURES
1 lakhs	= 100 000
1 crore	= 10 million

Source: Paranjpye (1990), The Montreal Gazette, March 17, 1997.

The Narmada Valley Project

The Narmada River projects, if completed, will make up the largest single irrigation and power project in the world involving some 3200 dams and taking more than one hundred years to construct (Alvares & Billorey, 1987:63). More specifically it is comprised of 30 major dams, 135 medium dams, and 3000 small dams and will involve the states of Gujarat, Madhya Pradesh and Maharashtra. In keeping with the policies of massive industrial development of the Indian government and the World Bank's preoccupation with large scale mega-projects, the first dams to be built happen to be the largest. Mikesell (1992), states the first dam to be built is the Sardar Sarovar in the state of Gujarat, and it is designed to provide 1200 megawatts (MW) of power (installed capacity) and is predicted to irrigate about 1.9 million hectares.

Table 3.1 : Power and Irrigation from Dams

Project	Irrigation	Power			
			Firm Power (MW)		
	(Hectares)	Installed capacity	Initial phase	Final phase	Average
Narmada Sagar	123 000	1 000	223	118	170.5
Sardar Sarovar	1 792 000	1 450	300	150	225

Source: Alvares & Billorey, 1988

These figures used by Mikesell (1992), concerning electricity output however, are very misleading (see table 3.1) if we examine the research conducted by Alvares and Billorey (1988). Table 3.1, provides a more

exhaustive breakdown of the power generation for the dams. There is a distinction between installed capacity and actual firm power. In the generation of hydroelectricity, what is relevant is firm power capacity, meaning power which is available the whole year round. In the case of the Sardar Sarovar 1450 MW[48] refers to installed capacity but the actual firm power is estimated to be 300 MW. The Second major dam which is to be constructed is the Narmada Sagar, further upstream on the Narmada River, in Madhya Pradesh. It is projected to irrigate 123 000 hectares of land and generate 1000 MW of power, although firm power is really 223 MW (Alvares & Billorey, 1988:14). In the initial phase the total firm power capacity for both dams will be approximately 500 MW and due to eventual siltation, over time generating capacity will drop by about half.

Most importantly this development project should provide drinking water, irrigation and electric power to 40 million people, and proposes to turn the region into a "valley of prosperity".[49] It will provide valuable electricity which is required by the industrial sector for manufacturing. The project will supply water to cities and communities, and provide irrigation to a drought prone area in the state of Gujarat, over 400 kilometers away. There are other projected benefits as well: the dams will moderate flooding and prevent devastation to agricultural lands

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[48] 1450 MW are referred to in Alvares and Billorey's figures while Mikesell writes of 1200 MW. Taking into consideration that Mikesell's 1992 work only touches on these dams briefly and that Alvares and Billorey's 1988 work is a comprehensive examination of this development project which includes the views of the dam builders, their figures could be viewed with greater confidence.

[49] Although the proponents of the dams do not provide much evidence for their claim, it stands to reason that the vast majority of expected beneficiaries are found outside the reservoir area, in urban centers or distant agricultural lands. These persons are not those who are going to suffer the negative consequences caused by the dams.

and peoples' property. [50] The government of India states that there will be benefits due to an increase in pisciculture, referring to fish farming in the reservoir. Figures for the Narmada Sagar propose a benefit of Rs400 million from pisciculture (S.S.P. figures not available). [51] New recreation facilities and tourism will result due to the huge reservoirs. The reservoirs will enable water sports, provide a panoramic view and the valley will benefit with the development of tourism. [52]

Although there is no conclusive evidence, it is also claimed the water used in the valley will be purer, because the increased quantity will dilute wastes even further and the greater the surface area will mean greater exposure to sunlight which acts as a disinfectant (Dr. R. S. Doria, 1990:11). The artificial reservoir caused by the Narmada Sagar will be the largest in India and will lead to a better developed navigation system. This benefit to the nations infrastructure means that larger and a greater number of boats can provide transportation and supplies to more isolated areas. This would be accomplished

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[50] No data is provided by the government for us to determine if flooding was a major problem in the region previously. However, it can be expected that like any other watershed valley basin, there must be some flooding especially in the monsoon season. What is to be determined is whether the project will work to moderate future floods, as the government claims. Opponents of the dams also fail to elaborate on the history of flooding in the valley, while they argue that flash floods may increase as a result of the project.

[51] Opponents claim, the transformation of the river will destroy fishery resources already prevalent. According to revenue estimates by Maharaja Sayajirao University losses from the catch of two species alone, Hilsa & Prawn would be Rs1.63 billion. It is doubtful whether potential pisciculture in the future will ever replace current fish resources (Alvares & Billorey, 1988:43).

[52] Presently the valley benefits from religious pilgrimage tourism. This will be disrupted once the reservoirs begin to submerge temples and other archeological sites.

at a lower cost than road transport. Connecting such otherwise inaccessible areas will spur economic development and raise the quality of life in the region.

Finally, using renewable resources and pollution free hydroelectric power is positive in itself. All countries need energy whether for domestic, commercial or industrial use, and some types of energy are better than others. Non-renewable energy resources such as oil, place a large cost on the Indian economy because it is imported from other countries. While coal is also non-renewable, Indian coal reserves are estimated to last 1000 years with the present rate of consumption. In either case both of these conventional fossil fuel energy resources pollute the environment and contribute to global warming (Singh, 1990:192). I should also like to mention that according to what K. C. Misra (1990) wrote in Man, Development and the Environment, nuclear energy generates approximately 33 % of India's total power, from just over a dozen nuclear power plants. The draw backs are long term storage and potential environmental contamination, which can create incalculable costs (Misra, 1990:320).

Contrary to all this, energy derived from renewable resources is less damaging. Solar energy, wind energy, geothermal energy and hydro power are more sustainable and impose less environmental degradation over the long term. Technically speaking those who favour the construction of this project are correct in citing the benefits of hydroelectricity over conventional fossil fuels. Yet there should be a distinction made between mega dams and small dams, because the former can bring about tremendous environmental and social costs,

while the latter typify sustainability (Paranjpye,1990; A. K. Singh, 1990; Smil, 1990,1993). According to Singh and the World Bank previous Chinese achievements in the construction of small-scale hydroelectric dams have been successful (Singh, 1990:193).

It is my objective to examine whether the sum total of all economic benefits provided by these two mega-projects will equal the economic losses they are expected to create.

The Environmental Costs

The construction of these two dams will have a tremendous effect on the ecology of the Narmada basin, where the total area to be submerged will come to 130 482 hectares. In an area where the *forests* are already surpassing their carrying capacity [53] it is expected that the Sardar Sarovar will drown 13 744 hectares of forest and the Narmada Sagar will submerge an additional 40 332 hectares (Alvares & Billorey, 1988:27). This destruction of the forests fails to include the additional land that will be required for the construction of irrigation canals or other related works. The only forest destruction included so far has been that which will be caused by the reservoir, but destruction will also result from the construction of the massive irrigation scheme. Hundreds of kilometers of canals and dikes will be constructed through forests and agricultural lands.

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[53] Carrying capacity is defined as, how many organisms of a particular kind can a particular environment support without undermining its capacity to support them in the long term, also described as the maximum number of persons the environment can support (Ehrlich, 1996).

Although the Narmada Valley Development Agency (NVDA) has promised to afforest 90 000 hectares of degraded forest to compensate for the flooding by the Narmada Sagar, this should not be seen as a benefit. Technically this should happen regardless of the flooding by the Narmada Sagar because it is the expressed duty of the Department of Environment and Forests (DOE&F) to replant in degraded forest areas whether these dams are constructed or not. Furthermore it has not even been determined if afforestation will succeed on degraded forest land. By 1988 the project authorities had not been able to find any non-forest land for compensatory afforestation yet their afforestation proposal seemed satisfactory to both the Indian Government and the financial backers (World Bank) of the dams. Although they may have had a satisfactory plan in theory, it is highly probable their calculation of the cost of compensatory afforestation is under-estimated, since project authorities have not transferred any funds from their budget to the DOF & E for the specific purpose of afforestation in the area affected. Unless there is evidence of a substantial transfer of funds, specifically earmarked for this aspect of the project, the afforestation policy will remain theoretical.

Apart from the direct effect on forests through submergence, further indirect effects caused by the dams will also negatively impact the surviving forests. The forest, besides being the home to wildlife, plays an integral role in the lives and economies of peasants. The forests provide construction materials, fuel wood and medicinal plants. They also contribute to subsistence by providing

forest produce and through the cultivation of forest gardens. Furthermore, hundreds of thousands of cattle already graze in the forest. (These issues will also be discussed in the section, The Project's Impact on Forests Subsistence) Therefore increased pressure on the remaining forest areas due to submergence, will accelerate deforestation. As the total area of forest lands decreases, the ratio of persons to forest land area will increase and this means that there will be a greater amount of peasants trying to squeeze out a subsistence livelihood from a shrinking forest. The remaining forests will be under considerable pressure and will no doubt degrade and such 'indirect' erosion is not considered as part of the costs of the project. In fact, " the indirect ecological consequences of the dams are even more serious than the direct negative consequences, and the former had not even been considered in the cost benefit ratios used to support the idea of the dams." (Alvares & Billorey, 1988:29) By excluding these very real 'indirect' ecological costs the project supporters attempt to put a more favourable spin on the mega-dams.

The effect on agricultural land is also disturbing, where the flooding of the regions most fertile *farmland* is proposed in exchange for irrigating less fertile fields. The Sardar Sarovar will submerge 11 318 hectares of farmland and the Narmada Sagar will submerge 44 363 hectares, for an approximate total of 56 000 hectares. Once again this destruction does not include the land which will be required to construct the vast network of canals for the mammoth irrigation schemes proposed by the NVDA.

The massive irrigation projects as proposed in this case will likely lead to *water-logging* and *salinization* and eventual soil degradation according to the Indian Institute of Science (IIS). As a result of former development projects, "In India, ten million hectares of land have thus become waterlogged and another 25 million hectares are threatened with salinity." (Alvares & Billorey, 1988:41) The Narmada Valley Projects boast an intended irrigation capacity of almost two million hectares yet opponents have not determined how much area will be affected by salinization. What they have done is to suggest that as in past schemes, the NVP will also cause some salinization.[54] In this particular case one of the suggested solutions to the inevitable water-logging is that wells be dug every 6.2 hectares so that water can be pumped from the ground every day in order to solve the problem. This means that no more than 70 % of the water which will be used for farming may be allowed to come from the giant irrigation system and electricity will have to be diverted to run all the new wells which will have to be constructed.

Furthermore, these large reservoir and canal systems frequently bring about environmental *diseases* due to the elevation in subsoil water levels and the destruction of fast moving self-cleaning rivers.[55] Irrigation systems tend to create health hazards like malaria, flouorosis, schistosomiasis and other water-

[54] In the United States, irrigation projects like the Central Valley Project have fed Californian irrigation schemes, which have resulted in increased salinization of farmland (Else, 1997).

[55] Some scientists argue that it is not surface exposure to sunlight but they free flow of rivers which purifies water. Fast moving rivers are purified quicker because of oxygenation, when water is impounded into large reservoirs toxicity levels can build up and this also breeds disease.

borne diseases.[56] According to Doria, "More than 50 % of all illnesses in India are related to water borne diseases...(and) over 70 % of all the water in India being polluted, the storage of such water in reservoirs aggravates the problem." (Doria, 1990:17-18) If the Narmada Valley projects result in an increase in disease, there will be a greater burden on the social supports and economic structures , of Indian society. Clearly these water related diseases have a cost which must be paid and factored into any cost benefit analysis of the development project. Costs should include medical care, pest control and decreased productivity. Yet, disease prevention has not been factored into any of the NVDA's calculation (Mikesell, 1992:108).

The area's ecosystem is already fragile and beyond its carrying capacity and coupled with these massive construction projects, it is expected that *siltation* will bring on further costs to the development project. As topsoil is washed away it finds its way into the reservoirs of large dams and in the case of the degraded environment of the Narmada Valley with its widespread deforestation, it is expected to have an even higher rate of siltation.[57] The result of siltation is a reduction in the storage capacity of reservoirs, or more simply a reduction in the life of dams. For the Narmada Valley dams, this dramatically alters the economic viability of these dams because the projected economic benefits through the production of future hydroelectricity will be cut short. In order to stem

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[56] Linda Harrar (1997) notes that in the developing countries people are wary of falling victim to "the disease of hydro-dams" a reference to the various water-borne diseases exacerbated by reservoirs.

[57] Refers to the filling up of the reservoir with silt due to natural and man-made erosion.

the damaging effect of siltation a sizable amount of investment must be made on the catchment area.[58] Catchment treatment will add considerable costs to the mega-project and it is doubtful it will occur because there are no funds available.

Another serious finding raised by Alvares and Billorey (1988) is that the water yield of the river appears to be an overestimate (by 17 %): it is really 23 MAF and not 27.2 MAF.[59] They use data from the Indian Institute of Management to dispute those figures assumed by the dam's proponents (Alvares & Billorey, 1988:55). What this means is that there is less water flowing through the river than what was expected and less water means a lower level of electricity is produced. True siltation and *water yield* rates also mean that the areas receiving irrigation will have to be reduced by approximately 35-40 %. This will reduce the benefits projected in the command area, all areas which will benefit from the construction of the Narmada Valley projects. The command area also includes territories which lie outside of the Narmada Valley, because these distant areas are to benefit from irrigation and electricity. Yet, in fact the most drought prone zone of the command area will have to be excluded from the project because there will not be enough irrigation water to reach this zone, even though providing water to this area was the justification for the S.S.P. (International Rivers Network, 1996). After examining such evidence, in all likelihood these specific individuals will be neither positively nor negatively affected from the

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[58] This refers to the area which 'catches' the incoming water. Although it includes the reservoir, the area (farmland, forests, villages) surrounding the reservoir is also part of the catchment area.

[59] MAF, measures the volume of water in million acre feet.

NVP in terms of irrigation because they will neither contribute water to the project nor receive any from irrigation.

Both dams are located in an *earthquake* zone which is classified as moderate. Apart from being a moderate seismic zone the Narmada basin is fractured and very porous, which means that with the impoundment of water by the reservoir, pressure can build up. The result can be Reservoir Induced Seismicity (RIS). Factors such as the huge size, of both the Narmada Sagar 91.4 meters and the Sardar Sarovar 155 meters means that the water pressure may lead to reservoir induced seismicity.[60] Such earthquakes have already occurred in Koyna. Engineers state the dam can withstand earthquakes of magnitude 6 but it has been recorded that quakes of magnitude 6.3 have occurred in this zone. Experts from the National Geological Research Institute at Hyderabad admit that earthquakes of this magnitude may occur in this area and the final water level in the reservoirs could trigger it sooner (Alvares & Billorey, 1987:68). Should such a disaster occur, the impounded water in the reservoir could be unleashed and catastrophic flooding downstream would endanger low lying populations and property.

Given the fact that the priorities of governments in less developed countries (LDCs) lie elsewhere (economic growth, debt repayment, building infrastructure, raising living standards, etc.), it is not surprising that these

[60] More recent 1991 reports put the planned height for the Sardar Sarovar at 140 meters. Height of the Narmada Sagar has also been projected at 860 feet, which is approximately 258 meters.

governments have more pressing concerns, other than the preservation of wildlife.

It is still important to note that no systematic survey has been conducted on the *wildlife* of the project area, even though the submergence area of both Narmada dams are teaming with flora and fauna. No planning has gone into dealing with the wildlife. The Environment Planning and Coordination Organization (EPCO) has said that the animals will migrate to other areas yet this is not possible. The critical problem is that there are no forest 'corridors' which would allow animals to cross over to other forested areas, they will be surrounded by agricultural land and the water from the reservoir. The end result will be that as the waters rise they will have no place to run and so most animals will likely die. Those that make it on to the farmland will destroy crops.

Although the Indian government expects an increase in pisciculture, it is likely that native fish species will decline. In the Untied States, Jon Else has reviewed in Cadilac Desert (1997), the negative ecological effects Grand Coulee Dam has had on the Columbia River. In this particular case it was found that 90% of the salmon in the Columbia River had disappeared due to this dam. These fish could no longer reach their spawning grounds. In India, the dams as well as the reservoirs will alter the habitats of fish and could lead to a decline in fish population in the Narmada River. Therefore, to sum up the ecological impact, it is highly probable that the construction of this development project will adversely affect forests, farmland and wildlife. It can also cause an increase in water borne diseases, salinization, siltation and possibly induce earthquakes.

The Social Costs

The Displacement of the human population in the Narmada Valley will cause severe economic, social and cultural disruption. If all 3200 dams of the Narmada Valley projects were actually constructed it is safe to assume that several million people would be displaced. Luckily most of the projects were never truly expected to be built, so only a small fraction of the construction projects have gone ahead. As it stands today only two of the major dams, Sardar Sarovar and Narmada Sagar (the two Largest) are actually being pursued and of these, construction has only occurred in the case of the Sardar Sarovar dam. According to, Department of Environment and Forest figures for 1981, the Sardar Sarovar will submerge 234 villages (100,000 people) and the Narmada Sagar will submerge 254 villages (170,000 people). These two dams would displace 270,000 people in the Narmada valley if they had been built in the late 1980s, which means this figure is sure to rise by the completion dates for the dams due to the expected population growth over time. As of the early 1990s the S.S.P. will flood out 237 villages and displace 140 000 people. The Narmada Sagar has yet to be constructed (Maloney, 1990-91:7).

As is often the case mega-projects tend to be located in areas inhabited by marginalized communities and in this case a large portion of those who will have to bear the negative consequences for these dams, are members of schedule tribes or schedule Castes, who are the poorest and have the lowest

social status.[61] Approximately 60 % of the population being submerged by the Sardar Sarovar will be members of schedule tribes or castes and for the Narmada Sagar it will be 34 %. If combined nearly half (47 %) of those persons who would be adversely affected by these projects would be members of such marginalized groups (Alvares & Billorey, 1988:17). During the late 1980s, the Chairman of the Narmada Valley Development Agency (NVDA), S. C. Varma stated that these Indians would have to sacrifice for the good of the nation.

