

# Population, Environment and Poverty in Pakistan: Linkages and Empirical Evidence

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***Abstract:** This study explores the interlinkages among population, environment and poverty and presents empirical evidence in a developing country like Pakistan. It gives alternative views on population-environment linkages. It explains poverty trap, market based harmony, and dual effect of poverty on the basis of a link between population growth and natural resource degradation. In addition, the paper also highlights social and political instability through population-poverty-environment spiral. It also presents empirical evidence on population-environment-poverty nexus in Pakistan. It also compares environmental sustainability index and human development index for selected Asian countries. The paper also gives scores for different components of environmental sustainability index for Pakistan and compares these with India. The paper concludes that the causal relationship between poverty and environment works in both directions, often through changes in GDP and population. Population stress does not have any significant direct effect on all aspects of environmental status in Pakistan.*

## I. Introduction

The twentieth century has been a century of unprecedented population growth, economic development and environmental change. From 1900 to 2000, world population grew from 1.6 billion to 6.1 billion persons (United Nations, 2001). However, while world population increased close to 4 times, world real gross domestic product (GDP) increased 20 to 40 times (DeLong, 1998), allowing the world not only to sustain a fourfold population increase, but also to do so at vastly higher standards of living. Nevertheless, this rapid population growth and economic growth occurred unevenly throughout the world and not all regions have benefited equally from economic growth. Moreover, population growth and economic development occurred simultaneously with increasingly unsustainable utilization of the earth's physical environment.

Discussion of the interrelationships among population, environment and economic development long precedes the writings of Thomas Malthus in the late eighteenth century. The recurrent theme was the balance between population and natural resources conceptualized as means of subsistence or, more concretely, food and water. Not all theorists saw population growth in a negative light. In particular, mercantilist ideas in Europe during the seventeenth and eighteenth century saw the positive aspects of large and growing populations and favoured policies to encourage marriage and large families. Today, members of the Julian Simon School also emphasize the positive aspects of large and growing populations (Simon, 1981, 1990, 1996).

Deliberations and actions of the United Nations in the area of population, environment and development began at the founding of the Organization. This topic was the focus of an important debate, at the first meeting of the Population Commission in 1947. In the early years of the United Nations, when world population was slightly more than a third of its present size, environmental issues in relation to population and

development tended to be framed in terms of the natural resources needed to sustain population growth and economic development. In the 1960s, there was an increased awareness that global population growth had reached unprecedented high levels, a situation that many studies and debates treated as a matter of grave concern.

The United Nations Conference on Environment and Development held in Rio de Janeiro, Brazil, in 1992 was a milestone in the evolution of an international consensus on the relationships among population, development and environment, based on the concept of *sustainable development* articulated a few years earlier by the World Commission on Environment and Development. The Commission had defined sustainable development as development that “meets the needs of the present without compromising the ability of future generations to meet their own needs”. The Rio Declaration on Environment and Development identified population policies as an integral element of sustainable development. These issues were revisited at the International Conference on Population and Development held in Cairo in 1994. Forging a balance among population, sustained economic growth and sustainable development was the central theme of the Cairo conference. Population factors were seen, sometimes, as inhibitors of sustainable development: “demographic factors, combined with poverty and lack of access to resources in some areas, and excessive consumption and wasteful production patterns in others, cause or exacerbate problems of environmental degradation and resource depletion and thus inhibit sustainable development” and “pressure on the environment may result from rapid population growth, distribution and migration, especially in ecologically vulnerable ecosystems” .

The United Nations Conference on Human Settlements (Habitat II) was held in Istanbul, Turkey, from 3 to 14 June 1996. Population, environment and development interrelationships received extensive treatment, particularly as they related to issues of urbanization. The Istanbul Declaration on Human Settlements recognized both unsustainable consumption and production patterns and unsustainable population changes as being among the factors that needed to be addressed in order to improve the quality of life within human settlements. Specific reference was made to changes in structure and distribution, especially the tendency towards excessive population concentration (UN, 2001).

It took all of the human history until 1830 for world population to reach one billion. The second billion was achieved in 100 years, the third in 30 years, the fourth in 15 years, and the fifth billion only in 12 years. Today, the world’s population is approximately 6.5 billion and grows by nearly 80 million people each year. The world population is expected to grow to 9.1 billion by 2050 (Govt. of Pakistan, 2006).

Population dynamics, poverty and environmental change are linked through multiple social and economic mechanisms. This paper identifies policy issues among various conceivable linkages. It considers both the environmental issues regarding the management of natural resources and those regarding the pollution of humankind’s living quarters. The paper also highlights the complexities in testing the linkages among population, environment and poverty in developing countries with special references to Pakistan.

## **II. Linkages between Population and Environment<sup>1</sup>**

There are alternative views on population-environment linkages. Most theories of

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<sup>1</sup> This section heavily draws on Marcoux (1999).

population and environment are expounded primarily in relation to agricultural resource usage, but they can be applied *mutandis mutatis* to all types of natural resources. For the *natural science* perspective humankind is one of the many species competing for the resources of the biosphere. As the resources of any ecosystem are finite, so is the latter's carrying capacity; hence, beyond a point, each additional inhabitant has a negative impact on the productivity of resources; this in turn depresses labour productivity and incomes (Figure-1). Policy-wise, this perspective leads to advocate population stabilization. At first sight, it thus seems redundant with policy prescriptions that emphasize the need to slow down population growth for the sake of enabling more productive investment and a higher rate of economic growth (Mishra, 1995; Marcoux, 1994, 1999; Bojo and Reddy, 2001; UN, 2001).