Although this may seem unpalatable to any social group in general, what makes it unjust is that the Indian Government has failed to provided adequate compensation to the displaced. Apart form the lack of available land for compensation to all those losing their farms, the tribal communities are also cheated because the plots they have cultivated over the years are 'part' of forest land which the government has continually refused to recognize their ownership. The result is that these poor tribals will not get any compensation for these lands even though they are losing the land that has been historically an integral part of their subsistence economy. In this case the Government of India is violating international law, which according to Convention 107 of the International Trade Organization, grants tribal peoples community rights over land they have traditionally occupied.

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[61] There are as many as 1000 castes and sub-castes in India. The Schedule Castes, considered as outcastes, include those with tainted occupations such as cleaning toilets, burning the dead and cobblers (approx. 16% of pop.). Outside the Hindu caste system are the Schedule Tribes or indigenous communities representing 12% of the population and they are considered menial outcastes (Union of International Associations).

By living among them, Baviskar saw first hand that the tribals dealt with this issue by acquiescing to corrupt officials and with collective protest. The 'illegality' of the forest plots or *nevads*, has fostered corruption and enabled forestry officials to extract bribes from the peasants in exchange for letting them to continue to cultivate these fields. This "unequal yet symbiotic relationship" between these two parties, allows necessary subsistence agriculture to continue. So the peasants have dealt with the issue of 'illegal' forest encroachment by accepting to pay bribes to officials in exchange for not having their forests plots confiscated. More recently, since the arrival of the *Sangath* (peasant union), their participation in collective action has begun to thwart the government's attempt to confiscate nevad lands. This new collective strength has also led peasants to stop appeasing corrupt officials and stand up for their right to forest lands (Baviskar, 1995:152-156).

The Narmada Valley Project begins to unravel irreversibly because of the tremendous problems raised by the resettlement of the evacuees. The construction of these dams could be more economically viable if the evacuees' needs could be provided for with the original financial figures proposed by the government. However these cost projections by the government, for acquiring new lands for those displaced are dramatically under estimated because the estimates of the number of people requiring resettlement and the costs of reconstruction are heroically optimistic. (For a corroborating example see page 121 in the section entitled Cost-Benefit Analysis) If this were not enough, Alvares and Billorey argue that a very high percentage of the land found for

rehabilitation is non-existent. "It has now been discovered that 90 percent of the land survey numbers presented by the Gujarat Government to the Narmada Tribunal to Prove it had land for rehabilitation are non-existent or false." (Alvares & Billorey, 1988:21) Even S. C. Varma, the former chairman of the NVDA, had to admit that most cultivable land is already being used and by 1988, government officials had begun to openly state that there is no more land for rehabilitation. There has be no study completed, that tabulates how or how many persons are adversely affected by the S.S.P..

In the University Field Staff International (UFSI) Field Staff Report, Environmental and Project Displacement of Population in India, it is reported that in India, anywhere from 15 to 20 million people have been displaced by officially sponsored development projects over the years and only around 5 million have been partially rehabilitated, there is no record on the rest.[62] In India, dams, reservoirs and canals have displaced 11 million people and of these 2.75 million have been rehabilitated, while 8.25 million had to fend for themselves without state assistance (Maloney, 1990-91:3,7). Just as the 'land for land' policy has failed so has the 'villages as villages' policy, here the government has reneged on the idea that whole villages should be relocated because it is less expensive to relocate individuals than it is communities. I could not find evidence that this "villages as villages' policy was anything more than theoretical. The limited data

[62] In this report Smithu Kothari, estimates the number of displaced persons from all projects at approximately 20 million; Fernandes and Thukral (1989) of the India Social Institute, estimate the total displaced, at 15.5 million, with only 3.95 million rehabilitated (Maloney 1990-91:3, Fernandes and Thukral 1989:80).

available shows that, 'planned' resettlement when it occurs at all, consists of transplanting individuals into existing communities. Those displaced are expected to be absorbed by their host communities. There are few longitudinal studies of those displaced and what Maloney (1990-91) makes clear is that oustees often become migrants and drift from place to place in search of agricultural, construction or seasonal work.

Displacement is a by-product of development projects and those affected are dismissed from participating in resettlement policy formation. "Little consultation of any kind takes place and halting the project is never an option that local people can chose." (Wilks & Hildyard, 1994:227) These authors rely on the findings of the World Bank's (1994) own research found in Resettlement and Development, the Bankwide Review of Projects Involving Involuntary Resettlement 1986-1993. Failure to include local participation and consultations, has caused resentment, protest and helped create organized opposition to this development scheme. Both local and international, activists and movements, have zeroed in on how poorly the Sardar Sarovar Project has dealt with human displacement. Even the World Bank's analysis in Resettlement and Development, concedes that "most relocation timetables were driven by construction timetables... rather than resettlement needs" (World Bank, 1994:5-10).

In the Sardar Sarovar Project's case, the result is that at the very most resettlement has proven to be disorganized. Many communities in the submergence zone, only learnt about the S.S.P. when eviction notices were

posted in their villages. People were sometimes given only a few days to prepare for displacement and even if they were given more advanced warnings, challenging their evictions or the project itself was beyond the capabilities for most peasant tribals. The reservoir would eventually flood their fields, forests and homes and those affected would have to relocate to other states such as Gujarat. It is very dubious that most of the land promised to these oustees will be given to them because it has yet to be found.[63] Some peasants have been 'compensated' with monetary sums for their losses in property, but their lands are regularly undervalued, while new lands they are expected to purchase on their own after relocation, are overvalued. The end result is that those affected by displacement will endure a downgrading of their living standard. Even the World Bank states in its study on resettlement by the Operations Evaluation Department, that for India the record was poor (World Bank, 1993:3).

Displacement affects society indirectly as well. The economy is disrupted, families and communities are scattered and local organizations are dismantled because of displacement. Production networks and economic links are severed as individuals are involuntarily dispersed. Long enduring communities are broken up and cultural and ancestral identity is lost as ties to the past are forcibly abandoned. As studies in India and elsewhere in developing societies indicate, (Hassan, 1996: 134-144) social networks are an important aspect of daily subsistence. All these studies as well as the report World Bank,

[63] The landless or those not holding legal title to land such as forest fields, are not provided with compensation.

Resettlement and Development 1994, recognize that mutual support, child care, savings clubs, job hunting loans and many other social institutions as well are the most important sense of security they have. The suffering of these victims is difficult to quantify, but it is undeniable. "Informal social networks that are part of daily sustenance systems - providing mutual help in childcare, food security, revenue transfers, labour exchange and other basic sources of socio-economic support - collapse because of territorial dispersion." (World Bank, 1994:iii-iv) The net result of such 'indirect' effects caused by displacement, is that the society is torn apart.

The Project's Impact on Forest Subsistence

Tribal communities make up 7.5 % of the total population of India and approximately 82 % of the tribal populations live in the central and western parts of the country. This is the region that the Narmada Valley development scheme is scheduled to be constructed. Three states in this region will be directly affected by the mega-projects and each has a large population of tribals, 12,000,000 in Madhya Pradesh, 5,800,000 in Maharashtra and 4,800,000 in Gujarat[64] (Maheshwari, 1990:32). Most of the tribal populations are resource poor farmers who supplement their subsistence farming with other activities. Their farmland alone cannot provide enough to sustain them, so many tribals cultivate forest plots called 'nevads' (Baviskar, 1995:149). The forest has always

[64] From 1981 census figures.

been a substantial source of food, medicine and construction materials and is an integral part of the tribal economy. For these peasants, forests are viewed in an economic light, not in an ecological one and so their relationship with the forest may not be what we would come to expect.

Table 3.2 : Total Area to be Submerged by Narmada Dams

Project	Total submergence (hectares)	Forest (hectares)	Agricultural Land (hectares)	No. of Villages
Sardar Sarovar	39 134	13 744	11 318	234
Narmada Sagar	91 348	40 332	44 363	254

Source: Narmada Project Authority, *project reports*, in Alvares & Billorey, 1988

Access to forest resources enables these peasant communities to survive, however, as the market economy (as well as the Forest Department) continues to encroach onto communal forests, the tribals' utilization of the forest is increasingly restricted. To fully understand what effect these multipurpose-purpose projects will have on the local inhabitants, I must examine both the ecology and the economy of the Narmada Valley basin.

Forests cover areas in each of the three states involved in the Narmada Valley Project and all sources concede that approximately 55 000 hectares will be flooded by both the S.S.P. and N.S.P. The reservoir for the Sardar Sarovar will submerge 13 385 hectares of forest and the Narmada Sagar will submerge

40 332 hectares, for an approximate total of 55 000 hectares (Paranjpye, 1990a:135). The sources I examined did not describe the total size of the forests found in these states and details referring to the forests in the region alluded to them being overused and in poor shape. Evidence did point to the fact that large scale erosion of forest resources had occurred overtime in all of India. Maheshwari (1990), mentions that through satellite imagery, the National Remote Sensing Agency in Hyderabad, conducted an examination of India's forests. They discovered that 161 000 hectares of forests were lost each year to human-made causes, mainly logging and a faster cycle of shifting agriculture (Maheshwari, 1990:37).

Such depletion threatens the economic development of peasant tribals. Like most cases the most productive farm land lies on the valley floor and those farmers who own these lands, tend to be better off.[65] At higher elevations further up the mountainsides, the land gets less productive and it is where we find the poorer tribal peasants. They busy themselves with subsistence farming and can also be described as *resource-poor* farmers[66] (Elliott, 1994:69). They do not rely solely on their marginal plots of land to survive, they utilize almost every aspect of their environmental surroundings and their economy includes the rivers and the forests too.

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[65] Admittedly there are wealthy farmers with large land holdings, especially in the Nimar region, but not all farmers on the plains have large farms.

[66] One quarter of the World's population are dependent on this type of agriculture for their livelihoods; they are amongst the world's poorest people and they live in the world's most highly vulnerable ecological areas (Elliott, 1994:69).

The forest contributes a great deal to their subsistence economy, especially when it is realized that a family could not be able to feed itself from (non-forest) farm fields alone. While forest plots ensure a greater supply of agricultural produce, the forest in its natural state, provides a wide range of 'products' vital to the peasant economy. It is a source of fodder for their animals and provides fiber (for rope), building material, fruit and other forest produce. Indispensable to the lives of all peasant communities, is fuel wood and it is the forest which supplies them with this valuable source of energy used for cooking and heating. The peasants also rely on forests to provide them with essential medicines, which they harvest from the diverse forest plant life. Clearly, forests play an integral role in the subsistence economy of these peasant farmers, so much so that, " the National commission on Agriculture held that MFP (minor forest produce) possesses the potential of an economic revolution among tribals" (Maheshwari, 1990:36).

This essential function of the forest to the peasants in the Narmada valley, was one of the major underlying concerns of local people surrounding the forest of Mandal, near the village of Gopeshwar, Uttar Pradesh. These concerns helped give rise to the Chipko movement, who's intentions were to save the forest from loggers and unexpectedly focused global attention on this environmental crisis in the Himalaya. Subsequently this popular protest movement to save the forest, spread to other parts of India, such as the Reni forest of the Chamoli district, Uttar Pradesh (Guha 1989:152-179, Bandyopadhayay 1992:266-270).

In the Chipko case it was discovered that women had (and continue to have) a great interest in defending and restoring forests (Dankelman & Davidson, 1988:48). This had been overlooked by officials who failed to see that women's work in these areas, was more intimately connected to the forests and the forest ecology played an important role in the lives of these peasants. For instance women collected fruits and plants from the forest, but they also gathered valuable fuel wood for their cooking needs. When these forests were confronted by increasing commercial destruction women protested and resisted both commercial and government agents, because they saw the connection between this destructive behaviour and their families survival. Previous logging had not only made fuel wood harder to find, making women's work more arduous, but it triggered mud slides, which resulted in the destruction of villages and loss of life. The women directly suffered from such natural disasters caused by commercial logging, because they (mud slides) ruined their agricultural fields. These Destructive forestry practices gave rise to protests which created the Chipko Andolan movement. This movement has become famous in international environmentalist circles as the 'hug a tree movement' (Guha 1989, Bandyopadhayay 1992, Rich 1994:152, Sachs 1993:51, Sen 1992:108) and it seems that the N.B.A (Save the Narmada Movement) is following a similar path.

With their increased marginalization, these tribals in the Narmada valley are using the forest to a greater extent, to meet their everyday needs. They do not attempt to conserve the forest in any manner and extract as many resources they see fit to use. This unsustainable use of the forest has caused much

environmental degradation and has caused the Forest Department to accuse these users of being the main perpetrators of the ecological destruction. Although tribals are willfully engaged in this 'forest economy', to attribute all ecological pressure on their economic behavior is simplistic.

History in these forests has shown that the Forest Department has had a significant role in forest degradation (see Baviskar, 1995 chp.6). While the peasants' use of the forest is considered inimical to environmental conservation, the Forest Department's use as a source of commercial lumber, is not. The tribals rights to the forest have been reduced to 'concessions' and they are barred from encroaching into the forest to cultivate new land, while commercial logging continues. The current practice of forest cultivation is leading to increased degradation, yet there are solutions which could turn this around. The same way squatters in developing world shanty towns are reluctant to invest in their homes and neighbourhoods, for fear of losing it all once evicted, neved farmers avoid investing in their forest plots because of the same risk. By granting peasants title to these lands it would remove the current state of insecurity and would encourage them to invest in land improvement and forest conservation. Ownership would give tribals a stake in the survival of their local environment, and they could now consider more long term strategies.

While it is still illegal for these peasants to use the forest, their economic circumstances forces them to continue. Baviskar's fieldwork has shown they have a deep respect for nature but this has not evolved into a conservationist ethic as we may have been led to believe by some environmentalists. "They act

as if the natural resources at their command are undiminishing." (Baviskar, 1995:168) In order to survive economically, even at a subsistence level, tribals have no choice but to act unsustainably. Long term perspectives have little meaning, all that matters is present subsistence.[67] While tribals have a great deal of indigenous knowledge about nature, this does not automatically enable them to cope with an ever deteriorating environmental base. Their marginalization and increasing ecological degradation constrains their actions. However their knowledge can be usefully employed for conservation in the light of more participatory intervention.

The peasants act in their short term interests, even though this is inimical to their long term survival. Can this situation be applied to India, on a grander scale ? Is not India pursuing industrial development in order to appease short term demands, placed on it by the global economy? The 'Industrialize or perish' philosophy is actually squandering valuable resources of the nation, as it turns away from the more indigenous ideology put forward by Gandhi. Reviving the village economy would be a more sustainable approach toward development, yet political and economic constraints limit India's immediate decision making and practices. If both the peasants in the Narmada Valley and India itself were not pressured by external realities, they could no doubt avoid their unsustainable practices.

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[67] It seemed to me that their 'irrational' behavior, seemed to mimic the behavior of developing countries. Many developing countries pursue environmental destructive development due to external economic pressures, like foreign debt. In order to service their debt they mortgage their ecological future.

Another parallel between tribals on the ground and India in the world economy occurs with environmental protection, in that both perceive it as an economic disincentive. At times the Forest Department attempts to impose conservation by cracking down on 'illegal' encroachment, in the name of environmental protection (Baviskar, 1995:151-152). Restricting peasant access to forest resources imposes hardships on people and it becomes clear environmental protection is a high cost for peasants to bear in the short term. Although such forest conservation would benefit them in the long term, being an essential part of their economy, they cannot survive without access to the forest. So under these circumstances environmental conservation is seen as an immediate threat to their survival.

The nation's view of environmental protection parallels what is found in the local forest economies. India is suspicious of environmental conservation and describes it as just another method of Western imperialism, used to deny developing countries the avenues to growth. Although developed countries are beginning to show concern over environmental issues such as global warming, they have yet to demonstrate that they are prepared to finance sustainable practices in the developing world (see Soto, 1992). Therefore, denying access to unbridled industrialization with the imposition of (local and international) environmental protection, is seen as a threat to development. But for both the peasant tribals and India, the continuation of current practices will result in environmental and economic collapse. Short sighted policy aimed at immediate returns will impose a crushing cost on India's future populations.

Participation, Protest and Politics

Some if not most communities in the Narmada valley only learned they were affected by the reservoirs when eviction notices were posted in their villages (see Maloney, 1990-91, Baviskar, 1995, Esteva & Prakash, 1992).[68] This reflects the lack of community participation in the Sardar Sarovar Project. The State with the help of the World Bank, has gone ahead and started construction on a project that adversely affects hundreds of thousands of people, without inviting them to even express their points of view. In time activists in *sangaths* (unions), environmental groups and *Andolans* (social movements) began to coordinate their opposition against the dam. Resistance towards the mega-project has been led by the Narmada Bachao Andolan (Save the Narmada Movement), this movement is a coalition comprised of human rights activists, oustees, environmentalists and scientists, from all over India (Esteva and Prakash, 1992:47). The Narmada Bachao Andolan (NBA), has mobilized many of the individuals affected, into speaking out and protesting against the injustice of the S.S.P.. To successfully develop effective grassroots opposition to the dam, the NBA had to educate tribals and other farmers about their rights

[68] No sources could cite the exact number of villages, that had not been informed, but an independent survey in 1986 concluded that numerous villages had not been visited (Maloney, 1990-91:7). In the area and village in which Baviskar (1995) was conducting her field work, no officials came to notify people of the impending submergence or to issue Land Acquisition notices (Baviskar, 1995:201). The Narmada Bachao Andolan, an alliance of Indian: oustees, scientists, environmentalists and human rights activists, claim that most villagers have not been informed of possible submergence (Esteva & Prakash, 1992:46).

concerning development. Learning they had the right to oppose this project was as much of a revelation to the peasants as anything else they learned. The movement also fostered links with NGOs, both national and international, which enabled it to spread it message and gain vital international allies and support: support which the Indian Government and the World Bank fear.

The struggle in the Narmada valley may be viewed as an example of the resistance of indigenous cultural communities towards development. It is also claimed that tribal peasants are sustainable managers of their ecology for being able to live on the ecological margins of society in relative isolation, throughout their history. This is an oversimplification of the actual economic behavior of these tribals. Such claims, by intellectuals and environmentalists are not entirely accurate. Although the tribal economy is not always in balance with nature despite what environmentalists preach, its negative impact is far less than the mega project. [69] Nonetheless, regardless of accuracy such claims have been adopted as an effective tactical ploy to present a desired picture to the media.

Shaping media representation by focusing attention on the tribals helps to put a more favorable spin on sustainable development. The NBA's awareness of the value of international media has made them media savvy, the manipulation of the media is accepted as necessary and effective strategy. Stopping the dam overrides, all other issues, like class conflict. Both upper and lower class farmers feel threatened by the dam's reservoir. Many wealthy

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[69] Although tribal peasants have engaged in unsound environmental and economic behavior, the reasons for the deterioration of the physical environment also relate to the state's prior environmental mismanagement (Baviskar 1995).

farmers who practice unsustainable mechanized agriculture in Nimar (a plains region in the valley), will also be submerged by the reservoir. Their model of agriculture is opposed by these same environmentalists, yet they are sidelined in the debate conducted through the media. The NBA has decided to showcase the plight of the tribals and hold them up as the model of sustainability, while it downplays their environmentally destructive methods and the presence of unsustainable farmers on the plains, even though the plains population make up two-thirds of the population displaced by the dam (Baviskar, 1995:221). Both the hill populations and the plains populations will be adversely affected by the dam and it has been decided among them and the NBA, that cooperation in fighting the dam is paramount. These two constituencies have been united around the issue of displacement and all other issues are secondary. Does this leave them open to criticism or should they concentrate their energies this way, tackling 'one disaster at a time'?

The NBA challenges the belief that the project benefits the national interest and has stated that the benefits of the S.P.P. will go to the dominant classes, while the ecological and social costs will fall on the poor. "While raising questions about social justice and ecological sustainability, the andolan challenges this ideology of development which inspires projects such as the Sardar Sarovar." (Baviskar, 1995:222) The response by the state to such a challenge has been authoritarian and violent. Now it is the Indian BJP Government, who believes that any opposition to its ideology concerning

development, is anti-national and anti-development.[70] State governments and their ruling classes will not tolerate protest or 'deviant' ideology and any opposition is turned into a 'law and order' problem. The state engages in repression (harassment, arrests, police terror, beatings, assassination, gang rape, torture, etc....) to crush the opposition against the Sardar Sarovar project (Sangvai, 1991:2265-2267).

The NBA's continued grassroots opposition and logistic capability has increased with links to outside NGOs, like Friends of the Earth (Japan). Attempts have been made to discredit them because protesters state that, India's government is a puppet of national and international capital.[71] They argue that the supporters of the dams misrepresent the true economic, environmental and social costs of the project. The Japanese government has canceled its financial assistance to the Narmada project concluding that, "even under heroic assumptions... ...(the S.S.P.) is environmentally destructive and uneconomic" (Esteva and Prakash, 1992:48). Such events have no doubt raised the level of the state's fear of people's movements, while at the same time they have cultivated hope among grassroots activists.

The people's movement has also played a role in bringing out the facts. Their participation has uncovered the true state of rehabilitation, the level of

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[70] Protest was waged against the Congress Party government and continues against the BJP government. Both governments engage(d) in repression.

[71] I think this is too simplistic, like most developing nations. India must succumb to powerful foreign economic pressures which give it little room to maneuver. Foreign debt, international trade and the need to raise foreign currency can lead to the same environmentally destructive behavior.

fraud and suppression of known facts. The public was not given accurate information, the only institution that was provided with more realistic figures was the World Bank. In 1989 Gujarat government even tried to invoke the Official Secrets Act, in order to prevent the spread of information[72] (Maloney, 1990-91:7). Ironically such an act enhances the credibility of the opposition and environmentalists, because government figures become questionable if they are kept hidden. Why would the government deny access to its very own analysis of the benefits to the public?

Even after several reviews, the estimate of the total number affected by the project is still not complete. More damming is the fact that there is not enough land to settle the oustees and to this day, there is no operable plan ready for resettlement. Most information was suppressed in order to get clearance for the project. By 1989, " S. C. Varma, the head of the Narmada Valley Development Authority in Madhya Pradesh resigned, publicly stating that he doubted that the government would ever be able to properly resettle and rehabilitate the oustees." (Rich, 1989:48)

[72] In April 1994, the World Bank published a Review of Resettlement, a damming report on the S.S.P., in July 1994, the report is sealed by court order. By December 1994 the Supreme Court of India ordered it to be opened and made public (International Rivers Network, 1995).

The World Bank and Transnational Influences

To examine this case study and the actions of the individuals involved and not include the participation of outside actors would be misleading. International influences shape the policies and practices on all nations and the influence of the World Bank on India and other developing nations are ever present. India is the World Bank's biggest borrower and by 1992 it had accrued a foreign debt of $74 billion (including IMF loans) (Chossudovsky 1992:271, Rich 1994:254). The World Bank's initial 1985 loan of $ 450 million, for the Sardar Sarovar dam was crucial to the birth of this controversial mega-project. The loan was granted before any environmental clearance or impact assessment was conducted by either India or the Bank itself. Besides the negligence and general disorganization of those favouring the project, the bank and the Indian government failed to consult local communities about displacement and rehabilitation, which violated the loan agreement (Rich, 1989:49). Even to this day there has still not been a comprehensive study.

The World Bank has a policy on involuntary displacement and its guidelines describe four basic requirements: one, surveys of the affected people have to be conducted; two, a resettlement plan for the purpose of restoring lost incomes must be implemented; three, Timetables for resettlement have to be coordinated with civil works construction; four, a budget for resettlement has to be included in the project (Wilks & Hildyard, 1994:225-226). Not only are these requirements systematically ignored, according to the bank's own internal

reviews, but the World Bank suffers from chronic miscalculation. If we examine its track record over the years we find the Bank regularly underestimates the number of people evicted from its development schemes by about half. In the World Bank's own review it describes how between 1986 and 1993, "the Bank underestimated the numbers affected by its projects by 47 percent, some 625 000 people" (Wilks & Hildyard 1994:226, World Bank 1994). These 'miscalculations' reduced the economic viability of many projects, with delays, actual compensation required, cost overruns and other problems. Resettlement and Development even warns that "failing to account adequately for resettlement can exaggerate a project's attractiveness and, in extreme cases, can encourage economically marginal projects to proceed when alternative investments would have been superior." (Wilks & Hildyard, 1994:228) This means that the Bank's practices, whether intentional or not, contribute to the creation and implementation of economically non-viable development projects.

The World Bank has evolved into the largest and most powerful organization involved in the capitalist global economy (see George & Sabelli 1994). It continually pushes the market economy into every corner of the world, as it provides mammoth loans to client nations. Over the years $ 9.1 billion have been loaned to India for energy development, making energy loans the Bank's second largest sector loans (George & Sabelli, 1994:167).

The nature and everyday practices of the Bank, as an organization, have compelled its officers into granting larger and larger loans, in order for them to seem 'productive'. Smaller more precisely targeted loans are frowned upon, by a

bank which is not set up to recognize or pursue such schemes (George &Sabelli 1994:164, World Bank 1992:iii). As most managers would rather work on one mega-project than several small scale projects, once again we find gigantism to be the central development philosophy (George & Sabelli, 1994:120-123, Shapley 1993:532-533). The ideology of the World Bank, pressures its officials and recipient governments towards huge loans and mega-development projects (Rich 1994:183, Wapenhans 1992). The bank lends billions of dollars to developing countries every year and millions of people are evicted. Dams account for 63 % of World Bank funded projects that are responsible for displacement and there has been growing concern on this trend (Wilks and Hildyard, 1994:225).

While there is a claim that the Bank has been stung by criticism and has made moves towards a greening of its development aid, the example of the Sardar Sarovar supports this is far from reality. After years of protest and criticism, the bank commissioned an unprecedented independent review of the project by Bradford Morse and Thomas Berger. They concluded the project was a disaster, yet the World Bank's board voted to continue funding. All those directors who voted against the S.S.P., were members of developed nations, while India and all other developing nations voted in favour of the loans. "Throughout the lifetime of the project the government of India was an enthusiastic and deliberate accomplice to the Bank." (George & Sabelli, 1994:178) Mounting evidence and international pressure convinced India to request a halt to further funding of the project and the Bank stopped the direct

funding for the dam. Prior to this declaration by India, the Bank increased non-specific development assistance to India's government to circumvent any delays and to compensate India for the loss of funding. George and Sabelli (1994), note that the Bank rushed through a $400 million loan to the Indian Thermal Power Corporation and that a total of, "$2.7 billion worth of loans to India (were) approved in fiscal 1993, up by a comfortable $487 million (22%) over the previous year." (George & Sabelli 1994:179-180, Asian Wall Street Journal 1993)

The Bank's mind set dismisses environmentalists as anti-growth (economically) and promotes conventional development. The World Bank's official historian, Mr. Webb, stressed that environmentalists did not recognize or accept the 'traditional forms of quantification'. The Bank's economic philosophy of crediting zero value to the environment, is rejected by environmentalists and is contrary to what I propose in my thesis. Economic calculations cannot reflect reality, so long as they ignore long term environmental costs. So, conventional economic philosophy (which the Bank shares) ends up justifying many development projects by taking a short term view on economic growth and development. It becomes apparent, that contrary to how they are described, many environmentalists are not anti-growth, they simply insist on looking at the long run (George & Sabelli, 1994:162).

Cost-Benefit Analysis

At the present time there is an ongoing debate in the development community and particularly among environmentalists whether or not to accept the notion of cost/benefit analysis. Some argue (Stirling 1993, Waring 1988) this demonstrates that the discipline of economics has once again infiltrated and co-opted another avenue of evaluation. These academics or environmentalists (ecologically centered approach) reject this commodification of the environment and see it as evidence that capitalist economic analysis has too much influence over development policies. By submitting to such cost/benefit analysis the environment is subjugated, becoming just another commodity. However, after a closer examination of the recent history of cost/benefit analysis, it will become amply clear that the 'makers' of these economic equations have consistently failed to factor in the total environmental cost of most projects as I have already discussed in Chapter 2. Failure to include <u>all</u> such costs has resulted in the acceptance of a string of economically non-viable development projects throughout the world.

If project developers would factor in environmental and human costs, governments would be better able to avoid uneconomic schemes in favour of those projects which are cost affective. Development schemes which could pass this type of cost benefit analysis, would be sustainable and be a true long term benefit to the nation. In the case of India, with its Sardar Sarovar and Narmada Sagar multipurpose dams, the failure of the NVDA and the Indian Government to

evaluate these projects with the type of analysis I propose, has caused needless suffering and wasted valuable resources of the nation on an unsustainable scheme.

In order to evaluate if a project is an economic benefit to the nation, the Indian Planning Commission decided that the cost/benefit ratio of any development project must have a ratio of 1 : 1.5. This means that for every one rupee spent by the Indian Government in any development project, there must be a return of 1.5 rupees to the state. If this ratio could be achieved, than any project would be considered profitable and viable. This in itself is not the problem, what is, is that those responsible for calculating the ratio have excluded the very environmental costs I suggest be included. What gets to be included in the analysis has a direct effect on the ratio and in this case officials have excluded or downplayed many of the costs, while vastly overestimating the benefits. (I have already discussed the issues of politics and fraud in a previous section) At this point I will only add, that there was a conscious attempt by the government to ensure a minimum ratio of 1.5 (Alvares and Billorey, 1988:46). In the case of catchment area treatment and command area development in the valley, the expense is put at Rs 24.98 crore, although the cost of treatment is not less than Rs 550 crore (1 crore = 10 million). The social costs due to human resettlement are also downplayed by declaring only 16,000 families need resettlement, even though the DOE & F maintains that 34,000 families will be displaced (approximately 170,000 people), which could cost another Rs 500 crore. The NVDA's calculations concerning the resettlement of displaced

persons are inaccurate. The clearest way to discredit their estimated costs required for resettlement, is to examine the expenses incurred in providing housing for the 5 000 staff members working on the SSP site, Rs 33 crore, "which is more than what has been allotted for the permanent resettlement of the 100,000 people displaced by the same dam"[73] (Alvares & Billorey, 1988:20). Even afforestation is underestimated, planting trees in 97,000 hectares of degraded forest land will cost about Rs 700 crore (Alvares & Bilrorey, 1988:47).

In the Narmada Sagar project, the cost-benefit ratio has been revised three times without any clear economic or scientific method for doing so. Initially, only annual benefits and annual costs were calculated, for a ratio of 1.88 in 1982. A second analysis of 1.74 in 1984, once again failed to " include environmental costs and excluded the capital costs of constructing the dam" (A & B, 1988:46). The submerged agricultural production was undervalued and the post-project production was over estimated by a factor of six. More disturbing is that the figures found in the appendix of this second analysis, produced an actual ratio of 1.52. However, it was only after the DOE & F calculated the environmental costs involved with these projects, that the government has shown how casual it was in calculating its third reevaluation of the figures.

The government's own department of Environment and Forests has estimated the environmental cost at 400,000 million rupees (approx $ 20 billion), 300,000 million rupees for the Narmada Sagar and 100,000 million rupees for

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[73] The total of Rs33 crore includes the cost of buildings, air-conditioned rest houses and circuit bungalows, as well as the cost of building roads, supplying electricity and setting up a communications network.

the Sardar Sarovar. The information from the DOE & F did not provide me with much detail but according to Raj Kumar Sen (1992), this figure is an estimate of the irreversible environmental cost due to the loss of forests (Sen, 1992:118). Other sources have also attempted to calculate the value of the forests, the National Forest Research Institute, Dehradun, gives a value of 12 674 000 rupees over a span of fifty years, for one square hectare of forest. "This is based on the role of forests in climate, pollution, soil conservation, water cycling and habitat." (Singh, 1990:197) From such an evaluation I have calculated the cost for the approximately 54 000 hectares to be submerged at roughly 680 000 million rupees.

It is now likely that to overcome these economically damaging figures the NVDA came up with entirely new benefits to justify the projects. A benefit of 170,000 million rupees (approx.$10 billion) has been added, because they are constructing a hydroelectric dam instead of a thermal plant. There is no rationale for such an irrelevant calculation, yet it is added on as a 'savings'. To further illustrate this point, imagine if I purchase a Rolls Royce instead of a Mercedes and I subtract the 'savings' (from not buying the Mercedes), from the cost of the Rolls. Such accounting procedures are technically described as 'cooking up the books'. In other instances the NVDA engages in double counting, as when it included 130,000 million rupees in direct revenue from electric power and then repeated this as 144,441 million rupees in 'increased industrial production'. Admittedly there are benefits created but they can not be included twice, at the

front end as 'sold' and at the back end as electricity 'bought' or used. "Thus about Rs 310,000 million (approx. $ 17 billion) are shown without any justification, to bring the sum total to Rs 500,000 million and retain the cost-benefit ratio of 1.5 !" (A&B, 1987:72)

Illustrated in Tables 3.3 & 3.4, Alvares and Billorey (1988), made their own calculations using internal documents and help from economists, officials and engineers. The tables provide us with a more comprehensive comparison of the costs (construction, social, area treatment, etc.), with actual benefits. Excluding environmental costs, Table 3.3, indicates a cost of Rs 34.5 billion and a benefit of Rs 6 billion for the Narmada Sagar; Table 3.4, indicates a cost of Rs 139 billion and a benefit of Rs 53.2 billion for the Sardar Sarovar. The cost-benefit ratio for the NSP was 1 : 0.17, while that for the SSP was 1 : 0.38, far less than the desired minimum of 1 : 1.5. Even such pessimistic results seem conservative when compared to further calculations which factor in all possible environmental costs. If the environmental costs presented by the DOE & F were included into the calculations as in Table 3.5, then the ratio for the N.S.P. would fall to a staggering 1 : 0.017 and the S.S.P. to 1 : 0.24. Only through manipulation and 'cooking up' of fraudulent figures could the ratios arrive anywhere near 1 : 1.5 for the N.S.P. and 1 : 1.84 for the S.S.P. (A & B, 1988:49).

Table 3.3: Narmada Sagar: Costs and Benefits

COSTS	Billion Rupees
1. Dam (units I=II=III)	15
2. Land Acquisition and Rehabilitation	7
3. Catchment Area Treatment	3
4. Command Area Development	2.5
5. Compensatory Afforestation	7
Total	34.5
BENEFITS	
1. Revenue from Power	3
2. Irrigation: Increased Produce	2.5
3. Non-agricultural use of water	0.5
Total	6

BC Ratio $\frac{6}{34.5} = 0.17$

source: Alvares & Billorey, 1988

Table 3.4: Sardar Sarovar: Costs and Benefits

COSTS	Billion Rupees
1. Dam (Unit I=II=II)	120
2. Land Acquisition and Rehabilitation	5
3. Catchment Area Treatment	2.5
4. Command Area Development	9
5. Compensatory Afforestation	2.5
Total	139
BENEFITS	
1. Revenue from Power (35 yrs.)	10.6
2. Irrigation: Increased Production	41.6
3. Non-agricultural use of water	1
Total	53.2

BC Ratio $\frac{53.2}{139} = 0.38$

Source: Alvares & Billorey, 1988

Table 3.5: BC Ratio & Environmental Costs

Project	Cost (billion Rs)	Benefit (billion Rs)	BC Ratio
Narmada Sagar	343.7	6	0.017
Sardar Sarovar	220.9	53.2	0.24
Total	564.6	59.2	
Average BC Ratio			0.13

Source: Alvares & Billorey, 1988

Alternatives

Though the government maintains there are no alternative schemes, the opposition points out there are alternatives available to India, to avoid the negative consequences that would be brought on by these two mega-dams. Three alternatives have been suggested and discussed: reducing the height of dams, lift irrigation, and reliance on small scale reservoirs. These alternatives become even more feasible and attractive when it is noted that over the long run the dams will not provide their projected amount of energy or irrigation (see Table 3.1, in previous section for generated energy; see also Damming the Narmada 1988). The actual benefit from the projects makes them less appealing economically, and much easier to substitute with less destructive schemes. The environmental damage and human dislocation required for such comparatively

small gains in power and irrigation should make less destructive alternatives attractive.