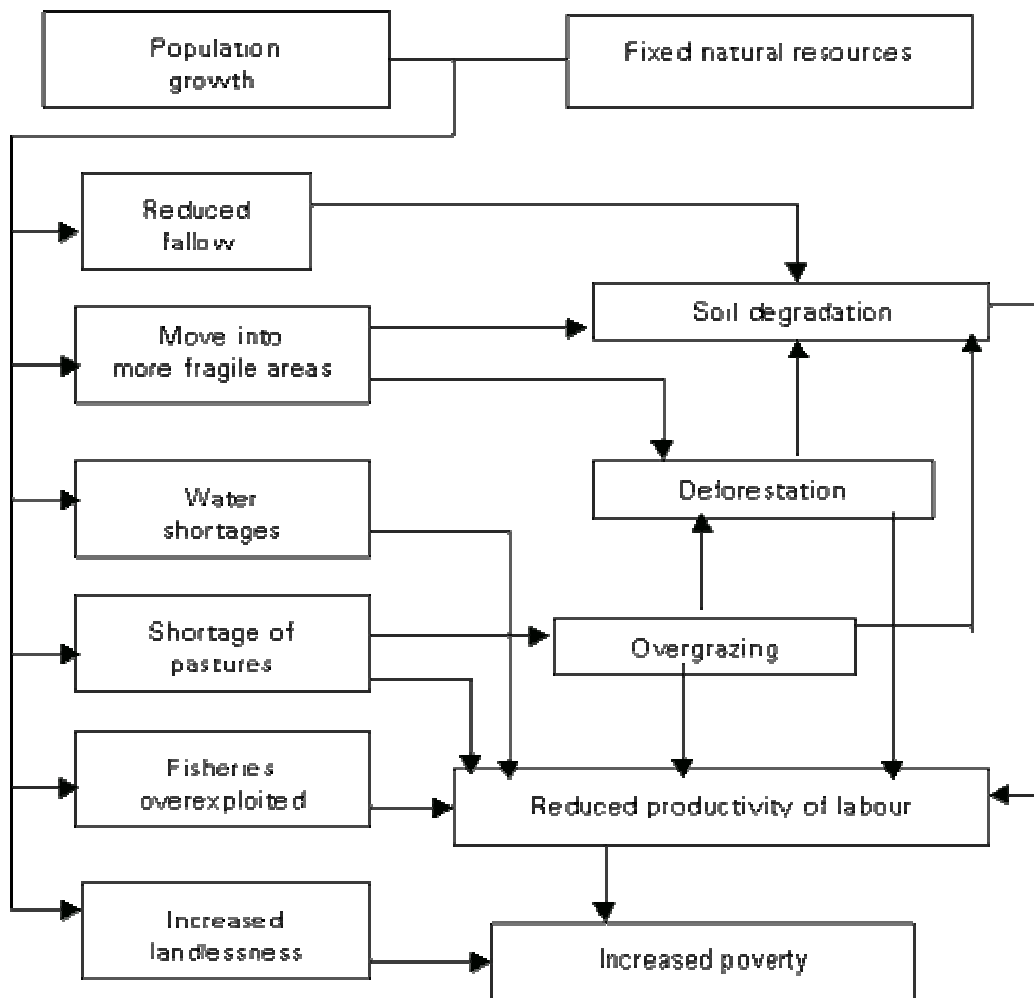


Figure 1: Population Growth and Natural Resources: Poverty Trap

That, however, is not exactly the case. This perspective proposes that population growth must be stopped as soon as possible: this drastic goal is a logical consequence of explicitly raising the issue of the scale of human interaction with the environment (and therefore of limits to economic growth). Such a goal is not much on national agendas yet. The largely accepted policy merely seeks a slowdown; in fact, many of its proponents

concede that slow population growth helps stimulate the economy, and they avoid addressing the long-term view and the difficult question of an eventual upper limit to population size. The fate of natural resources and the environment is absent from this perspective, but the concept of sustainable development now imposes a re-examination of the problem.

In fact, the two ideas (stabilizing population to protect the environment versus slowing population growth to foster more rapid economic growth) are at sharp variance. The problem is that economic growth, even coupled with slower population growth or even population stabilization, other things being equal, brings about greater environmental damage (Marcoux, 1999).

This view also recommends a balanced population distribution, i.e. a more even pressure on natural resources. It is difficult to make much of that policy-wise. First of all, the population of a given territory can exert very different degrees of pressure on land, water, biomass, and other resources, because those may be present in different quantities and qualities. Some concepts may be of help here, for instance the "potential population-supporting capacity" (PPSC). But human pressure also depends on resource-specific patterns of use, which also vary across space, cultures etc. Equalizing degrees of resources exploitation depends on much more than population distribution, because non-resident populations participate in that exploitation (e.g. urban dwellers require agricultural products or water - in greater quantities than rural people - so they too exert a pressure on rural resources). In sum, this policy recommendation is potentially very relevant, but it requires conceptual deepening and the development of appropriate methods of analysis (Higgins et al., 1982; Marcoux, 1999).

A major source of criticism to the natural science view is based on neo-classical economics and market-based adjustment mechanisms (Figure-2). In this framework natural resources degradation is not necessarily a problem, since resources can be depleted at an acceptable rate, i.e. one that allows the market to replace those resources by alternative ones for the future ("efficient depletion"). Excessive degradation also may happen, either as a temporary consequence of population growth while adaptations take place or as a structural problem where markets do not work efficiently (because some resources are not privately held and because prices do not reflect the scarcities and "sustainable values").

The policy prescription deriving from the neo-classical perspective is to give full efficiency to the market, meaning: define and price the use of common property resources; do not subsidize the exploitation of natural resources; and let the market, not the government, allocate resources. In this view population policy may "buy time", but it is not a "proper solution". This perspective leaves no role for population policies and programmes.

A third perspective (sometimes labeled *political ecology*) argues that environmental degradation and rapid population growth are both consequences of poverty (Figure-3). In this framework, resource degradation is the result of poor farmers eking out a living in marginal areas, with few resources and an inappropriate technology. Distortions in social structures, particularly unequal land distribution, inequitable relationships between landowner and tenants, limited access to credit, and biases in technology against small peasants, are designated as culprits. This perspective descends from the theory of dependency, which sees environmental degradation as the result of

changes in production systems and societal relations, mostly induced by the exploitation of the "center" over the "periphery".