Reducing the height of both dams will avoid a tremendous amount of environmental degradation and human suffering. If the height of the Narmada Sagar (yet to be built) was reduced from 860 to 814 feet, it would mean less water would have to be impounded in the reservoir. In result, thousands of hectares of forest and farmland would be spared from submergence and so would hundreds of thousands of people. The latest height of the Sardar Sarovar reported by the Narmada Bachao Andolan in October 1995, is 80.3 meters. If its proposed height were reduced to 126 meters instead of 136.5 meters, then 90 % of the population and 80 % of the agricultural land would be saved from submergence while no adverse affects would be imposed on irrigation. In 1987 S. C. Varma, chairman of the N.V.D.A., was interviewed by R. Billorey and S. Sarangi, a development journalist who asked,

" It is understood that if we were to reduce the Full Reservoir Level (FRL) of the Narmada Sagar from 860 feet to 814 feet, the number of people to be affected by submergence will be reduced to about 20,000 (people) from 77 villages instead of the present estimate of 200,000 from 254 villages. The area of forest submerged will be reduced to 8,075 hectares instead of 40,332 hectares and the total submergence of land will be just 35,628 hectares instead of 91,348 hectares. Thus 90 % of the oustees, and 80 % of the forest and 60 % of the total area can be saved from submergence by the Narmada Sagar Reservoir. Likewise, if the height of the Sardar Sarovar were reduced from 455 feet to 420 feet this will save 90 % of the people and 80 % agricultural land submergence by the Sardar Sarovar. Moreover this reduction in height will not affect irrigation in any way. So why isn't it done?"

To this S. C. Varma answered, " We are not going to discuss with you any reduction in height." (Alvarese & Billorey, 1988:80)

In fact when it comes to irrigation, the type proposed by these projects (canal irrigation) is highly inefficient and more expensive than other suggested alternatives. One less expensive alternative is lift irrigation, where the cost of

irrigation per hectare is Rs 10 000, while it stands at least Rs 25 850 for canal irrigation which still fails to include costs like command area development and catchment area treatment.

Another issue which must be addressed is that most of the already constructed irrigation schemes in India are underutilized, projects continually supply more water than there is demand. So to construct even more unneeded irrigation potential is a wasteful allocation of the nation's resources. When confronted by the widespread under-utilization of available irrigation in the country, S. C. Varma answered, "that is unutilized because people are not utilizing the water" (A & B, 1988:81).

Admittedly the one negative effect of lowering the dam height for the N.S. is that over the long run the generation of firm power would become 22 MW instead of 118 MW (A&B, 1988:114). This is where S. C. Varma and India stand together firmly, in their quest for electrical power. The desire to industrialize and the increasing consumer demand from urban areas will have to be met. Where will the nation get power, if not from these mega-projects? Traditional development policies see low cost power as a precondition to industrialization. But in most industries power is not the major contributor to production costs. In many developing countries urban consumers demand low cost power and it is the rural populations who subsidize urban electricity. In India the projected demand for power will mean that energy production will have to double over the next decade (Mikesell, 1992:60).

Before finding alternative sources of power, we should consider the quantity of power actually produced (500 MW) by these two colossal dams. How can India produced these 500 MW? Coal and other thermal power plants produce a large amount of pollution and nuclear power poses problems with long term waste disposal. Some agree that the best alternative is small-scale hydroelectric dams. "Small hydro-power also remains largely untapped. By 1980 India had an installed capacity of 220 MW from small-hydro, even though there exists a potential of about 2000 MW in the hilly regions..." (Paranjpye, 1990a:58). They provide power without the need for massive reservoirs and they tend to benefit local economies. Small dams can also be built for irrigation and evidence suggests that small-scale single-purpose projects, fair better that multipurpose schemes (Alvares & Billorey Damming the Narmada 1988, V. Paranjpye High Dams on the Narmada 1990, A.K. Singh Large Dams on the Narmada 1990). History has shown, that in China roughly 40 % of rural townships get their electric power from small scale hydroelectric dams (Paranjpye, 1990a:58).

Research by the Madras Institute of Development Studies has shown that a series of small dams are more efficient and can utilize 90 % of a river's water. Micro-hydroelectric schemes are also less expensive because they require less financial investment and operating costs are lower since they don't have to deal with significant transmission losses. Minor dams are less complicated and in the case of India or China, can be constructed (if not completely financed) by these countries themselves. They posses the necessary technology and expertise for

such projects. However, difficulties may arise in securing foreign funding for these minor projects, because they do not elicit the same enthusiasm from lending agencies like the World Bank (see previous section).

For the submerged population, many can be absorbed by nearby villages if not the same village. Those affected also benefit because the dams are set up to serve the local area, not to provide power to distant urban centers. Benefits and costs are borne by the same people and environment. These types of small scale projects require decentralized management and the participation of local people. These alternatives are efficient, less costly and practical, the obstacle to small-scale projects is Indian politics and foreign finance.

The price of electricity must be set to include the full social and environmental costs in its production, which would lead to better resource allocation and decision-making. Other measures could include investment in more energy-efficient industrial equipment, consumer appliances and technologies, all of which are less costly than constructing power plants to generate an equivalent amount of electricity.

Summary

The Sardar Sarovar and the Narmada Sagar dams, are predicted to provide benefits in the form of irrigation and electricity. Although the figures are disputed, supporters of the dams described the benefits which would flow from these development projects in the form of electrical energy and irrigation. Most

importantly these development projects could provided drinking water, irrigation and electric power to 40 million people, and hope to bring improved prosperity into the region. It was designed to provide almost 2500 (installed) megawatts of valuable electricity which is required by the industrial sector for manufacturing, as well as supply water to cities and communities, and provide irrigation to drought prone areas. It was suggested that the Narmada Valley Project could have other projected benefits as well, the dams will moderate flooding, improve navigation, increase pisciculture and create new recreation facilities. However, supporters have been slow to recognized and evaluate the environmental and social costs generated by this development scheme.

Critics charge that the costs of the Narmada Valley Project (NVP) exceed all of the possible benefits. The NVP will create tremendous environmental and social costs, directly or indirectly. It will submerge approximately 130 482 hectares of land inflicting a great environmental impact on the valley as forests, farmland and animals are lost. The supposed benefits from the dams may lead to salinization and soil degradation while the reservoir may induce earthquakes. The social costs brought on by this development project proved just as daunting, when it was uncovered that the submergence of about 500 villages and the displacement of approximately 270 000 people in the Narmada Valley will cause massive economic, social and cultural disruption. Furthermore, the unfair nature of resettlement in this case is raised as public participation and consultation is dismissed and it is questionable if any adequate compensation for those displaced will be forthcoming.

An improved environmental/social cost-benefit analysis of the Narmada Valley Project, provides India with a more accurate accounting of the cost involved. This more comprehensive analysis no longer separates direct and indirect costs and uses sustainable human development as its framework. It is therefore of little surprise that project developers have been slow to utilize such a framework, where negative impacts to forest subsistence or even an increase in water borne disease would find a place in this development project's economic calculations. When the major environmental and resettlement costs are factored into the government's analysis the project, its viability is put into question and this should raise the attraction to possible alternatives.

Although developing countries like India may judge environmental accounting not to be economically feasible in the short term, my analysis in this chapter gives support to the idea that in the long tern green accounting could be beneficial. If both social and environmental accounting methods would have been utilized in the initial stages of the Narmada development schemes, then the poor economic viability and ecological sustainability of these mega-projects would have been known before hand. Wasteful spending would have been avoided and massive human costs would not have been suffered. By internalizing all impacts brought on by development activities a more accurate cost-benefit analysis can be made. An environmental/social analysis would have uncovered the ecological and human implications of the development project at the policy formulation stage and not during construction. It is to the advantage of developing countries like India, that projects and programs be evaluated in terms

of their full economic, ecological and social cost, even though they may experience immediate economic disincentives. Conventional economic cost-benefit analysis, misrepresents the true cost to the Indian economy for this project, a cost which a nation like India will inevitably have to pay.

CHAPTER 4

Case Study: THE THREE GORGES PROJECT (China)

Will an analysis of the Three Gorges Project using environmental accounting techniques, illustrate more effectively the non-viability of the project ?

Introduction

Modernization and economic growth have been the goal for most developing countries, for several decades. At a time when capitalist free market economics has regained global supremacy and won over most other credible ideological and economic theories, less developed countries (LDCs) are confronted with a new problem of environmental sustainability. With the fall of communism, LDCs have accepted (in some cases reluctantly) the benefits and greater efficiency of the free market and its ability to bring about economic growth. Economic 'growth', to the conventional developmentalist, is the holy grail of economic development and so anything perceived as an obstacle to increased growth is treated with suspicion if not contempt. Environmental/social concerns have introduced new demands on economic growth and most

developing countries will have to come to terms with sustainability and green economics.

China's government too, sees economic growth as indispensable to modernization. Although officially a communist country, it has turned to pursue a more liberal free market policy for almost twenty years now. Pragmatic leaders like Deng, who said, "it is not important if a cat is black or white, so long as it catches mice", transformed the Chinese economy into the fastest growing economy in the world. As a result of economic reform China's economy has been growing at approximately 10 % per year and this has brought on an increase in energy use and demand.

One of China's strategies to meet the increasing energy demands brought on by modernization and economic growth, calls for the construction of the Three Gorges Dam (TGD). This chapter will be a case study of the Three Gorges Dam Project in China. The dam will be the largest civil engineering project of modern times (Fisher, 1996) and it expected to provide flood protection for millions of people; generate up to 18 000 MW of hydroelectricity[74]; and improve navigation along the Yangtze river. The government of China believes such an investment in infrastructure, will lead to substantial economic growth in the surrounding region, making it an industrial powerhouse.

This super-dam will be constructed across the midpoint of the Yangtze river, which lies at the heart of China, dividing the country into north and south.

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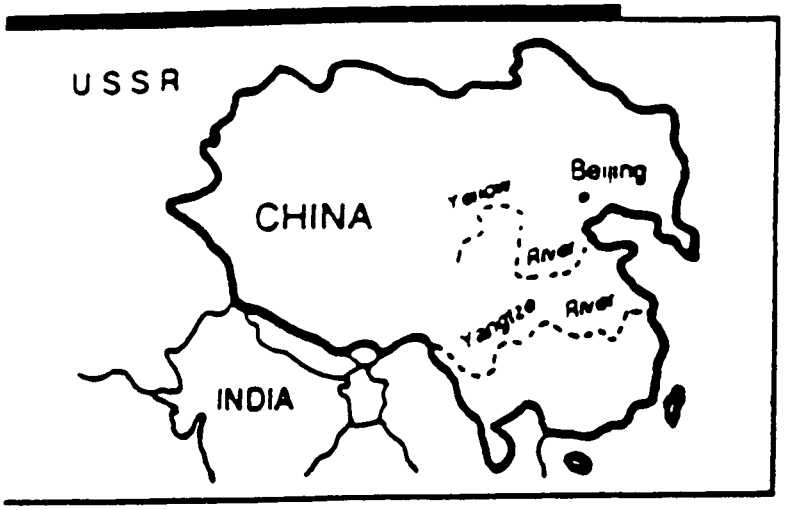
[74] At 18 000 MW of electricity, it surpasses by 50 % the current largest power producing structure, the Itaipu Dam, in Brazil (Fillon, 1996:54). Hydro Quebec's dam La Grande 2, is ranked number 8 in capacity at 5 328 MW (Grenier & Poix, 1997:166)

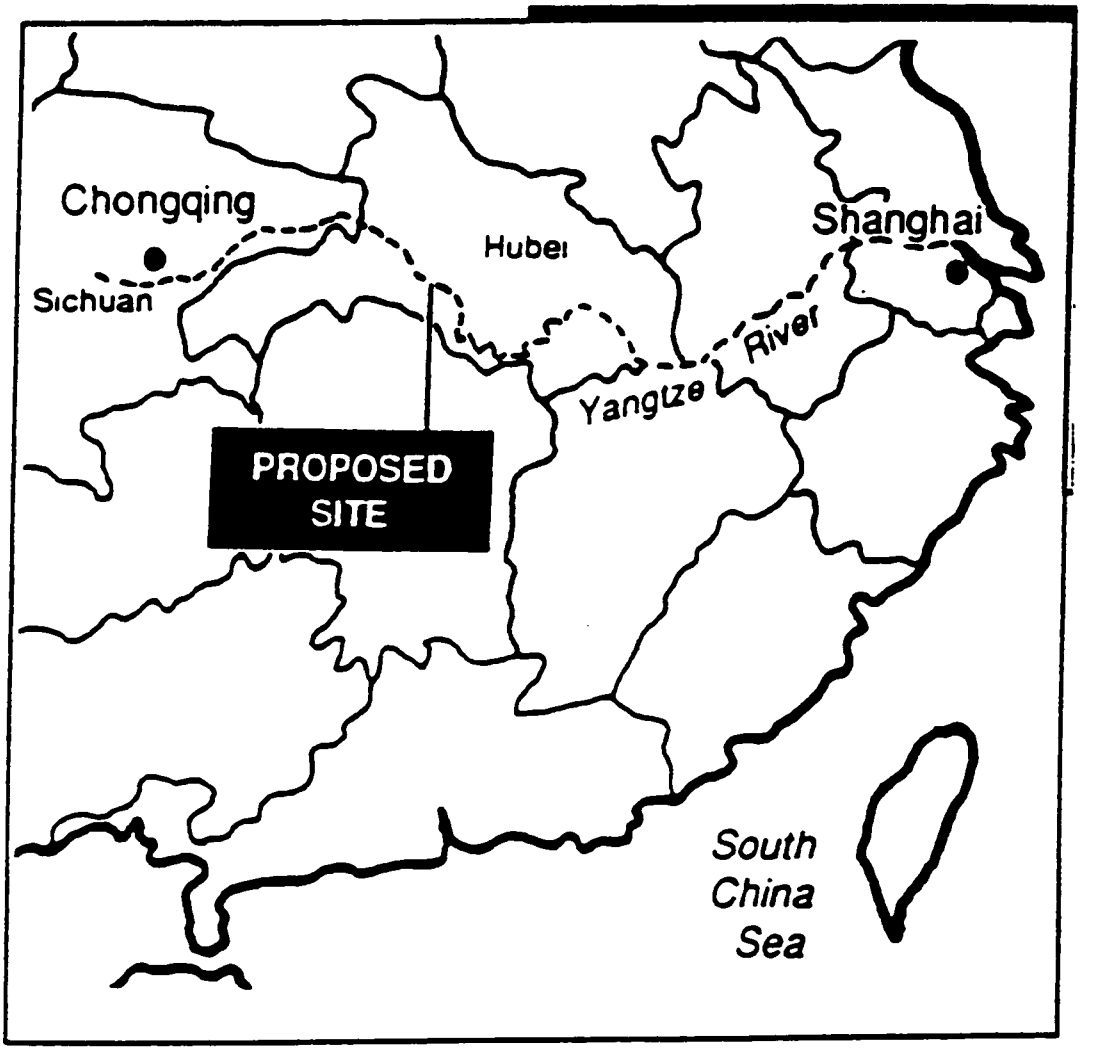
The Yangtze river is 3 940 miles long and 75 million people make their livelihood fishing or farming along its banks. Even more significantly the Yangtze Valley is home to approximately 400 million Chinese and so, any miscalculation of the project's real benefits and/or overlooking or underestimating its social and economic costs could potentially lead to unprecedented suffering. Thus many are treating the claims by China's government and its international allies and collaborators in the project with the utmost caution.

Independent experts like the International Rivers Network, Probe International and Chinese People's Political Consultative Committee (CPPCC) also question the benefits of the TGD. Others agents, including the World Bank and the U.S. Bureau of Reclamation (one of the world's leading dam building agencies) argue the potential environmental degradation and social dislocation will make the project economically nonviable.

In this chapter, I will examine the environmental, social and economic viability of the Three Gorges Dam. After reviewing the benefits and costs, using an environmental economics perspective, a more accurate evaluation of the Three Gorges Project can be attempted. As in the Indian case, the positive and negative impacts on the environment, people and economy, should enable the reader to judge the merits of alternative development schemes more effectively.



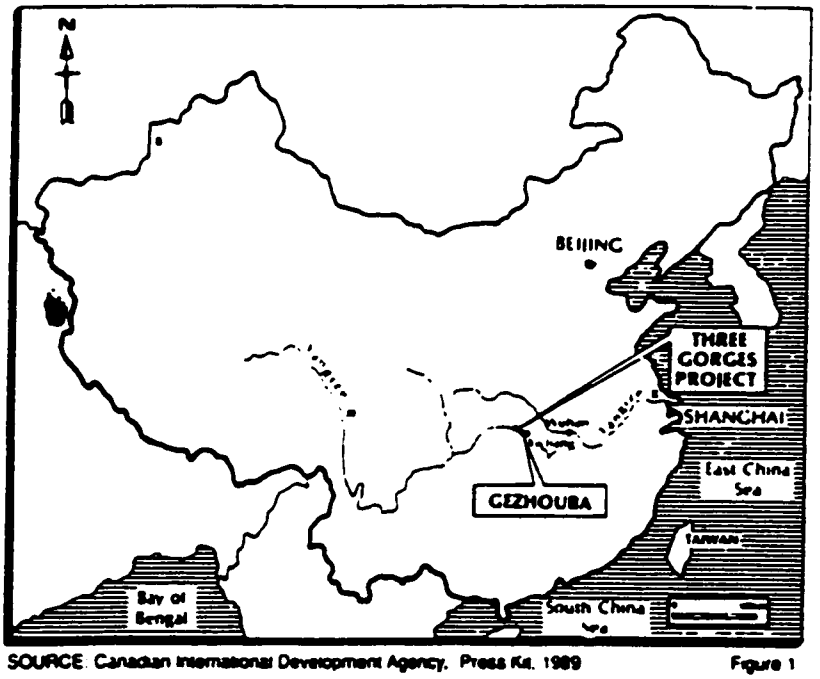
Map 4.1



Source: Ryder. World Rivers Review

Map 4.2

THE THREE GORGES PROJECT



SOURCE: Canadian International Development Agency, Press Kit, 1989 Figure 1

The CYJV-Recommended Project

Cost	US $10.7 billion
Location	Sandouping Village Xiling Gorge (Three Gorges)
Construction Duration	18 years
Reservoir Length	500 to 600 kilometres
Counties Affected	19
Total Pop. of Counties	14 million
Resettlement	727,000 people
Urban Centres	
Submerged - Fuling	80,000 population
- Wanxian	140,000 population
Number of Towns Submerged	104
Cultivated Land Submerged	14,500 hectares

Cultural/Historical Sites Lost

108 sites identified by CYJV (some dating back to 10,000 B.C.)

Some specific examples include:

- two iron Buddhas, Tianfu Temple, Fengdu City, dating back 600 years through the Ming and Qing Dynasties
- ancient plank road of the Han Period (A.D. 64) along the Daning River through the counties of Wuchan and Wuxi

Source: Barber and Ryder, 1990

History of the Three Gorges Project

The idea of constructing a dam at the Three Gorges was first proposed by Dr. Sun Yat-sen, in the 1920s. This century 300 000 people have been killed and millions left homeless by floodwaters in the valley. Therefore any scheme which attempts to protect the almost 10 million people living along the river banks and flood plains in the lower sections of the Yangtze valley, is attractive to China. Over the decades several projects have been proposed but all were delayed because of unresolved issues. When flood control alone was unable to justify construction, the dam was turned into a multi-pupose project which now included hydroelectric generation and navigation. By 1983, the Yangtze Valley Planning Office's proposal suggested a dam height of 175 meters and a reservoir level of 150 meters, however an analysis by the Chinese People's Political Consultative Committee (CPPCC) did not recommend the TGP and so it was excluded from the Seventh Five-Year plan (1986-90).

In 1986, The Chinese Ministry of Water Resources and Electric Power (MWREP) asked the Canadian government to finance a feasibility study for the dam. The study was financed by the Canadian International Development Agency (CIDA) at a cost of 14 million dollars and was conducted by a Canadian consortium called CIPM[75] Yangtze Joint Venture (CYJV). CYJV involved Hydro-Quebec International and British Columbia Hydro International, two state own

[75] CIPM refers to Canadian International Project Managers Ltd. It is made up of private engineering firms SNC-Lavalin Inc. and Acres International.

utilities, as well as private companies SNC-Lavelin and Acres International. The consortium was competitive enough to beat out other global competitors in conducting the feasibility study for the Three Gorges Dam. In February 1989, the CYJV feasibility study recommend that the dam was viable.

The study recommended a dam height of 185 meters and a Normal reservoir level of 160 meters and declared the project "technically, environmentally and economically feasible", however the study was not made public (Ryder & Barber, 1993:12). The secrecy in both China and Canada gives credibility to the suspicions of critics who oppose the TGP. Probe International was able to secure a copy of the CYJV feasibility study through Canada's Access to Information Act, yet many sections were still censored.[76] After reviewing the study with independent experts Probe International published a detailed analysis critical of the Three Gorges Dam.[77] In 1992, after reviewing the evidence in the CYJV feasibility study, the International Water Tribunal in Amsterdam ruled that the Canadian study was inadequate in its assessment. The case had been brought before the tribunal in Amsterdam, against the government of China and the Government of Canada by Probe International and the Federation for a Democratic China (Ryder & Barber, 1993:19). Questions were raised about the projects economic, social and environmental consequences.

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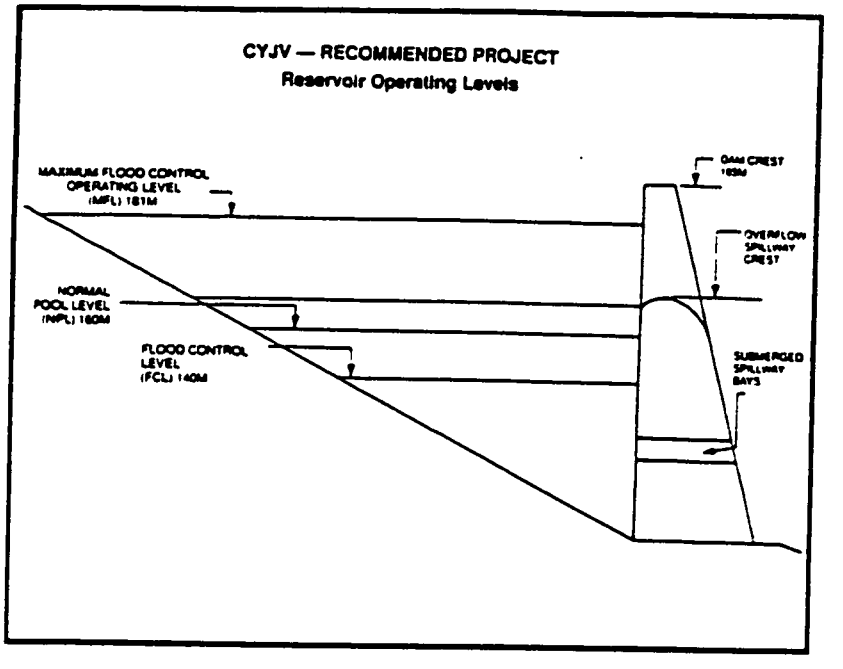
[76] Probe International is a Canadian public interest research organization.

[77] The book, Damming the Three Gorges: What the Dam Builders Don't Want you to Know, has provided me with a considerable amount of information throughout my research on the TGP and is one of the most informative published sources available.

Figure 4.1



Dam

Dam height (crest)	185 metres (m)
Dam length	2,150 m
Overflow Spillways (26 units)	8 m wide x 20 m high
Submerged Spillways (27 units)	7 m wide x 9 m high

Reservoir

Normal Pool Level* (NPL)	160 m
Flood Control Level (FCL)	140 m
Maximum Flood Control Level (MFL)	181 m

Function

Flood Control Storage	31 x 10^9 cubic metres (m^3)
Installed Hydropower Generating Capacity	16,750 megawatts (MW)
Average Annual Output	68.8 terawatt-hours (TWh)
Navigation Locks	Twin 5-stage flight locks 20 m lift per stage

*Normal Pool Level is the maximum height of the reservoir during the dry season.

Source: Barber and Ryder, 1990

Environmental, Social and Economic Costs - *Pro*

The Three Gorges dam will reach a height of 185 meters, it will be two kilometers wide and create a 600 km long reservoir, making it the largest and most powerful dam in the world (Probe International, 1996). It will take approximately 20 years to construct and costs range from $12 billion to $70 billion or more. The Dam is situated in Hubei province at Sandouping village, just up river from Yichang and the resulting reservoir will stretch 500-600 kms westward to Chongqing, in an area which is ideal for hydroelectric development. According to the Chinese government the TGP's primary purpose is to reduce the flooding which occurs downstream, yet the Three Gorges Dam will be a multi-purpose project whose benefits include power generation, improved navigation, aquaculture and tourism, as well as flood prevention.

Environmental Impact - Supporters argue that the impact on the environment should only result from the direct submergence caused by the reservoir. This is so because, only flooded sections of territory in the reservoir are labeled affected. No significant negative effects will be incurred by forests because there are virtually non left below 200 meters elevation. Animal populations are already considered to be too low for the reservoir to make any real difference in their long term survival.

Overall the TGP may actually have a positive impact on the Chinese and Global environment, if it can lead to a reduction in pollution from coal power

plants. China is the world's largest producer and consumer of coal (Suzuki 1996, Smil 1993:112). It relies heavily on its rich coal reserves and if it continues at its present rate of growth, it will be a chief contributor to global pollution. On a per capita basis it has a very low level of energy consumption when compared to western countries, yet China uses its energy in a most inefficient manner, which contributes pollution.[78] This leads proponents of the dam to suggest that the least polluting energy source for a growing China is hydroelectricity.

Although there is a definite impact on the riparian environment and on the territories submerged, the global environment may benefit from China's decision to move away from coal-fired power plants. The pollution from this type of energy generation contributes to acid rain and global warming. Therefore, while the local (regional) environment may have to endure some negative ecological effects, the national and global environment could likely benefit from this hydroelectric scheme.

Flood Prevention - Floods have continually plagued the Yangtze, throughout China's history and various flood control projects have been implemented over the centuries.[79] Presently, China relies on a series of levies, embankments, dams and diversion areas to protect the people, farmland and industries located on the middle and lower reaches of the Yangtze. The Three Gorges Project is a

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[78] China's energy consumption per unit of GNP is one of the highest in the world. "In 1987, one metric ton of Chinese steel needed 670 kwh of electricity while the Western and Japanese rates are between 300 kwh and 450 kwh." (Smil, 1993:124)

[79] Some (Moore, 1966) suggest that flood prevention and management gave birth to Chinese civilization.

continuation of China's efforts at flood control and it is expected to contribute to the protection of millions of down-stream inhabitants and industries. This is considered a social benefit to the region since future flood damages are expected to have a lesser impact on these communities because of the TGP.

Flood prevention is the first major benefit derived from the Three Gorges Project. The current design for the dam, favoured by the Chinese Government, proposes a dam height of 185 meters, a normal pool level (NPL) of 175 meters and a flood pool level (FPL) of 145 meters. What this means is that during the rainy season the water level in the reservoir will be lowered, to increase storage capacity. In this way 22.1 billion cubic meters of water can be impounded above the regular levels needed for hydroelectric generation, all to mitigate the threat of severe flooding in the middle and lower reaches of the Yangtze (Chaojun, 1993:103). In this way, industries, farmland and individuals will benefit from increased flood protection because of the TGD.

Navigation - The TGP is expected to improve navigation about 660 kilometers between Chongqing and Yichang by creating a huge deep-water reservoir which will enable 10 000 ton ocean-going cargo ships to sail 1 500 miles inland from Shanghai on the Pacific, to the city of Chongqing. The municipal government of Chongqing has pressed for the dam so that its ports could benefit from the increased traffic, making this city of 15 million in central China the world's

biggest sea port.[80] Improvements in navigation will open up the heartland of China, expanding trade and commerce. Potential social benefits like greater employment opportunities will be due to the increased commerce and economic growth to follow.

At present transportation along the Yangtze is slow, inefficient, costly and capacity is low, especially in the upper reaches of the river. Transportation is hindered by swift currents, shoals, 12 winching stations and 32 one-way sections which bottleneck traffic. According to the CYJV 1988 study, the higher water level is expected to remove most of these obstacles, leaving just a single one way section for most of the year, allowing access as far upstream as Chongqing (Luk & Whitney, 1993:31). The annual shipping traffic of 6 to 9 million tons along the Yangtze is projected to reach 27 to 38 million tons by the CYJV report and the Ministry of Communication states it will reach 50 million tons. The increase in transportation will further develop the economy of this region as well as facilitate people's mobility.

Resettlement - By far the greatest social cost raised by the TGP is population resettlement. The estimated number of dislocated people ranges from 500 000 to 1 300 000 people, depending on the reservoir level, while resettlement costs are expected to make up one third of the project's total expenditure of $10.7 billion according to CYJV figures. Out of a total population of

[80] It would be the biggest seaport, not just the largest inland seaport. No coastal or inland port would be larger in population than Chongqing.

approximately 14 million from the 19 counties affected only 5.3 % will be displaced (727 000 persons). Chaojun, (1993:92) estimates that of those individuals to be displaced 54 % are urban residents and 46 % are rural. The Canadian study states that those individuals who will be submerged can be resettled to higher elevations where land is available for cultivation. These same experts also concluded that China's resettlement policy is among the best in the world. The CYJV feasibility study has gone even further, concluding that resettlement is actually a benefit because new construction will increase growth in the region (Fearnside, 1990:34).

According to Fang Zongdai and Wang Shouzhong (1993), more than half of the submerged population lives in cities or towns. The Chinese government promises to construct new urban centers along with the accompanying industry for those affected. China will attempt to carry out, "resource-exploiting resettlement", which is an innovative type of resettlement that I describe as more proactive. Here resettlement is not considered as a negative cost which must be dealt with by the state, rather it is an opportunity to engage in social engineering and comprehensive development. In this manner significant social costs can be avoided or transformed into positive investment. Those dislocated by the TGP will not simply be compensated or resettled but rather they will be part of a comprehensive investment scheme for the whole region. Investment will not only go to provide housing, but also towards the development of industries which will employ the new settlers. One third of the original budget for the TGP has been

earmarked for investment in resettlement, this must be noted as an improvement from past projects where resettlement considerations were often overlooked.

It is the government's intention that the region as a whole is to benefit from macroeconomic investment so as to achieve a higher level of development. The new urban centers will become more efficient and will benefit further from hydroelectricity. These new cities will not simply replace the 104 towns and approximately 500 industries which will be inundated, they are expected to be vastly more productive according to Chinese authorities and help contribute to increasing China's economic growth (Zongdai & Shouzhong, 1993).

The social costs for the rural populations affected by the reservoir will include 14 500 hectares of agricultural land that is to be submerged. The result is that about 300 000 peasant farmers will also have to be resettled and compensated. The affected populations can be resettled upslope where the CYJV report states there is enough claimable land for the farmers. One half of the new land will be at an elevation of 800 meters or above and it is suggested that the farmers switch to cultivating orange groves, because of the altitude and steep terrain. Orange orchards are promised to increase the living standards of the displaced population and bring about a higher level of development and economic growth, according to the Chinese government.

Additional benefits include an increase in the aquaculture environment due to the reservoir. This will result in an improvement in the fisheries sector. The creation of a vast reservoir could have positive benefits for those wishing to engage in fish farming. Although native species may not adapt to the altered

environment, new more adaptable species can be introduced. This is what transpired on the Colorado River, after the construction of the Glenn Canyon Dam. Here native fish have been replaced by more hardy trout species (Else, 1997).

The reservoir along with better river transportation will also spur growth in tourism contributing to the economic development of the region. Once again the American experience with the Glenn Canyon Dam has demonstrated how a resulting reservoir can be used as a recreational facility. Glenn Canyon has been transformed into lake Powell. This new lake supports a variety of recreational enterprises and many visitors (Else, 1997). Chinese authorities expect the Three Gorges Dam reservoir to provide the same positive spin-offs.

Hydropower - Generating hydroelectricity will be the second major benefit derived from the Three Gorges Project. When completed the dam will generate approximately 18 000MW (installed capacity), to supply China's growing industrial centers. High economic growth can be maintained if Chinese industries and cities are supplied with much needed electricity. This will be the largest power producing structure in the world and it will ensure a steady supply of energy for decades. Harris Chan, a Three Gorges engineer states that the dam will provide one tenth of China's electricity (Harrar, 1997).

Hydroelectricity accounts for 20% of China's power supply, while coal meets more than 70% of China's energy requirements. When we consider that China's hydropower potential is largely undeveloped (only 6.4% of total potential

has been developed), and that the TGP's output is equivalent to burning about 50 million tons of coal a year, the dam gains greater acceptance by being a relatively clean source of energy. For China, a country in pursuit of greater development, the construction of such a project is seen as a wise choice for both the country's energy needs and the environment.

In Table 4.1, we find Canada and the United States have developed a considerable amount of their hydroelectric potential, almost 48 % but China has merely developed 6.4 % of its potential. Even a fellow developing country like Brazil, has managed to develop approximately 27 % of its hydropower potential. Hydropower makes up over 90 % of total electric generation in Brazil and Zaire (64 % in Canada), whereas in China and the U.S., it accounts for 20 % and 9.4 % respectively. What these figures in Table 4.1 demonstrate is that China can do much more to develop its hydroelectric potential and that criticism of an over reliance on coal generation by proponents of the TGP are valid.

Table 4.1: Leading Countries in Hydropower Potential

Country	Technical Potential (MW)	Installed Capacity (MW 1987)	Installed Potential (%)	Total Power Production (GWh)	Hydro/ Total♣ (%)
Brazil	150 322∞	40 106	26.68	202 287	91.72
China	436 197♥	28 000	6.42	497 267	20.11
USA	183 287	87 192	47.57	2 685 627	9.48
Zaire	120 000	2 486	2.07	5 295	97.37
Canada	118 596∞	56 846	47.93	496 335	63.73

Source: World Resources, 1990-1991.

♣total electric generation ♥exploitable potential
∞exploitable potential at large scale sites (over 1 megawatt) only

Environmental, Social and Economic Costs - *Con*

Opponents of the Three Gorges Project question many of the Chinese government's, and Canadian feasibility study's, figures (Dai Qing 1989; Probe International 1996; the Economic Construction Group of the CPPCC 1987; Philip B Williams 1990). In many instances the social cost analysis undertaken by the government understates the actual impact. Again, some environmental and social costs are considered by the Chinese authorities but many are significantly underestimated or even excluded from cost-benefit calculations. In various analyses the project's impact on the region, will raise substantial mitigating costs. These costs will fall on the environment, economy, people and culture heritage[81] of China.

Environmental Impact - China is a developing country with many pressing demands it finds difficult to address because of limited resources and so it may not devote a strong effort toward environmental protection. However the TGP will have a noticeable environmental impact beginning in the reservoir and ending on the estuary of the Yangtze river, from Chongqing to Shanghai. According to David L. Wegner, an aquatic biologist with the U.S. Department of the Interior, "The CYJV's assumptions in its ecological and environmental assessments are based on either no data or data that is outdated, non-verifiable,

[81] 1 200 archeological sites will be flooded by the reservoir. Chinese archeologists estimate that up to 360 million USD is needed to save just 10 % of the most important ancient sites and monuments (Thibodeau, 1996).

and representative of only a narrow band of conditions." (Wegner, 1990:63) As a result the dam builders suggest that the TGP will cause minimal environmental degradation.

The impact on wildlife is also dismissed because the numbers of wild animals in the reservoir area are dwindling. The few animals that inhabit the area will simply have to flee to higher ground. This is as far as the analysis concerning terrestrial wildlife is pursued by both those for or against the TGP. I could not uncover a more detailed examination on the effect to terrestrial wildlife, which leads me to believe that the area might be truly lacking in wild animals.

Starting with the environmental impact on the river itself, experience from around the world has shown that hydro-dams will harm the river ecology. Grand Coulee dam on the Columbia River, Glenn Canyon dam on the Colorado River and the Aswan High dam on the Nile River, have all adversely affected their respective river and riparian environments (Else 1997, Smil, 1990). Environmental engineers in Chongqing say that 265 billion gallons a year of raw sewage and industrial waste will flow into the reservoir from the surrounding urban centers and national authorities have no funds to address this problem (Tyler, New York Times International, Jan. 15, 1996). There could be an increase in methyl mercury contamination[82] or in water borne diseases which will

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[82] James Bay Cree Indians have high levels of contamination (Penn. 1990:70).

require state intervention, landslides causing flooding[83], while fish habitats will degrade.

Although the natural fisheries has declined about 55 % since the 1950s along the Yangtze, the TGP is certain to transform fish habitats even further, which could lead to a greater decline in their populations as in the case of the Aswan High Dam in Egypt or Grand Coulee Dam in the United States. Some species are caught commercially and are adapted to the fast flowing river while most others are raised in aquaculture facilities.[84] The reservoir would submerge these facilities and the industry would suffer a serious setback. Other aquatic life will also be negatively affected, such as the Chinese river dolphin, the Chinese sturgeon and the Chinese alligator. In most instances they have either been ignored, recommended for more study or given up for extinction even if the project were abandoned by dam authorities (Larson, 1990:80).