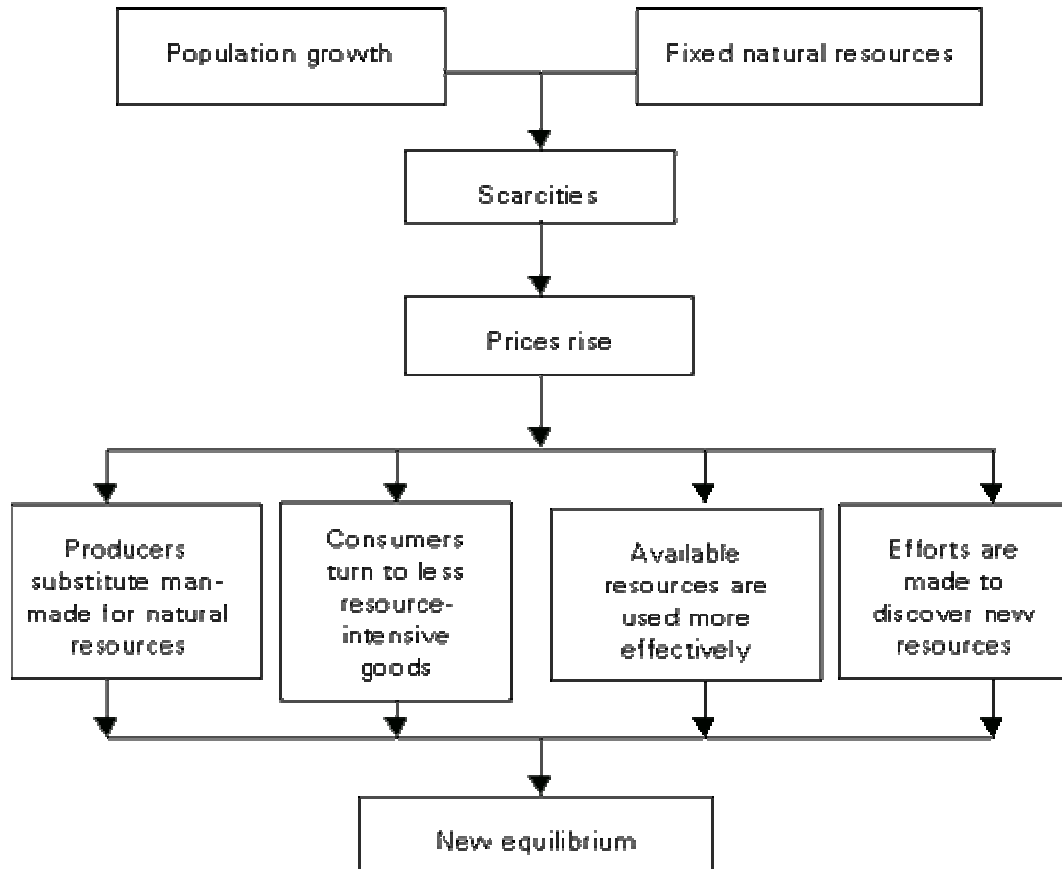
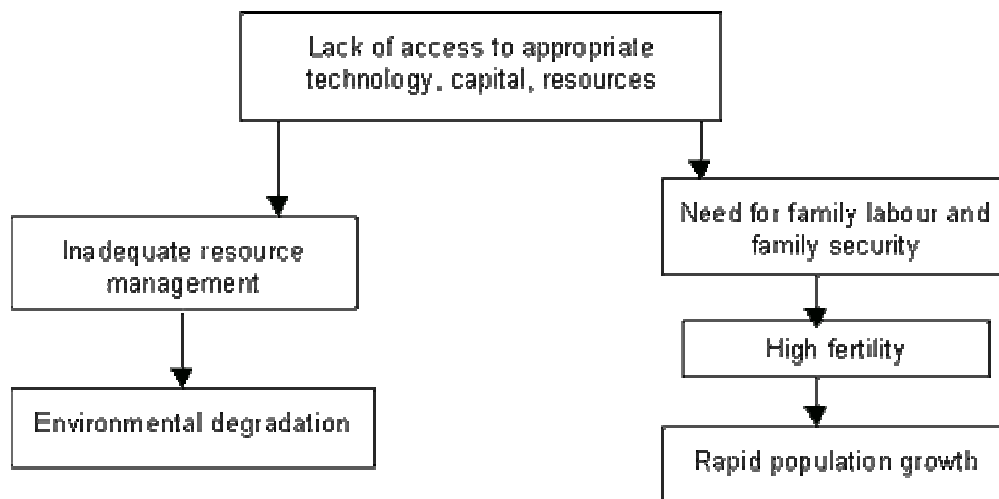


Figure 2: Population Growth and Natural Resources: Market Based Harmony



### Figure 3: Population Growth and Natural Resources: Dual Effect of Poverty

Policy-wise, this line of thought sees usefulness neither in population policy nor in mere technical interventions that it regards as inefficient as long as the "real" factors of degradation are not addressed. Environmental degradation is a result of the dynamic interplay of socio-economic, institutional and technological activities. Environmental degradation may be driven by social factors (population growth, poverty and urbanization), economic factors (market failures and poorly functioning markets, divergence between private and social discount rates, poorly or improperly defined property rights, the level and pattern of economic development, transport activities, impact of agricultural development on environment, etc.) and institutional factors including weak collaboration among various governmental and non governmental organizations. Thus, the real factors of degradation include economic growth, population growth, urbanization, intensification of agriculture, rising energy use and transportation. Poverty still remains a problem at the root of several environmental problems. Therefore, it advocates poverty alleviation, through a more equitable distribution of resources and the redressing of distorted relations both within developing societies and between countries. This policy conclusion is entirely redundant, since the objective of poverty alleviation imposes itself on mere grounds of human rights, without any need to assume that it is the single most effective manner of tackling environmental problems.