The reduced water flow in the lower Yangtze will also cause environmental degradation to this region. Low flows would result in an increase in sea water intrusion into the estuary, making it unfit for drinking or irrigation. This will impose greater costs on the city of Shanghai, which would have to deal with a fresh water shortage in the dry season. The salinizanation of the water table will also negatively affect the farmers in the region, incurring even more

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[83] " The US Three Gorges Working Group Warn that Landslides, which are common in the Three Gorges area, could cause disastrous floods and possibly a tidal wave similar to the disaster at Italy's Vaiont Dam in 1963." (Ryder, b:18)

[84] Aquaculture facilities are said to produce 20 times more fish than the annual natural fisheries.

financial and environmental costs.[85] Coastal flooding and erosion of China's best farmland will likely occur due to the reduced sediment load deposited down river and into the estuary.

Those proposing the construction of the dam dismiss the project's environmental effects as insignificant, yet according to Probe International the Chinese impact statement failed to meet China's National Environmental Protection Agency guidelines. This seeming lack of interest in the environment is better understood when we accept a more 'Chinese' perspective. Over the centuries population pressure has already taken a heavy toll on wildlife and the surrounding ecology, leaving this region with little wilderness.[86] Unlike the Sardar Sarovar Project in India, here the impact (due to submergence) on forests will be minor. Large forests do not exist below 200 meters so the reservoir would cause no direct impact from submergence.[87]

Flood Prevention - The Three Gorges dam will not solve the problem of flooding in the middle and lower Yangtze, yet it will increase flooding in the upriver region. The dam will play a minor role in flood prevention regardless of what its proponents say because its storage capacity is not enough to protect

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[85] When there is an increase in salt water, "irrigation has to be interrupted for a few days or even several months. In 1978-79 1 333 hectares of rice crops were destroyed due to the very high salt content of the irrigation water supply. Due to the salinized water supply, Shanghai experienced an economic loss of $4 963 000." (Larson, 1990:86)

[86] The population density in the region is more than double that of the national average.

[87] Although 73 900 mu (4 926 hectares) of orange groves would be submerged (Chaojun, 1993:77). One hectare = 15 mu.

downstream populations. Both those for and against the dam use the 1954 flood as a measurement of the TGP's effectiveness. Fang Zongdai, a senior engineer with the Water Conservancy and Hydropower Research Institute, concluded that the total amount of flood water (in the 1954 flood) was 102.3 billion cubic meters and since then, other flood prevention techniques have been implemented (raising embankments), reducing these floodwaters to 50 billion cubic meters. The Three Gorges dam is expected to impound 22.1 billion cubic meters of flood water, above the regular levels needed for hydropower generation. Although this is a considerable amount, it is less than half of what will be expect from another 1954 flood, which demonstrates that the TGP is unlikely to protect the millions of residents further east from the dam (Zongdai, 1993:162-163). Other experts like Philip B. Williams, a Hydrologist and President of the International Rivers Network predict that the dam could only hold 10 % of the volume found in a 1000 year flood, such as the 1954 flood. The region's existing flood management system of dykes, embankments, diversion areas and flood plains have more than three times the capacity of the TGP (Williams, 1990:103).

Apart from those forced to move because of submergence by the reservoir, others will suffer from increased flooding due to future sedimentation and higher flood levels caused by the reservoir. The Yangtze is the third most silt-laden river in the world and approximately 70 % of this silt could be deposited inside the reservoir.[88] In times of flood, an additional 500 000 people

[88] Silt is a serious problem, the Samenxia dam on the Yellow River was so filled with silt that it had to be rebuilt and it now generates only 20 % of its intended capacity (Ryder, a:2).

inhabiting the reservoir area (between 162m and 182 m) and who were previously safe from inundation will be affected. Originally, these people did not live in what would be described as a flood prone area, however they will now face increased risk of flooding. Such "temporary" victims are not entitled to compensation, if they were the TGP's cost would increase by 20 %.

The city of Chongqing would have to endure an increased chance of flooding, adding millions of dollars in costs to the project.[89] This will occur because in times of flood during the rainy season the water levels will already be 'artificially' high upriver because of the reservoir. In time sediment deposits along the bed of the reservoir will also contribute to the raising of the flood water levels, especially at the tail end of the reservoir near Chonqing. This sedimentation will also drastically reduce the impounding capacity of the Three Gorges dam, as its reservoir fills up overtime. "Neither the cost of reducing the sediment input to the reservoir nor the cost of increased flood damages in Chonqing are included in project costs." (Williams, 1990:112)

Furthermore, as the river's sediment is trapped in the reservoir, the resulting *clearwater* released downstream, will erode valuable embankments and dykes. Similar erosion has occurred along the Colorado River, downstream from Glenn Canyon Dam (Else, 1997). Necessary repairs will have to be made yet these costs are not included in the CYJV's cost-benefit analysis. Dam authorities state all these problems will be avoided by utilizing the policy of "impounding

[89]In 1981, the city was hit by a flood that cost $5.4 million in flood damages and affect about 137 000 people (Williams, 1990:111).

clearwater and releasing turbid water". This however is highly unlikely if not illogical because it is precisely in times of flood, when the waters are full of sediment that they will have to be impounded. Letting the turbid water flow at this juncture would mean that the dam would not play its role in flood control, its supposedly main purpose. In preparation of anticipated floods, the water level in the reservoir will have to be lowered at a moment when the water would be flowing clear.

Navigation - The TGP will hinder the growth of navigation on the river. The construction of the dam will be an obstacle to river traffic for a minimum of 18 years, acting as a drag on the region's development. Once built, the accumulation of sediment upstream at the tail end of the reservoir will obstruct shipping at Chongqing. Its port would eventually be filled in with silt requiring massive dredging operations. The CYJV feasibility study failed to examine this problem and it did not include any of these future expenditures in its calculations. Furthermore it is expected that river traffic would only enjoy the proposed 'benefits' on navigation for only the two months (November-December) when the water level is maintained at a high enough level. During the rainy season it would have to be kept at much lower levels for flood prevention and therefore of little benefit to navigation. This would make investment in the promotion of this traffic unprofitable for individuals and the business community.

The massive locks constructed at the dam site will be the largest in the world and it is not guaranteed that the technology for such a scheme will work.

What is sure is that once built, river traffic will be forever limited to the capacity of the lock system. Although the Ministry of Communication projects a theoretical capacity at 50 million tons (CYJV predicts 41 million tons), the Economic Construction Group of the CPPCC believes this figure cannot be achieved. The members of this Chinese Committee suggests that economic development will be adversely affected because of the losses in ship traffic and the damage to the economy would outweigh any benefits from hydropower (E.C.G. of the CPPCC 1987, in Luk & Whitney 1993:114).

Resettlement - The opponents claim that resettlement will introduce tremendous social costs on the TGP, making it economically nonviable when an accurate count of the people affected is examined. This social disruption and reconstruction will call on a larger portion of the project's budget. Disputes over the numbers affected must be settled before a reliable expenditure figure can be calculated. The Planning Office of the Changjiang[90] River Basin (POCRB) has the lowest figures for displaced people and project costs, 330 000 for a normal pool level (NPL) of 150m, a resettlement cost of 3.5 billion Yuan and a total project budget of 20 billion Yuan.[91] The CPPCC[92] disputes these findings, stating that their investigation indicated the Three Gorges Project would cost over 60

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[90] Changjiang is another name for Yangtze.

[91] At a normal pool level (NPL) of 160m 420 000 people affected, but no figures concerning costs were provided (Zongdai & Shouzhong, 1993:181).

[92] The CPPCC is an influential group of "opposition" parties. It works within the Chinese political system, something like a parliamentary committee in Canada, or a congressional committee in the U.S..

billion Yuan and it further accepted the data from the Chinese Urban Planning Institute (CUPDI) as more realistic. This institute states the numbers displaced will be at least 860 000, with resettlement expenditures at 11 billion Yuan (E.C.G. of CPPCC 1987, in Luk &Whitney 1993:117).

Estimates by the Institute of Urban Planning and Design (IUPDC) also exceed the POCRB figure, while the estimates carried out by the affected cities and counties involved, exceed the numbers of all these organizations. The Yangtze River Water Resource Commission has said it would have to relocate 1.2 million (Fillon, 1996:55). Finally, the most recent estimate (Sept. 1997) by Arthur Zich of National Geographic, predicts that almost 2 million people will be displaced.

The CYJV feasibility study declares that (NPL 160m) 727 000 people will need to be resettled, a sum which is contested by national and international experts. This number fails to include those residents in the temporary flood zone which will be submerged on occasion, whenever excess water is stored in the reservoir. Sedimentation at the tail end of the reservoir will increase the size of the population displaced, by making those upriver or on adjoining tributaries more susceptible to floods. Finally, anywhere from 10% to 30% of urban populations are made up of unofficial residents. These non-persons[93] are not counted in any plans and will receive no compensation. They are not included in any social impact assessments and so will not be officially contributing to an increase in social costs. By doing so the dam builders understate the true

[93] Persons not recognized by the Chinese government because they are listed as unofficial residents.

investment required for successful resettlement. For these reasons, the figure suggested by organizations like Probe International or the authors of Yangtze! Yangtze! , of approximately 1.2 million people having to be rehabilitated, is more credible.

Those persons who will have to be resettled are farmers (46%) and Urban Dwellers (54%) and so both farmland and the construction of new cities are required. The new agricultural lands are located at high elevations on steep slopes and according to the Chinese Academy of Sciences, "it could take as much as 5 acres of mountain land to yield the harvest now taken from an acre of lowland soil" (Popular Mechanics, July 1996:55). The Nanjing Institute of Pedology also suggested that it would take 133 333 hectares (2 000 000 mu) of new land to replace 26 666 hectares (400 000 mu) of submerged prime agricultural land.[94]

With hundreds of thousands of farmers relocating to an area with an already high degree of population density, there will be significant environmental degradation.[95] The clearing of new land for cultivation and the demand for firewood will increase erosion and contribute to sediment buildup.[96] These indirect environmental effects have been neglected by Chinese authorities, as well as the Canadian CYJV study. The effect of human activities contributing to

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[94] One hectare is equivalent to 15 mu.

[95] Another worry is that people will be resettled to far away territories like Tibet or Xinjiang, for political and military reasons. Those displaced can be used by the central government to populate minority areas with Hans, the dominant group in China.

[96] Very little information can be found concerning forests or forest subsistence unlike the case for India.

land degradation are ignored, even though the resulting sediment from erosion will decrease the benefits attributed to the dam. The added cost for erosion control (catchment area treatment) have been excluded from the cost of the TGP.

Massive construction will have to be undertaken to replace the 13 major cities and 140 towns submerged along the Yangtze's banks. The new cities will require massive expenditures for housing construction and infrastructure (water and electricity supplies, roads, communications, services for education and health, etc.). Informal social networks which contribute to human welfare will be hurt in the transition, negatively impacting the quality of life. Construction will also take place on rugged terrain at high elevation, inflating the costs involved. The government's estimate of 110 million yuan per square kilometer of urban construction is unsound according to Zongdai and Shouzhong.[97] They suggest that the cost of resettling an urban resident could likely be 300% to 400% higher than resettling an agriculturist. This is so because many industrial, commercial and service enterprises will have to be established to provide employment for those being relocated. Even though it is more costly to compensate urban residents it is still more difficult to resettle farmers, because there is only a finite amount of land.

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[97] The authorities estimate these figures from the experience of the reconstruction of the municipality of Tangshan, after an earthquake. In this case the city located on level terrain was rebuilt in the same place, unlike the case for the TGP, in which dozen of cities and villages will have to be relocated farther away and rebuilt from scratch over more rugged topography. These conditions will raise the actual cost of reconstruction (Zongdai & Shouzhong, 1993:180).

Whatever the number of displaced persons, critics of the dam have reason to doubt that the Government's resettlement scheme will work as intended. China's record on resettlement is poor according to Li Rui (vice minister of the Ministry of Water Resources and Electric Power) and he urged the government to reconsider the project. Since 1949, about 10.2 million people have been involuntarily resettled in China yet about 3 million (30 %) have failed to receive adequate compensation and are living in poverty (Human Rights Watch/Asia, 1995:11). Even Pierre Senecal, one of the authors of the Canadian feasibility study, has admitted that, "the study's recommendation that resettlement is feasible is not valid any more." (Probe Alert, November,1995)[98]

Hydropower - As a developing country choosing a policy of economic growth as the method of ensuring development, China needs energy. In Central and Eastern China there will be an increase in demand from 20.6 gigawattts (GW) in 1985 to about 120 GW by 2010[99] (Smil, 1990:119). Yet China's per capita energy consumption is low compared to Northern countries, while its hydroelectric potential is high. On the surface it would seem that the Three Gorges dam makes sense considering China's great need for electricity. However, there are serious doubts that the dam will ever produce the amount of

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[98] Apparently his change of mind is due to the resulting population increases and shortage of available land.

[99] 1000 kilowatts (KW) = 1 megawatt (MW)
1000 megawatts (MW) = 1 gigawatt (GW)
1000 gigawatts (GW) = 1 terawatt (TW)

electricity predicted and tying China's legitimate energy needs with only one possible solution (TGP), is unsound.

The installed capacity of the dam will be less than 18 000 MW, yet the actual (firm) power eventually generated will be only 53 % of the potential capacity. This is so because the reservoir will not be filled to its maximum generating capacity for most of the year due to its obligation to flood management. Maintenance too will reduce optimum performance as some of the 26 generators or turbines will be off-line from time to time, while sedimentation will shorten the productive life of the dam. The result is that the TGD will likely operate at submaximal levels for most of its life, while peak hydroelectric generation will only occur after the 18 years of construction are completed.

Other solutions to China's energy needs come to light when we examine its energy consumption. China is highly inefficient in its energy use and if these inefficiencies were removed there would be no need for the dam. Energy inefficient heavy industries consume approximately 65 % of the country's electricity supply.[100] Coupled with the fact that China has created an inordinately large industrial sector (responsible for 52 % of GNP) has meant that the country's energy is largely wasted.

If China invested towards better energy efficiency, like modernizing power plants and industrial furnaces or upgrading their locomotive technology, it would free up to four times the electricity generated by the TGD and it would make the

[100] Chinese plants consume anywhere for three to six times the amount of electricity used in western countries (Smil, 1990:120).

project redundant (Smil 1990:120-121, State Statistical Bureau 1988). Even the Chinese Ministry of Energy admits that China does not need new energy sources because it could double its GNP through conservation and efficiency improvements (Probe Alert, Nov. 1994). Presently the nation's economy could be supplied by just 60 % of its hydroelectric generating capacity, were it not for inefficiency. When Chinese energy inefficiency is compared to Western countries as in Table 4.2, we find that the possibilities for China to conserve a significant amount of energy by investing in newer technology, exists. Improvement in energy use would also benefit an already strained Chinese environment, because of the carbon-intensive nature of the Chinese economy (Smil, 1990:121). The reduced demand for electricity caused by efficiency improvements would require the burning of less coal, which contributes heavily to environmental pollution.

Table 4.2: Coal Conversion Efficiency

	China	Western countries
Thermal Power Plant	28 %	35 % - 40 %
Industrial Boiler	50 % - 60 %	80 %
Industrial Furnace	20 % - 30 %	50 % - 60 %
Household Stove	15 % - 20 %	50 % - 60 %
Railway Locomotive	6 % - 8 %	25 %

Source : L. Ross 1988.

The growing demand for electricity which the Chinese will want to meet would best be met by an 'appropriate' form of electrical production, like hydropower. Today coal meets more than 70 % of China's energy requirements and it contributes to global pollution. China has abundant coal resources but to

its credit, it is trying to switch to more environmentally benign energy production. The best alternative is hydroelectricity when we consider that to equal the dam's energy production, thermal plants would have to burn as much as 50 million tons of coal a year (Fillon, 1996:56). This fact is indisputable, and the Chinese government is right to insist that given such a choice, the TGP is a better alternative. However, a more comprehensive analysis would discover that they are given a choice, on what type of hydro-dams to construct (Smil 1993:109-115, Xiong, 1990:27-31).

Since China is known to have great hydroelectric potential, the question is whether it should construct small dams rather than large dams.[101] There are already 70 000 small hydro stations in rural China, with a total installed capacity of 10 000 MW . Building a series of small hydroelectric facilities could easily replace the Three Gorges Project. They could be constructed in a shorter time, in less populated areas, with less social and environmental impacts (Smil, 1990:123-124). The TGP's massive expenditures could draw funds away from wiser development schemes such as the smaller and more cost effective dams (see Alternatives).

China has the opportunity to select from a wide variety of possible hydro developments because the country has only developed 6.4 % of its hydroelectric potential (see Table 4.1). Smil (1990), states that it is technically feasible for the state to construct 11 103 hydro-dams (from small to mega in size) in all of China

[101] It has been suggested by the Tennessee Valley Authority and the US Army Corps of Engineers. that a series of five or six dams along the Yangtze river could meet energy demands.

and 4 440 of these dams could be constructed on the Yangtze River's tributaries alone. He proposes that a series of smaller hydroelectric dams can be constructed on the Yangtze's tributaries in Sichuan province to replace the TGD. At 1 to 3 GW in size they would be smaller than the TGD, but would still be classified as mega-dams. " These dams could be built on upper, less densely populated reaches of Yangtze tributaries, in less than half the time required to build the Three Gorges Project, with less social and environmental impacts." (Smil, 1990:123)

Cost-Benefit Analysis

The Canadian feasibility study of the TGP put the total monetary cost of the project at 10 billion USD spread over 18 years, giving a net benefit-cost ratio of 1.48. This figure is achieved with the benefits derived from flood control, power generation and improvements to navigation. However, the benefits from each, are calculated from unsubstantiated assumptions. First, the CYJV report claims that the TGP is the only economical way to provide flood protection yet it includes no data to support this assumption. Benefits due to flood protection are derived from economic losses avoided and these are arbitrarily set by the dam authorities.

The benefits from hydropower too, may be questionable, because the Chinese have the authority to set any price they want for electricity. There is no independent way to determine what the price of electricity could or should be, as

in a free market. This makes suspect revenues from the sale of electricity, as well as consumer demand. "With the stroke of a pen... it would be possible to demonstrate the financial feasibility of the Three Gorges Dam even if it were to cost twice as much." (Paranjpye, 1990a:150) In addition it is expected that electrical transmission losses will be approximately 11 % of the total generated, reducing power benefits further.