Unlike natural resource degradation issues, there has been little analysis of the role of population dynamics in pollution. Soil, air and water pollution is mostly urbanization- and industry-related: rural pollution by agricultural chemicals (or local mining or industrial activities) is limited if compared to industrial wastes from urban areas; domestic wastes are a much more serious problem in urban areas than in rural ones because they are emitted in much higher quantities on a per capita basis; and population concentration plays a specific role in that it physically makes the dispersion of pollutants in the air or water much more difficult. Incidentally, agricultural intensification is urbanization-related when it responds to a need for supplying growing quantities of food for the cities with a dwindling rural labour force.

The above review seems to tell us that single-minded perspectives do not help very much in understanding the issues - nor in designing appropriate policies in response.

Population dynamics must be taken into account, and it must be regarded as more than an exogenous variable: two-way linkages between population change and other elements of the system must be recognized. A systemic view of the "linkages" is therefore needed. This being said, what specific, self-standing policy recommendations can we reasonably sustain?

#### **A Policy Analysis Perspective**

How should policy analysis orient itself in the "population-poverty-environment nexus"? The negative view of a nexus is that the elements are linked in a vicious circle, so that people are caught in a deadlock if not in a downward spiral. Figure 4 is a simplified image of one such nexus.

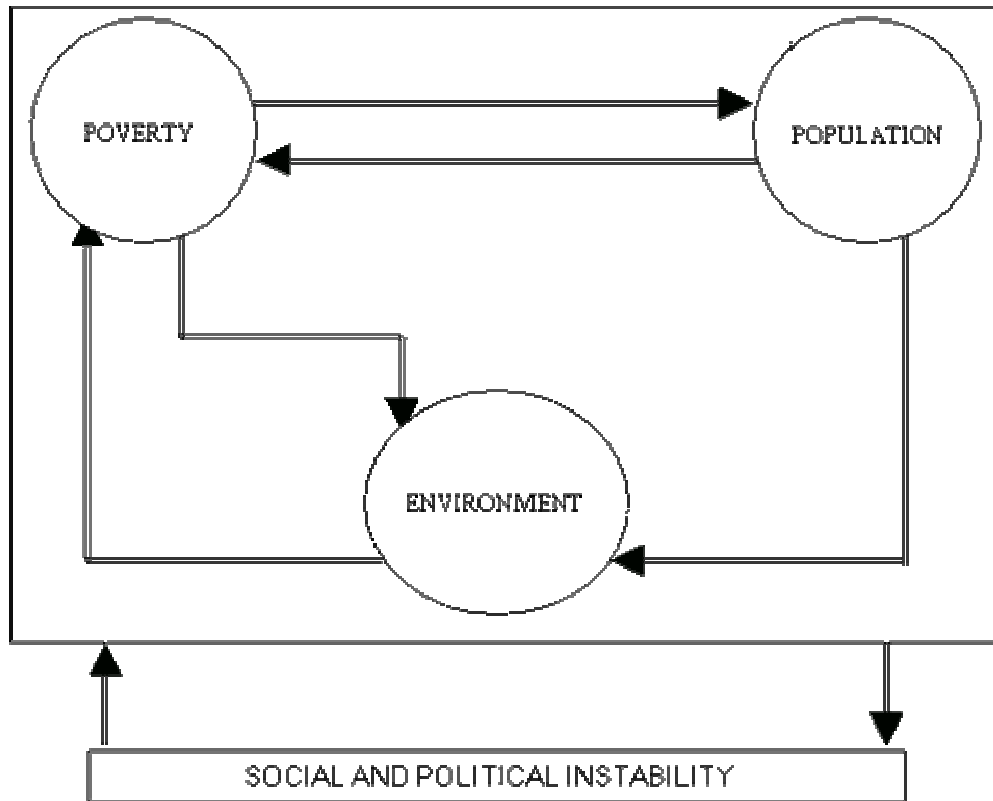


Figure 4: The Population-Poverty-Environment Spiral

The detailed linkages in Figure 4 are given as follows:

*How poverty affects population?*

- i) High child death rates lead parents to compensate or insure by having more children. Crude birth, crude death and infant mortality rates are 26.1, 8.2 and 77 per thousand persons in Pakistan. This assumes serious implications for the country as the population still has growth rate of about 2% annually. Currently, Pakistan ranks 6 in terms of population in the world (Govt. of Pakistan, 2006).
- ii) Lack of water supply, fuel and labour-saving devices increases the need for children to help in fields and homes. Only about 30 percent of the population has access to piped drinking water, which has been rarely completely tested for safety. Seventy percent of our population drinks water of unknown quality (Daudpota, 2005). Similarly, lack of fuel, gas and electricity as source of rural energy in Pakistan also enhances demand for more children.
- iii) Lack of security in illness and old age increases the need for many children as there is no proper social security scheme in the country.
- iv) Lack of education means less awareness of family planning methods and benefits, less use of clinics. The official statistics show that the literacy rate in the country is 54% which is much less than many developing countries.
- v) Lack of confidence in future and control over circumstances does not encourage planning - including family planning.
- vi) Low status of women often associated with poverty, means women often uneducated, without power to control fertility.

*How population affects poverty?*

- i) Unemployment, low wages for those in work, dilution of economic gain.
- ii) Increasing landlessness - inherited plots divided and subdivided among many children.
- iii) Overstretching of social services, schools, health centres, family planning clinics, and water and sanitation services.

*How poverty affects environment?*

- i) Difficulty in meeting today's needs means that short-term exploitation of the environment must take priority over long-term protection.
- ii) Lack of knowledge about environmental issues and long-term consequences of today's actions.

*How environment affects poverty?*

- i) Soil erosion, salination, and flooding cause declining yields, declining employment and incomes, loss of fish catches.
- ii) Poor housing, poor services and overcrowding exacerbate disease problems and lower productivity.

*How population affects environment?*

- i) Increasing pressure on marginal lands, over-exploitation of soils, overgrazing, and excessive deforestation and over depletion of other natural resources.
- ii) Soil erosion, silting, flooding.
- iii) Increased use of pesticides, fertilizer, water for irrigation- increased salination, pollution of fisheries.
- iv) Migration to overcrowded slums, problems of water supply and sanitation, industrial waste dangers, indoor air pollution, mud slides.

The positive view of a nexus is that progress in one of the interlinked sectors is likely to generate positive effects on the others. For example, efforts to slow down population growth, to reduce poverty, to achieve economic progress, to improve environmental protection, and to reduce unsustainable consumption patterns are mutually reinforcing. Similarly, eradication of poverty will contribute to slowing population growth and to achieving early population stabilization. But it also adheres to the common wisdom that sustained economic growth is essential to eradicate poverty. On the other hand, rapid population growth is an obstacle to sustained economic growth.

### **Population, Environment and Poverty in Pakistan**

As mentioned earlier, population and environment are closely intertwined in a complex and dynamic relationship. The relationship between population and environment is mediated by a number of socioeconomic, cultural, political, and developmental variables whose relative significance varies considerably from one context to another. Over the past three to four decades, some economists, biologists, and environmentalists have been debating the role of population in environmental degradation.

#### *Population Increase in Pakistan*

At the time of independence in 1947, 32.5 million people lived in Pakistan. By 2006-07, the population is estimated to have reached 156.77 million. Thus, in roughly

three generations, Pakistan’s population has increased by 124.27 million or has grown at an average rate of 2.6 percent per annum. While Pakistan has more mouths to feed, more families to house, more children to educate, and more people looking for gainful employment, the high population also represents an abundance of labour which can be used for productive purposes. The large population also represents a large potential market for goods and services. This large consumer base with increasing disposable income may attract even more foreign investment. The interest in relationship between population change and economic growth has reignited in Pakistan which is experiencing declining fertility and mortality rates and therefore declining growth in population. Consequently, Pakistan is witnessing changes in age structure with proportion of working age population increasing and offering a life time window of opportunity to turn demographic transition into demographic dividend. Demographic transition consists of three phases resulting from the lag between changes in fertility and mortality. The demographic dividend is defined as “transition from a largely rural agrarian society with high fertility and mortality rates to a predominantly urban industrial society with low fertility and mortality rates”.

As shown in Table 1, the Population Census data depicts two phases of demographic transition. During the first phase when fertility rates were higher, the share of young age (0-14) population continued to rise thereby creating bulge in young age population while the share of prime age (15-59) continued to decline until 1981. Pakistan appears to have entered the second phase of demographic transition from 1981 onward as it has witnessed a secular decline in fertility rate from 6.0 to 3.8 resulting in the rise of the of working age population and consequent decline in the share of dependent population (see Table 1 and Fig. 5). Theoretically, therefore, Pakistan’s long term growth potential should be a function of factors such as demographics, physical capital stock and productivity.

**Table 1. Demographic Transition in Pakistan (%)**

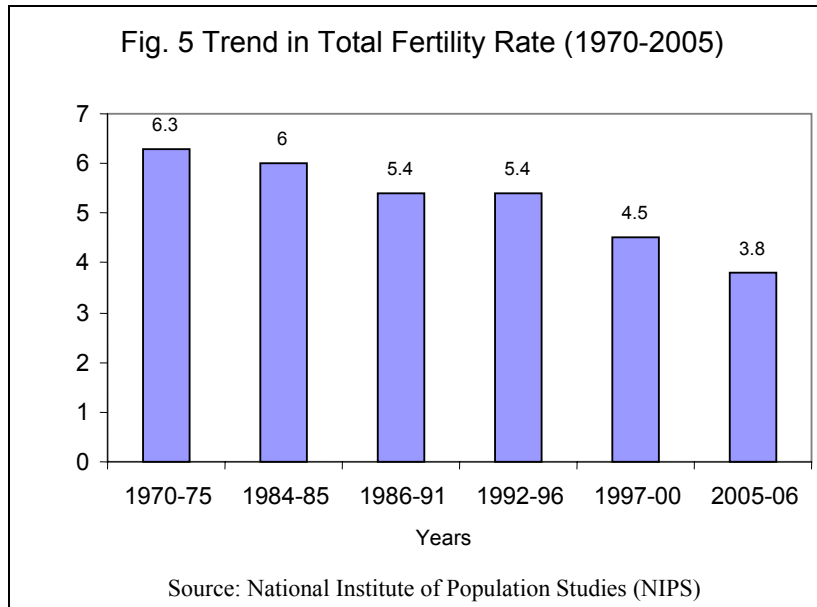
Census <sup>a</sup>	Young (0-14 age)	Prime (15-59 age)	Old (60 + age)
1961	42.4	50.6	6.9
1972	43.8	49.2	7.0
1981	44.5	48.5	7.0
1998 <sup>b</sup>	43.4	51.1	5.5
2006 (E)	36.8	57.2	6.0

Source: various Economic Surveys & P&D Division

<sup>a</sup> The years in Table 1 are calendar years.

<sup>b</sup> No census was conducted between 1981 and 1998.

Pakistan is currently passing through the demographic transition phase which provides a window of opportunity to convert this transition into demographic dividend. Empirical evidence support the fact that Pakistan is in the second phase of demographic transition as more resources are available for investment , economic growth is accelerating and per capita income is rising at a faster pace. In other words, Pakistan has already started reaping its first dividend on the back of a large-scale spending on social sector (education, health, vocational training, etc.) over the last several years.