The Chinese government and the CYJV use a discount rate of 10% instead of the 12% rate which potential financiers like the World Bank, use in their estimates.[102] The World Bank has used a discount rate of 12 % in its past economic appraisals of development projects. This was the rate used in the Narmada Valley Project in India and were it applied to the TGP, its benefits would decline by 59 %. One of the effects of using a 10 % discount rate is that the project's true cost is understated.

An artificial rate of exchange further skews the economic figures in favour of this development project. The real exchange rate would raise the actual construction cost of the dam and it may be why the government has been reluctant to recognize the actual rate. The more accurate rate is closer to 5 or 6 yuan per US dollar, while the artificial rate is 3.7 yuan to the dollar. Even the CYJV acknowledges that the higher rate (of 5 or 6) would be more appropriate. The CYJV along with the critics of the TGP recognize that at 6 yuan per US dollar, construction costs would increase by 30 %. Therefore the current artificial

[102] The discount rate reflects the social cost of capital invested, or the opportunity cost of capital. The rate is applied to the expected costs and benefits over time.

rate is likely, "incorrect, biased, and results in an underestimation of the total cost in economic terms." (Paranjpye, 1990a:152)

Construction delays in developing countries like China, are normal and can be expected to increase project expenditures. These cost overruns have occurred in past Chinese dam projects.[103] For the TGP a delay in the construction schedule for one year would reduce benefits by 22.5 % and a longer delay of 2 to 5 years would make the project nonviable.

A more thorough social and environmental accounting method would include what I have already discussed in the previous sections, to the final cost-benefit analysis. Most of these points have not been address by the CYJV study or by the Chinese government. Here is a summary list of the social, environmental and economic costs I have examined so far, or come across in my review of the research literature. (various sources)

- the real number of displaced persons (at least 1.2 million)
- the actual costs of resettlement and reconstruction
- the submergence of 13 major cities and 140 towns and villages
- the submergence of 620 industrial and mining enterprises
- the submergence of 957 km of roads, 1 133 km of transmission lines
- the submergence of thermal and hydropower installations - 67 MW
- flood damage up stream
- the impact of sediment on power generation
- the impact of sediment on flooding
- the disruption of navigation for 12 years to Chongqing
- future dredging costs for navigation
- loss of 14 500 hectares of agricultural land

[103] The Gezhouba dam experienced delays and cost overruns which critics say double the original cost of the dam.

- loss of more than 1 200 archeological sites
- loss of wildlife and forest lands leading to extinction
- increased pressure on remaining forests
- increased water pollution
- increased costs to deal with water-borne disease
- a decrease in the fish population
- soil erosion due to increased pressure on remaining farmland
- increased landslides and possible reservoir induced seismicity (RIS)
- salinization of Shanghai's water supply
- downstream and coastal erosion
- the opportunity cost to the Chinese in sacrificing other development projects

[These are some of the costs raised by the Three Gorges Project] I have already examined the benefits that have convinced the Chinese government to go ahead with the project, yet who are the beneficiaries. It seems logical that upstream populations will have to pay for the benefits acquired downstream. Those inhabiting the reservoir area and the residents of Chongqing will be sacrificed to increased flooding in order for the flood protection of those downstream from the dam. Many critics suggest that an equal number of people will now be made vulnerable to flooding, in exchange for those protected.

The province of Hubei would receive the largest share of the electricity and flood control benefits, while the poor province of Sichuan would have to bear most of the costs. Power benefits would also flow to central and eastern China, so cities like Shanghai would prosper from increased hydroelectricity and the employment generated from the ensuing economic development. The world community is also expected to benefit because the TGP is a source of 'clean' power.

In assessing the Three Gorges Project Tian Fang, Lin Fatang and Ling Chunxi (1993), have suggested that those attempting to analyze the viability of the TGP, ought to take a macro-strategic approach. I do not believe this is contrary to the socially sensitive green economics approach I propose. They insist that such a national mega-project consider the long-term and overall benefits to people.[104] Using their macro aspects, I can judge that in considering the overall energy resources and policy in China, hydropower is a logical choice. The nation's heavy reliance on coal, its abundant hydroelectric potential and increasing energy demands from a fast growing economy, make energy policies that favour hydropower very sound. However, addressing energy inefficiencies in the Chinese economy (see Table 4.2) would contribute significantly to China's energy and socioeconomic needs, in a shorter time. Smaller hydroelectric dams could also generate considerably less environmental and resettlement costs (see Alternatives).

The TGP has introduced new issues, in the assessment of development projects with respect to resettlement. Admittedly China has included the cost of resettling those displaced, within the TGP budget. This action demonstrates that the TGP authorities acknowledge and consider the social impacts related to the megadam. One third of the TGP expenditures have been assigned toward resettlement.[105] China takes a more overall strategy for economic and social

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[104]The problems begin to arise when we examine who are 'the people': that is, are those who benefit the same persons who have been asked to sacrifice?

[105]For the moment we will ignore the fact that the total number of people displaced is greatly understated.

development and so the TGP should be assessed in the context of a region wide investment scheme. " When we speak of 'resource-exploiting' migration, we refer to rebuilding new-type villages, towns and cities according to social systems engineering. This type of resettlement is not mere relocation and compensation, as in the past." (Fang, Fatang & Chunxi 1987, in L&W, 1990:208)

Participation and Politics

My research has uncovered a much lower level of public participation on the TGP, as compared to the Narmada Valley Projects (NVP). Little information is available concerning local populations and their attitudes towards the TGP, this may be due to the nature of Chinese politics as well as communist propaganda. It seems that significant opposition has so far failed to rise up from the grassroots but has come from journalists, academics, scientists and even members of the National People's Congress (NPC). This opposition has gone as far as publishing the book, Yangtze! Yangtze! (Dai Qing, 1989), which represents a rare moment of large-scale public lobbying in China.[106]

The publication of Yangtze! Yangtze!, by journalist Dai Qing, has been the paramount manifestation of open dissent in China concerning the Three Gorges dam. In trying to open the debate, this collection of essays, letters and interviews by Chinese scholars and public officials, expresses independent

[106] This book criticizing the TGP. was banned soon after it was first publish and only 25 000 copies survived within China, the rest being destroyed.

opinions concerning economic policy decisions taken by the government. This is one of the few times where ordinary Chinese people (working outside the government) have attempted to express contrary views over government policy in order to influence the decision-making process. There are scholars who argue, that policy-making in China, follows a process of consensus-building within the state apparatus, however academics like Lawrence R. Sullivan, note that the lack of checks and balances in the Chinese political system and the absence of press freedom, isolates critics and squelches scientific debate (Sullivan, 1989:xv).[107]

Contemporary Chinese opposition to the TGP gained attention after a report by the Economic Committee of the Chinese People's Political Consultative Committee (CPPCC) in 1986, which concluded that construction of the dam should not proceed. Their conclusions were not disseminated in the state-controlled media nor were they made available to other government departments. Interested parties like journalist Dai Qing, obtained most of their information from outside news sources in Hong Kong, since the Chinese media only engaged in "positive reporting". Access to the international news media was essential for information gathering by the TGD critics within China because unlike India, the Chinese media is an extension of the state.[108] Although

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[107] L.R. Sullivan is Associate Professor of Political Science at Adelphi University and Research associate, East Asian Institute at Columbia University.

[108] With the return of Hong Kong in July 1997, a valuable link to independent information may be severed, further reducing the transmission of scientific information concerning the TGP in mainland China.

repression did occur in India, opposition groups could still pressure (if not rely on) the Indian media to act as a check against the government's excesses. In China grassroots and 'elite' protest groups do not receive any help from the more monolithic press.

To overcome this state control of information, Dai Qing and her colleagues published Yangtze! Yangtze! in February 1989, in order to provide delegates to the National People's Congress (NPC) with alternative information before they were to vote on the TGP. With questions raised about the viability of the dam, that April the State Council suggested that the project be postponed. Other organizations such as the Sichuan provincial government, the Chinese Society of Territorial Economic Studies, the Chinese Society of Hydro-Electric Power Engineering, The Society of Energy Resources Studies, and the Society of Hydro-Power Economic Studies, all began to oppose the TGP and questioned their lack of involvement in the decision making process (Shi He & Ji Si, 1989:25). Li Rui, who was Mao Zedong's secretary on Industrial affairs and Vice-Minister of the Ministry of Water Resources and Electric Power, has written that the decision making process for the TGP, left no room for alternatives. "The Three Gorges dam was the only option even before they (the Yangtze Planners) started to collect data and formulate arguments to support their decision (Rui, 1989:68).

By June 1989, Tiananmen Square altered the debate considerably and enabled the government to silence all Chinese opposition to the dam. Dai Qing was arrested and held in a maximum security prison for 11 months and told she

was to be executed (she was not). Other public officials recanted their previous opinions, while Yangtze! Yangtze! or any other anti dam writings were banned. Meanwhile, state repression has intensified and the police are to arrest any who oppose the TGP. Any individual who expresses opposition to the dam would be considered a counter-revolutionary according to the state education minister (Shi He & Ji Si, 1989:29). The post-Tiananmen Square atmosphere provided the government with the opportunity to suppress all opposition opinions on the project and enabled it to hasten the vote at the NPC. Legislators were prevented from speaking out and any information on the project was suppressed. The Three Gorges Project was officially approved in 1992.

Construction began in 1993 and continues 24 hours a day, employing close to 20 000 workers, according to Rod Mickleburgh of the Globe and Mail. The majority of this still growing labour-force consists of migrant workers, usually relegated to the lowest position in Chinese society, where they endure discrimination and abusive labour conditions.[109] Yet China goes beyond the suppression of free labour practices when it makes use of its *Laogai* system of forced labour camps.[110] The nation's prison workforce, which is an integral part of China's construction materials market will also help to supply the TGP (Human Rights Watch/Asia, 1995:17-19). Thus (unpaid) forced-labour will

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[109] There are approximately 100 million migrant workers in China.

[110] "The provinces of Sichuan and Hubei contain at least 134 prison and 'labour re-education' enterprises, many of which are engaged in", the production of chemicals, machine tools, concrete, bricks and mining. Shayang Farm in Hubei province, is located only 100 kms from the Three Gorges dam site. It is the biggest agro-industrial penal complex in all of China, occupying a total of 2 146 square kilometers of land and holding 71 000 prisoners. This prison also contains brick factories and cement plants. (Human Rights Watch/Asia, 1995:18).

provide materials and equipment for the construction of the dam. Such (monetary) cost-free inputs lower project costs and help make it more financially attractive than it might otherwise be.

The view that economic development and prosperity will eventually bring human rights to China and other countries with similar development policies is unsupported. Rapid economic growth in highly authoritarian countries does not necessarily lead to democratic freedoms. In China's case, the belief is that a benign dictatorship ensures sustained and orderly economic growth and so human rights must be delayed or restricted because they hamper this growth. The result is that anyone who seeks such rights, is labeled a counterrevolutionary saboteur.[111]

The CYJV study does not give any evidence that the local people have been consulted about the TGP, or that these persons had any input in the decision-making process. Ten times as many Chinese people will be displaced by this mega dam, compared to India, yet the question of population dislocation is not given as much consideration as we would come to expect even by some Chinese critics of the dam. India has had a history made familiar with protest under Gandhi and groups can rely on the court system to protect their rights to a greater extent than China.

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[111] This behavior occurs in non-communist countries as well. "In Indonesia, the label 'obstructor of development' has replaced 'communist' as the accusation of choice for allegedly subversive activity." (Human Rights Watch, 1995:20)

Although there is an information blackout on the existence of local level protest to the TGP which makes it difficult to measure the level of discontent by those being displaced, there are signs that these populations are not as docile as we may believe. In 1994, 5000 people who had already been displaced from Yichang County by the TGP protested against their living conditions and lack of permanent housing. Other critics of the dam calling themselves the "Democratic Youth Party", formed by residents negatively affected by the reservoir have increased resistance. However they have been arrested and accused of trying to sabotage the socialist revolution and construction of the TGP, and of sabotaging social order (Human Rights Watch/Asia, 1995:9-16).

The scale of resettlement with over one million relocated people, has raised the concerns of police authorities. The police are preparing countermeasures, with the help of new sweeping legislation to crack down on expected protests. Penalties for those refusing to resettle or for protesters (labeled counterrevolutionary) can include, without trial, a three-year sentence for 'labour re-education', while judicial penalties can extend to death (Human Rights Watch/Asia, 1995:14). (see also Internal Report of February 1993 by Officials of the Wanxian Prefectural Public Security Department and the Internal Report of February 1994 by Officials of the Hubei Province Yichang Municipal Public Security Bureau, in Human Rights Watch/Asia, 1995)

Alternatives

After thorough examination of available data and research findings, several alternatives to the Three Gorges project become apparent. The benefits in flood protection, power generation and in the improvement of navigation, are more easily achieved by other projects or policies. The President of the International Rivers Network, Philip B. Williams, a hydrologist and engineering consultant, describes how investment in flood warning systems, reforestation and in the upgrading of dykes as well as flood plains, would provide even more effective flood management (Williams, 1990:100-114). This is not foreign to the Chinese. They have been following such effective strategies for 2 000 years. Consistent and continual improvement in this type of comprehensive flood management system would garner better results than from investing heavily into a single mega-project[112] (see also previous subsection on flood prevention).

The country's electricity shortage can be significantly reduced if not eliminated by modernizing the energy inefficient economy. Improving the energy efficiency of China's industry will free up massive amounts of power, even more than what will be generated by the TGP. Expenditures in improvements to energy consumption would cost less than building new power plants. If new generating stations are required, then demand should be met with small-hydro

[112] The existing flood management system can hold approximately 100 cubic kms of water and has functioned relatively well. Although it was overwhelmed by the 1954 flood (estimated to have discharged 366 cubic kms of water), such a system is a more cost effective alternative than a single costly dam. Even so, the TGP would only store 31 cubic kms of water, which would be a lower contribution compared to the existing flood management system.

installations. Small hydro-dams provide the most sensible and economically profitable way of producing energy (Khabeishvili, 1994). Smil 1990, points out that minor dams are much more beneficial for development. They provide electricity for local consumption, they require less financial investment and the dams can be constructed in a much shorter period of time.

A desirable alternative would be the construction of smaller hydro-dams, especially for rural populations. China is less urbanized than most other developing and developed countries and by 1986 only 41.4 % of its population lived in urban areas (Liang, 1990:97).[113] Approximately half of the rural population is without electricity yet the TGD is expected to supply mostly urban areas with electricity. Since it is impractical (financially and technically) for small rural towns and villages to be linked to centralized electrical grids from mega-dams, rural population are better served by small hydroelectric dams.

"More than 1 500 of China's 2 133 counties have small hydrostations, and about 800 rely on them for most of their electricity supply." (Smil, 1993:110, see also Paranjpye, 1990b) China has had much success in constructing small hydro-dams as a way to provide rural electricity and as previously mentioned there are about 70 000 working small hydro stations in rural China.[114] These plants provide power without the need for massive reservoirs and they tend to

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[113] For an informative analysis of urbanization in China, see Zhong Feng Liang's M.A. Thesis (1990).

[114] China's impressive record with small scale hydroelectric dams may be due to what Liang (1990) described as its bias against the cities. China may have pursued the construction of these small projects because it wanted to develop the rural interior instead of the coastal cities.

benefit local economies because the electricity is consumed locally (Khabeishvili, 1994).

There are also other benefits to small dams. As already cited in chapter three, research by the Madras Institute of Development Studies has shown that a series of small dams are more efficient and can utilize 90 % of a river's water. Micro-hydroelectric schemes are also less expensive because they require less financial investment and operating costs are lower since they don't have to deal with significant transmission losses and because they can be constructed more rapidly. Again, minor dams are less complicated (technically) and in the case of India or China, can be constructed (if not completely financed) by these countries themselves. Both countries posses the necessary technology and expertise for such projects.

Small-hydro plants do not have strong negative impacts on the environment. Even when a series of smaller reservoirs are combined, submergence areas are relatively small and do not place undo pressures on the local ecology. Their smaller size cause less environmental degradation and just as important, these dams do not require the displacement of large numbers of people. The result is that resettlement cost are low, and local communities can usually absorb those who are dislocated. Those affected also benefit because the dams are set up to serve the local area, not to provide power to distant urban centers. Benefits and costs are borne by the same people and environment. These types of small scale projects require decentralized management and the

participation of local people, as well as encouraging domestic engineering capability.

Problems can arise with small dams as well. Their size leaves them vulnerable to desiccation, when after several years of abnormally low precipitation small reservoirs can dry up. Other factors like forest and environmental degradation often increase erosion, which in turn can rapidly silt up small reservoirs. In China, desiccation and siltation combined, have led to the abandonment of almost 20 000 small dams (Smil, 1993:109). The smaller scale of these projects makes it easier for some of the problems to be overcome. Silt clogged reservoirs may be dredged back to useful life, so although problems may arise from these smaller projects, their more modest scale means that these problems are more easily overcome.

Other potential alternatives described by S. Khabeishvili (1994) may include solar, wind and biomass energy. These renewable energy sources are available today and their environmental impact is much less than current energy sources. Renewable energy production is also less centralized than current hydroelectric, fossil fuel or even nuclear energy production and this may be advantageous for those who propose to democratize energy production and use. With a many scattered renewable energy sources of various types, communities could become responsible for their own energy needs (Khabeishvili, 1994).

Even if we dismiss the fact that the predicted figures in increased shipping traffic is not supported by any studies, improvement in navigation can be achieved in other ways. Other alternatives which the dam authorities accept,

can also increase shipping traffic along the Yangtze. Probe International along with Luk and Whitney 1990, suggest how better traffic control, extended hours, more powerful tug boats and improved barges would increase the amount of shipping on the river. Traffic could triple making the TGP unnecessary and there would be no need to incur dredging expenditures (Luk & Whitney, 1990:97).

Finally, I would like to add a word about multi-purpose projects. As in the Narmada Valley Project, here too we are confronted by the internal contradictions of multi-purpose projects. The various objectives of the TGP (flood control, power generation and improved navigation) require different reservoir levels. The needs of flood protection require a low water level while those of power generation and navigation require the highest levels. Either one of the stated objectives of the dam will be sacrificed or the TGP will have to operate at less than optimum levels.