The demographic dividend being currently experienced in Pakistan is affecting growth through the mechanisms of labor supply, saving and human capital in conjunction with rising per capita income, growing middle class, availability of consumer credit, inflows of workers remittance and rising exports (foreign demand). These are fueling consumption demand leading to the expansion of domestic markets. The growing domestic demand is being met through various booming sectors of the economy such as agriculture, manufacturing and services. As such, the strong domestic demand leading to the expansion of domestic market has emerged as a key driver of economic growth and is supporting the ongoing growth momentum. Foreseeing the importance of human development to realize the benefits from demographic dividend for an emerging economy like Pakistan, the government has already initiated a large number of programs to ramp up social spending. These programs include the recently launched National Internship Program, establishment of the National Vocational and Technical Education Commission (NAVTEC), increased budgetary allocation for social sectors, especially education (including higher education through the Higher Education Commission (HEC)), health, population etc. In addition, the Government has launched *Rozgar* Scheme (self employment scheme), Kyushu Pakistan Program and many other initiatives.

#### *Poverty in Pakistan*

The declining trend in poverty in Pakistan during the 1970s and 1980s was reversed in the 1990s. Most of this increase in poverty in Pakistan has taken place after Fiscal Year (FY) 1997, coinciding with the onset of a period of slow growth in the country. Poverty has consequently emerged as the central challenge of development for the Government of Pakistan. Recognizing this, the Government has prepared an Interim Poverty Reduction Strategy Paper (IPRSP) which lays down the framework for a poverty reduction strategy that ensures pro-poor growth through macroeconomic reforms, improved access to social services, governance reforms and targeted interventions. The most commonly used standard for the measurement of income or consumption related poverty, involves calculating a poverty line (based on some minimum acceptable level of consumption) and estimating the proportion of population below that line. While

Pakistan's Planning Commission has only very recently recommended an official poverty line, historically there has never been a uniform methodology for estimating poverty and that has been the cause of considerable uncertainty with regard to the incidence of poverty in the country. Most studies on poverty in Pakistan are based on the Household Income and Expenditure Survey (HIES) data set. The HIES has been conducted by the Federal Bureau of Statistics (FBS) intermittently since FY1964, and 2 with greater frequency in the 1990s. The quality of data from the HIES is considered to be reasonably good, but because of methodological differences, each study generally gives different estimates of the incidence of poverty. Nevertheless, while there is no consensus on the precise level of poverty in the country at any given time, there is general agreement with regard to the trends in poverty since the 1960s. The last four decades can be grouped into two broad periods with respect to poverty trends. The first period is from FY1964 to FY1988, while the second covers the years from FY1988 to FY1999 (the last year for which data is available). During the first period, poverty declined in the urban areas until FY1970, but increased in the rural areas leading to an increase in overall poverty in the country. Subsequently, between FY1970 and FY1988, poverty declined in both rural and urban areas. A number of factors, including the green revolution, increase in employment due to a boom in the housing and construction sectors, as well as rapid expansion of the public sector, and the inflow of workers' remittances from the Middle East contributed to poverty reduction during this period (ADB, 2002).

During the second period, data from various studies indicates that the incidence of poverty increased from 22 - 26 percent in FY1991 to 32 - 35 percent in FY1999. As mentioned earlier, most of the increase in poverty in this period seems to have taken place between FY1997 and FY1999, a period of slow growth and macroeconomic instability in Pakistan. Since FY1999, growth has slowed even further, the fiscal squeeze has intensified, development spending has declined, and the country has experienced a severe drought. It is highly likely, therefore, that the incidence of poverty in Pakistan now is higher than in FY1999 (ADB, 2002).

#### *Spatial Dimensions of Poverty*

Poverty in Pakistan has historically been higher in rural areas than in urban areas. In terms of the number of poor, about 35 million out of the total of 47 million people estimated to fall below the poverty line, live in rural areas. Poverty rose more sharply in the rural areas in the 1990s, and as a result the difference in the incidence of poverty between the urban and the rural areas increased from about 5 percentage points in FY1991 to 8 -14 percentage points 5 in FY1999. In the presence of robust agricultural growth in the 1990's, this increase in the poverty differential between the rural and urban areas could be attributed to a possible disproportionate impact of the economic slowdown in the rural areas caused by low economic growth, decline in public sector development spending and lower worker remittances in this period (Khan, 2007a).

#### *Environment in Pakistan*

Like many developing countries, the environment-development nexus and consequently the environment-poverty nexus is strong in Pakistan. Growth in the agriculture sector (the backbone of Pakistan's economy) is strongly reliant on the state of the environment, particularly on the country's land and water resources. The industrial sector is also dominated by agro-industries which is also dependent on the environment. However, there is general agreement that the environmental situation in the country has

been deteriorating. Current environmental problems in Pakistan include land degradation due to erosion, use of agro-chemicals, water logging and salinity, depletion of forest and water resources, and pollution associated with industrial and domestic activities. Carbon dioxide emissions have more than doubled in Pakistan from 31.6 metric tons in 1980 to 94.3 metric tons in 1996, doubling from 0.4 to 0.8 metric tons in terms of per capita emissions. During the same period, the discharge of organic water pollutants increased from 75,125 kg/day to 114,726 kg/day. Moreover, it has been noted that, only 39 percent of the population has access to 27 sanitation facilities. The forests, which cover only 4.2 million of the 85 million hectares of the land, are shrinking at one of the highest rates in the world (2.5 - 3.1 percent annually), resulting in severe reduction in biological diversity, and threatening not only the ecological balance but adding to the perils faced by threatened and endangered species. In terms of loss of biological diversity, Pakistan has 13 species of mammals, 25 species of birds, 14 species of higher plants and 6 species of reptiles classified as 30 threatened. These include the Greyleg Goose, Shadduck, the Indus Dolphin, 31 Antelope, Ibex, Houbara and Markhor.

The existence of the poverty-environment nexus points to the need for making concerted efforts to mainstream environmental concerns and issues in development policy given their central importance to the quality of life and the sustenance of key sectors of the economy. The need for investment in environment and natural resource management tends to be obscured because there is insufficient research on the economic costs of environmental degradation. Environmental degradation can generate strong negative externalities affecting the commodity producing sectors, including agriculture and agro-based industry. While there is limited information on the costs of such pervasive externalities, the cost of environmental disasters such as floods and droughts are now becoming increasingly apparent for the economy as a whole and for the poor in particular. Encouragingly, evidence from community based environmental programs suggests that local institutions can play an important role in mitigating the effects of environmental degradation, while instituting resource use practices that decelerate or even reverse environmental damage.

#### *Vulnerability to Environmental Degradation*

The poor in Pakistan are also characterized by their vulnerability to environmental degradation and deterioration of the natural resource base that has a devastating impact on the poor, given that they tend to be strongly dependent on the exploitation of such resources. As population grows, and the quantity and quality of renewable resources decline, resource captures that occur in powerful groups alter the distribution of resources in their favor. Resources are in effect appropriated by the elite, increasing environmental scarcity among poorer or weaker groups as a result. Groups experiencing this scarcity are then often ecologically marginalized as they migrate to rural or urban regions that are also ecologically fragile.

The link between environmental situation in any particular site, location, region, state or nation (even global) is a complex one (Boulding: 1966; Markandya, 1998, Grossman and Krueger: 1995, 1996; Arrow *et al.*, 1995; Seldon and Song: 1994; Shafik and Bandyopadhyay: 1992; Beckennan: 1992). Regarding the population-environment-poverty linkages, it is important that we take a look at the Environmental Sustainability Indices (ESI) for Pakistan. The ESIs have been estimated by the Yale Centre for Environmental Law and Policy (2005) for 146 countries in the world. Table 1 indicates

comparable scenario among the neighbouring countries. The Pakistan's status of environmental sustainability is better than China, but worse than India, Nepal, Bangladesh, Malaysia, Bhutan, Indonesia, or Sri Lanka. Globally speaking, the highest ESI rank is observed for Finland with a score of 75.1 and lowest being North Korea with 146<sup>th</sup> rank and a score of 29.2. Pakistan ranks hundred and thirty one in the global ordering. Furthermore, a comparison between the ESI and human development index (HDI) ranks indicates that among the neighbouring south Asian countries, as compared to the status of HDIs, the variation in environmental status is much less. Secondly, countries like Bhutan and Indonesia with very high ESI seem to be low in their HDI rankings. Likewise, highly populated countries like China seem to be much better in HDI, but very low in ESI ratings. The low level of correlation coefficient (i.e. 0.102) between ESI score and HDI score for these countries suggests that improvement in human development alone is not sufficient to ensure environmental sustainability and *vice versa*. Pakistan ranks one the lowest in terms of both ESI and HDI implying that there in neither improvement in human development (poverty alleviation) nor environmental sustainability in the country.

**Table 1: Environmental Sustainability Index and Human Development Index for Selected Asian Countries**

Country	Environmental Sustainability Index (ESI)	ESI Ranking On A Global Scale	HDI (2004)	HDI Ranks
Malaysia	54.0	23	0.793	59
Bhutan	53.5	43	0.536	134
Indonesia	48.8	53	0.692	111
Sri Lanka	48.5	79	0.740	96
Nepal	47.7	85	0.504	140
Philippines	42.5	97	0.753	83
India	45.2	101	0.595	127
Bangladesh	44.1	114	0.509	138
Pakistan	39.9	131	0.497	142
China	38.6	133	0.745	94

Source: Yale Center for Environmental Law and Policy (2005).

The data in Table 2 show scores for various components of ESI for Pakistan. In order to compare these components of ESI we have also given some data for India.

**Table 2. Scores for Different Components of ESI for Pakistan and India**

Components of ESI	Pakistan		India	
	Rank	Score	Rank	Score
Environmental system	140	27.7	144	23.1
Reducing environmental stress	105	45.5	82	49
Reducing human vulnerability	97	38.6	86	45.7
Social and Institutional capacity	117	31.5	54	51.2
Global stewardship	43	63.4	39	65.7
Air quality	113	-0.47	143	-0.98
Bio-diversity	88	-0.06	135	-0.62
Land	83	-0.08	101	-0.36
Water quality	143	-1.48	140	-0.96
Water quantity	127	-0.87	117	-0.75
Reducing air pollution	55	0.33	101	-0.28
Reducing eco-system stress	100	-0.18	35	0.32
Reducing population pressure	109	-0.62	82	0.12
Reducing waste and consumption pressure	72	0.06	37	0.35
Reducing water stress	103	-0.38	95	-0.27
NRM	80	0.07	114	-0.25
Environmental health	109	-0.53	80	0.08
Basic human sustenance	75	0.03	92	-0.04
Reducing environment related disaster vulnerability	120	-0.48	117	-0.37
Environmental governance	113	-0.54	66	-0.10
Eco-efficiency	67	0.03	70	0.00
Private sector responsiveness	111	-0.67	32	0.50
Science and technology	120	-0.74	91	-0.28
Greenhouse gas emission	73	-0.04	98	-0.37
International collaborative efforts	97	-0.29	30	0.27
Reducing transboundary environmental pressure	8	1.36	20	0.92

Yale Center for Environmental Law and Policy (2005).