Summary

China's rapid economic expansion coupled with its over-reliance on coal to meet its energy needs, has provided a powerful incentive to proponents of hydroelectricity. The Three Gorges Dam is seen as a positive step toward tapping into the vast, largely untapped hydroelectric potential of the nation. Reducing the share of energy generated from coal and increasing the proportion of hydroelectric production is a sound policy, yet the long term viability of one large dam, such as the TGD is precarious. Environmental/social economics has

enabled a more accurate representation of the total long term costs of this mega project.

Both national and international supporters of this development project believe it will provide needed flood protection along the lower reaches of the Yangtze and that it will generate approximately one tenth of China's electricity. The TGP will also improve navigation which means that China's less developed interior regions, near the city of Chonqing will benefit from easier access to transportation and trade. The Three Gorges Dam is also expected to increase aquaculture and tourism.

Those opposed to the TGP, question the validity of the figures put forward by dam's supporters and they raise serious concerns over the TGD's true cost. The Yangtze River's ecology will be altered significantly by the 500 to 600 km long reservoir, affecting aquatic life and water quality. The reduced water flow down stream, will contribute to coastal erosion and increase sea water intrusion into the estuary creating problems for irrigation and endangering Shanghai's drinking water. However the greatest impact by far is the involuntary displacement of over 1 million people, a significant social cost. The resettlement scheme will require massive investment and construction to replace the drowned cities and towns, while it is still not certain that any new agricultural land can be found to replace the 14 500 hectares of cultivated land submerged. The negative social and environmental impacts of the TGD are so great that international institutions like the World Bank and the U.S. Bureau of Reclamation have

declined to participate in the project, stating it was neither economically or environmentally feasible.

Finally, a more comprehensive environmental/social accounting procedure has demonstrated how it can more accurately reflect the costs involved in this project. Massive resettlement and environmental costs decrease the viability of the TGP. These realistic figures have not been included in any of the official cost-benefit analysis and they are largely ignored by the proponents of the dam. The inclusion of such costs in the cost-benefit analysis of the TGP, would more clearly demonstrate how nonviable the project is environmentally, socially and economically. While it is accepted that China is in need of electrical energy, it is possible that other energy generation alternatives could more economically and environmentally viable.

Chapter 5

SUMMARY and Conclusion

In this thesis I have attempted to provide an overview of the cost-benefit analysis involved in large-scale development projects through a review of the theoretical debates, as well as by examining the Narmada Valley Project and the Three Gorges Dam. I provided a summary of the diverse and opposing camps of environmental supporters and their criticism of conventional economic models of development. Most importantly I examined the basic tenets of environmental/social cost-benefit analysis. Furthermore, since all of these debates have occurred within the development framework I found it necessary to explore the evolution of development models since the mid twentieth century, from initial economic growth theories to contemporary sustainable human development models.

During the last five decades or so development based on the economic growth model has evolved into a much more whole encompassing framework of human development. Originally this economic development model was centered on economic growth, it concentrated on the expansion of the cash economy and rested on the idea that development was to be perceived in strictly economic

terms. In an effort to mimic past Western development, economists and development experts emphasized economic growth as being the key avenue toward overall development for the developing countries. However as the quality of life in the developing world failed to keep pace with growth, the model's imperfections became more apparent.

The economic growth model has been subjected to much criticism. It has been problematic because it has largely ignored other aspects of development and it has assumed that social and political development would spring from economic development. Furthermore, it has failed to incorporate the diversity of the developing world and the peculiarities of the modern era. Another problem with the economic growth model of central importance to this thesis, is in its utilization of natural resources and its perception of the environment as valueless when it is not being exploited.

The earlier economic growth models have demonstrated their inclination towards short term returns and have not appreciated the ecological linkages within the economic cycle. They also failed to incorporate social impact assessment into economic analyses. I discussed how such conventional economic models have not been able to fully address, the complexities of the ecology-economy cycle even while environmental awareness and the momentum toward sustainable development has grown. After many years of scholarly discussion and activism, the United Nations now calls on sustainable development for achieving human development, a more broadly based development, where social services like education, health and the elimination of

poverty replace maximizing the economic growth rate as the major development objective.

Sustainable development allocates a higher priority to the welfare of human beings. It does not call for the total rejection of market economics, but rather that social, ecological and natural resource implication must be included in both policy and project evaluation. By introducing intergenerational concerns and internalizing all impacts brought on by development activities, development policies and projects may attain greater long term viability. It is for these reasons that sustainable development is the best approach for working within the framework of human development.

Since the seventies there has been an enhanced awareness of our environment, where air pollution, water pollution, waste disposal, the degradation of farmland, coastal areas and other ecosystems, have all become important issues. Alarmed by the effects of environmental degradation an environmental movement took root in the developed world and there was a growth in the politicization and globalization of environmental concerns. Apart from the growing scientific data, the environment became a national and international concern because its continued degradation was having a negative impact on the citizens of the developed world. Increased politicization of the environment and the interdependent global nature of pollution intensified public pressure. It was the environmental threat posed to the self interest of the developed countries which politicized this issue internationally.

Although the politicization and acceptance of social impact assessment within economic analysis has coincided with similar developments in environmental impact analysis, it can be characterized as even more of an afterthought. The politicization of social costs has been only belatedly addressed because of the efforts of environmentalists. It is they who have introduced concerns for social impacts as a strategy to strengthen their case for protecting the environment. Environmentalists have often pointed to the considerable social costs which are endured by the powerless and voiceless communities who are primarily affected by the consequences of large-scale development projects. Even though social cost analysis has gained credibility, its implementation has fallen short when projects deal with more marginalized groups. Social accounting has been less successful than environmental accounting because there has been less pressure for the inclusion of social accounting in economic analysis. Internationally, there has been less solidarity between North and South on this issue because the citizens in the developed world are less threatened by the social costs inflicted on the peoples of the third world. Clearly this issue is not as interdependent as the environment. It is due primarily to such realities that the social cost-benefit analysis within this thesis has been imperfect.

All this has raised the issue of how we are to deal with the negative consequences (like acid rain, nuclear accidents, waste-disposal and water scarcity) of economic development. These issues have generated three schools of thought within sustainable development, on how to respond to

environmental degradation and continued development. The ecologically centered approach calls for an end to economic growth, the market-based approach seeks to accommodate both growth and the environment and the neo-marxist approach proposes monumental change in the existing world system.

The ecologically-centered approach proposes zero economic growth to help stop environmental degradation. Preserving the environment supersedes most other consideration including human welfare. Such a strategy is diametrically opposed to the workings of the international capitalist system and it is deeply unattractive to developing countries as well. Forgoing economic growth would result in an immediate deterioration in the quality of life for millions of people, especially in the developing world. Next to impossible to implement, this impractical approach expects individuals to protect the environment even if doing so threatens their immediate welfare.

The market-based approach sees continued development as the best strategy to preserve the environment. Environmental and social problems can be overcome with the help of economic growth and technical advancement. This approach is flexible enough to allow for its continued improvement. The market-based approach is able to accommodate calls for the reform of economic valuation procedures like cost-benefit analysis. Its adaptability to global circumstances and acceptance by international capital or institutions like the World Commission on the Environment and Development make the market-based approach the most pragmatic alternative available.

The neo-marxist approach compels those involved in development to come to terms with the inequality which exists between the North and the South However this approach is not very practical because it argues, success will only come about if the global economy is fundamentally restructured. Revolutionary changes are required for this model to succeed.

In the final analysis, abandoning economic growth (the ecological-centered approach) or calling for nothing less than a revolutionary change in the global economy (the neo-marxist approach), is a non-starter because it would be economically and politically impossible in both the North and the South. Even attempts at formulating entirely new non-monetary indices prove exceedingly experimental and have yet to gain acceptance in development or financial circles. Therefore we should attempt to include sustainability into development theory through resource accounting and environmental/social cost-benefit analysis and this can be accomplished within the market-based approach.

In practice, for sustainable development (via the market-based approach) to function properly and for it to be more easily accepted by the international economic system, it could rely on an improved cost-benefit analysis which includes environmental and social factors. This type of analysis could recognize that changes from development projects have social, economic political and environmental implications, which could at the very least be estimated. Being problematic at times, the valuation of the environment has generated debate among economists, environmentalists and even philosophers. Economists have argued that attempts at calculating environmental costs would be unscientific

and would reflect personal value judgments. On the other hand some environmentalists consider the ethics and ideology of cost-benefit analysis as deeply flawed, because any attempt at characterizing a multidimensional variable like the environment with a one-dimensional (monetary) index, is not possible. From opposite ends of the spectrum both these camps decry the theoretical difficulties of valuation.

However, assigning no monetary value to environmental attributes, whether by economists or environmentalists, fails to provide an appropriate value for the environment in cost-benefit calculations. Not indicating any value for the environment for whatever ideology, in reality results in an ascribed economic value of zero and this has been problematic for viable long term development. The current world system with its public and private actors, work within the market paradigm. Therefore pragmatic attempts at improving cost-benefit analysis within this system may be more successful at reducing environmental decline because they do not necessarily conflict with the interests of powerful groups.

Putting a price on human impacts, the environment and expanding conventional cost-benefit analysis could be the most influential and productive way of conserving the environment and fostering sustainable development in the South. This inclusion of more comprehensive variables has generated uneven support. At the international level it appears that environmental accounting has gained more support and gone farther than social accounting due to the greater interdependent nature of ecological impacts. Nevertheless, improving cost-

benefit analysis remains a useful route for future project evaluation. Used in the field of international development for decades, cost-benefit analysis has proven to be a practical tool for comparison and evaluation, even though its current form is rife with ecological shortcomings. An Environmental/ Social Cost-Benefit Analysis which is fully integrated into the project development process from the beginning, may help to anticipate and avoid problems, increasing the viability of mega-projects.

Development projects and policies often bring about negative consequences for particular citizens and this raises ethical issues. Often times those individuals and communities who incur the costs of a development project do not necessarily share in any of the benefits. Ultimately if a project's gains are greater than the losses it may generate and if those negatively effected are compensated then the ethical dilemma is considerably reduced. In practice, so long as individuals are 'adequately' compensated our ethical values do not conflict with the right of Eminent Domain for governments, even if those expropriated are unwilling participants. Evidently, both compensation and environmental/social cost-benefit analysis can contribute to the resolution of some of the ethical problems. By reducing social and environmental costs from development projects through the introduction of more sustainable development methods, the size and gravity of the negative consequences can be diminished.

Since my interest lies in the developing world, I chose to examine the debates about environmental and social analysis with respect to two of the most controversial mega-projects, these are the Narmada Valley Project in India and

the Three Gorges Project in China. They provided to a large extent concrete examples of colossal development projects which involved the international community and they also provided the opportunity to put environmental/social cost-benefit analysis to the test. We needed to see environmental/social cost-benefit analysis applied to practical cases or else it would have simply been a theoretical exercise. Secondly, it was more informative to use different cases to study environmental/social cost-benefit analysis at work in the distinct circumstances of India and China.

Bearing in mind that the level of democracy varies from country to country, Environmental/Social Cost-Benefit Analysis measures may be limited. In practice, given governments and political situation are diverse, so even when we come up with a promising model it is necessary to examine whether it can be called upon to work everywhere. India is a place where democracy is practiced and it has a history of community level protest, while in China channels of expression for local people are more restricted. Each of these nations provide us with an opportunity to explore the cost-benefit analysis of development projects in the context of the developing world.

The Two major dams in the Narmada Valley Projects in India, the Sardar Sarovar and the Narmada Sagar are predicted to provide benefits in the form of irrigation and electricity. Although the figures are disputed, at best these two multipurpose projects combined may irrigate almost 2 million hectares and have an installed hydroelectric capacity of 2 450 megawatts. Most importantly these development projects should provide drinking water, irrigation and electric power

to 40 million people, and hope to bring improved prosperity into the region. The Narmada Valley Project will provide valuable electricity which is required by the industrial sector for manufacturing and the project will supply water to cities and communities, and provide irrigation to drought prone areas. There are other projected benefits as well: the dams will moderate flooding, improve navigation, increase pisciculture and create new recreation facilities.

Critics charge that the costs of the Narmada Valley Project exceed all of the possible benefits. Apart from disputing the figures as was seen in the chapter, the Narmada Valley Project will create tremendous environmental and social costs, directly or indirectly. It will submerge approximately 130 482 hectares of land inflicting a great environmental impact on the valley as forests, farmland and animals are lost. The supposed benefits from the dams may lead to salinization and soil degradation while the reservoir may induce earthquakes. The social costs brought on by this development project proved just as daunting, when it was uncovered that the submergence of about 500 villages and the displacement of approximately 270 000 people in the Narmada Valley will cause massive economic, social and cultural disruption. Furthermore, the unfair nature of resettlement in this case is raised since public participation and consultation was dismissed and it is questionable if any adequate compensation for those displaced will be forthcoming.

The Three Gorges Dam in China is to provide needed flood protection along the lower reaches of the Yangtze and it will generate approximately one tenth of China's electricity. The Three Gorges Dam will be the largest civil

engineering project of the modern era. The government expects it will protect millions of people from flooding; generate up to 18 000 megawatts of hydroelectricity; improve navigation and increase aquaculture and tourism. Furthermore, China's rapid economic expansion coupled with its over-reliance on coal to meet its energy needs, has provided a powerful incentive to proponents of hydroelectricity. The Three Gorges Dam is seen as a positive step toward tapping into the vast, largely untapped hydroelectric potential of the nation. Reducing the share of energy generated from coal and increasing the proportion of hydroelectric production is a sound policy, which could be beneficial for the global environment.

Once again, critics of this particular project dispute most of the figures put forth by the dam's supporters and they raise serious concerns over the true cost of the Three Gorges Project. The impact from the mammoth reservoir (almost 600 kms long) which is about as long as lake Superior, will alter the Yangtze river ecology, affecting aquatic life and water quality. The reduced water flow downstream, will contribute to coastal erosion and increase sea water intrusion into the estuary creating problems for irrigation and drinking. However the greatest impact by far is the involuntary displacement of over 1 million people, which will require massive construction to replace the cities and towns submerged. The negative impacts and costs of the Three Gorges Dam are so great that international institutions like the World Bank have declined funding for the project.

Environmental/social economics would have enabled a more accurate representation of the total costs for both these mega-projects and it also would have raised questions about their actual long term viability. By internalizing all impacts brought on by development activities, a more accurate cost-benefit analysis could have been attempted. Environmental and social cost analysis would have uncovered the ecological and human implications of these two development projects at the policy formulation stage and not during construction. Wasteful spending could have been reduced and massive human costs could have been avoided. In reality massive human resettlement and environmental costs have decreased the viability of both dams. These realistic figures have not been included in any of the official cost-benefit analysis and they are largely ignored by the proponents of the dams. The inclusion of such costs in the cost-benefit analysis of the Narmada Valley Project and Three Gorges Dam, would more clearly demonstrate how nonviable the projects are environmentally, socially and economically.

In both cases the cost-benefit analysis and environmental studies have been included or tagged on almost as an afterthought to a decision which can be described as virtually political and has little to do with real economic or environmental analyses. In either development project for instance the social costs have been considerably understated. Both megadams raise environmental and resettlement concerns and are being constructed in areas whose people generally wield little political or economic power. India and China provide us with two examples of not just geographically diverse situations, but two politically

diverse situations. Although we have come across corruption in India, there still is considerable public freedom enjoyed by Indians and this is not the case in China. It so happens that both the India and China case studies have reinforced the pattern, that megadams are constructed not only in poor areas but more importantly in disempowered areas. The relative public freedom found in India enables local opposition to organize even against serious harassment and state corruption. In time, local people were slowly empowered and they protested and fought back. This is not the case in China. The Chinese people affected have yet to be empowered and they are unlikely to protest against the state authorities. There is less history of protest or even significant press freedom in China which could help channel opposition to the dam, unlike India.

Finally, can environmental/social accounting be economically feasible for developing countries? Although these countries may judge it not to be in the short term, my analysis supports the claim that in the long tern it is beneficial. It is to the advantage of developing countries, that projects and programs be evaluated in terms of their full economic, ecological and social cost, even though these countries may experience immediate economic disincentives. Conventional economic cost-benefit analysis, misrepresents the true cost to these nations for their particular projects, costs which these nations will inevitably have to pay. The professional analysis which has been conducted in both India and China is not the kind of cost-benefit analysis which I have recommended. I believe an improvement to conventional cost-benefit analysis would protect the environment and bring about sustainable human development.

For the most part, developmental institutions and international agencies, have been slow to incorporate environmental/social cost-benefit analysis into their project designs and evaluations. This could be overcome if environmentalists and development experts hammer out a comprehensive and workable framework for environmental/social cost-benefit analysis.

An improved environmental/social cost-benefit analysis may at least make alternative solutions to the Narmada Valley Project and Three Gorges Dam more attractive. The purpose of such an analysis is not to obstruct the construction of unpopular or politically incorrect megaprojects, it is to provide a more accurate evaluation and improve the long term viability of these projects. At the very least environmental/social cost-benefit analysis may put other alternative projects such as solar, wind and biomass energy production in a favourable light. These decentralized renewable energy sources are currently available and their environmental impact is much less than the prevailing energy sources. This may spur a reallocation of scarce resources in the developing world and could contribute to more sustainable development. It is likely that the demands which led to the construction of both these megadams could have been (and still be) met by alternative schemes.

Both India and China could significantly reduce their electricity shortages by modernizing their energy inefficient economies. Improvements to energy efficiency in both countries would free up massive amounts of power but if new generating stations were still required, small-hydroelectric dams would be more beneficial for sustainable development. They provide power without the need for

massive reservoirs, they tend to benefit local economies and small dams can also be built to provide irrigation. Apart from the reduced environmental impact due to the smaller size of these types of dams, they do not require the displacement of large numbers of people. Many in the submerged population can be absorbed by nearby villages and those affected also benefit from the smaller dams, since they are installed to serve the local area. We have seen how inimical displacement and resettlement can be for human development, while the magnitude of resettlement in these case studies has also demonstrated the nonviable economic costs involved.

In conclusion, there has been a lack of input from disciplines like sociology and project appraisal is still dominated by other disciplines. Anthropology, ecology or sociology are essential to an environmentally and socially sound cost-benefit analysis, yet these disciplines are marginalized from the formulation of development schemes. Increasing the contributions these disciplines bring to project planning and training people with multidisciplinary skills, could produce more sustainable development because they would be better able to appreciate the gravity, environmental and social factors have on human development.

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