Table 2 shows that out of 25 major indicators included in ESI, fifteen of them are negative (some very high and some marginal), leaving the remaining 11 to positive. For India, 13 of the indicators are negative and the remaining 12 positive. For both India and Pakistan, the major indicators of air, water and bio-diversity and land related indicators are negative. In terms of policy interventions, attempts to reduce environment related natural disaster vulnerability is very poor with a very high negative score. Some factors, other than population dynamics, influence the environment directly and significantly. In short, three different types of links between environmental matters and their changes are affecting the quality of life in both Pakistan and India. They are the increasing blue *environmental matters* (such as pollution and degradation of air and water quality), second, depletion *and deterioration of resources* such as forest, land and water bodies, and third, *loss of links between livelihood supports to population and natural resources*.

Duraippah, et al. (2000) has shown that on a global level there is some evidence by now that environmental degradation affects the quality of life just like changing quality of life in turn affects environmental quality and status. This implies that the process of growth leads to higher demands on natural and environmental resources. This in turn adversely affects the environment, which also affects the human development

itself. Figure 6 shows such interactions and feed back processes of pressure and impacts. There are a number of studies to show that wherever peoples' dependency is very high on environmental resources and welfare losses due to environmental degradation is quite high. The views go on the lines of complementarities between environmental and natural resources with human development. Similar views are found in some studies for a highly populated country like India and Pakistan (Jodha, 1986; Kadekodi, 2001, 2004; Khan, 2007a and 2007b). In the context of a country like Pakistan, the debatable issue is whether population pressures alone drives the environmental degradation and in turn the down turn of human development or, is it development which drives environmental degradation in the early phases of development as an evitable consequence, a hypothesis referred to as inverted U shaped curve, popularly known as Environmental Kuznets curve.

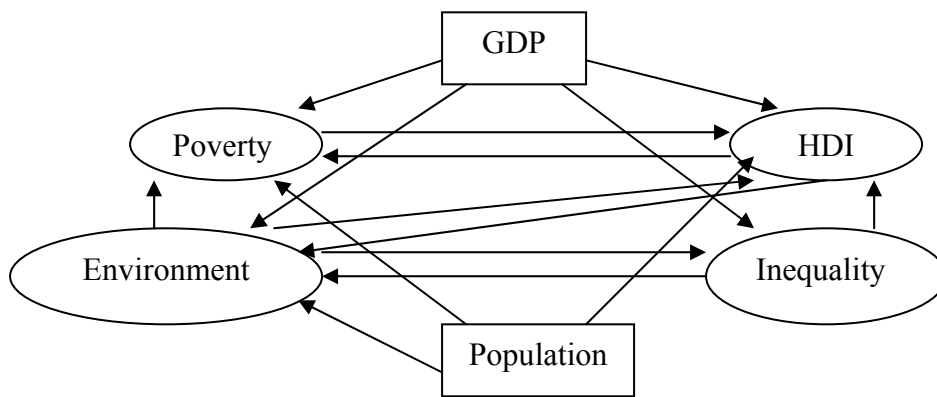


Fig. 6: Links among GDP, HDI, Population, Poverty and Environment

In the context of the debate on the inverted U-shaped relation between income inequality, poverty and environment, the two-way linkages between poverty-environment is important but very difficult to establish (Dasgupta, 2003; Duraiappah, 1998; Dasgupta and Maler, 1994). How poor people are often impoverished by degradation in environmental resource base, which in turn force them to degrade the environment further was the argument of the 'vicious circle' of the human development-environment nexus (WCED 1987). For instance, environmental degradation is found to be mediated by high fertility rate, and in many cases poverty, population growth and environmental degradation feed up one another. This hypothesis has been criticized with a view on the failure of the society and the country to internalize the positive livelihood linkages and strengths of the link between them, and also not being able to discourage the adverse pressures from development on environment through proper policy interventions (Nadkarni, 2001; Markandya, 1998; Jodha: 1986, 2000). That is why, it is often said to be a matter of proper institutions to link the human and resource development together. It is also evident from the fact that the governments all over the world are not able to introduce effective economic instruments (e.g., fiscal and monetary measures) to drive the use of natural resources towards their sustainable use, and also to put a cap on

pollutions (Datt et al., 2004). Table 3 shows correlation matrix of selected variables dealing with population-poverty-environment nexus in Pakistan.

Table 3: Correlation Matrix of Selected Variables in Pakistan

Variable	Pop	LitRate	PCI	FArea	CA	V-Road	OilPet	Coal	Elect.
Population	1								
LitRate	0.997*	1							
PCI	0.997*	0.998*	1						
For-Area	0.925*	0.938*	0.914*	1					
CultArea	0.930*	0.927*	0.943*	0.827*	1				
VehonRoad	0.990*	0.996*	0.979*	0.940*	-0.370	1			
OilPetroleum	0.842*	0.845*	0.859*	0.814*	0.906)	0.806*	1		
Coal	0.212	0.167	0.218	0.026	0.145	0.159	-0.023	1	
Electricity	0.984*	0.981*	0.521	0.506	0.930*	0.978*	0.818*	0.227	1

Source: Govt. of Pakistan (2006, 2007).

### Conclusions

Based on some evidence for Pakistan on the nexus between environment, population, and poverty the following conclusions can be drawn:

- a) The causal relationship between poverty and environmental works in both directions. That is, an increase in poverty may impact negatively on the environment and the deterioration in the natural environment leads to increased hardship.
- b) Some of the relationships based on the evidences can be connecting. For example, there is no simple relationship between increase in poverty and economic growth, the causal structure is quite complex. Nor is there an accepted relationship between the quality of the environment and changes in population;
- c) The linkages between poverty and the environment often work through changes in GDP, population, etc. The dynamics of the relations arc only partly understood. There is lack of understanding of the role of institutions in mediating the linkages and the way in which institutions evolve in response to changes in the economic and policy environment.
- d) Population stress does not seem to have any significant direct effect on all aspects of environmental status in Pakistan.
- e) While some human development has taken place in Pakistan, there are, however, *pressures* on various socio-economic and environmental attributes (or variables). Examples are, with better health provisioning expectation of life can improve, degree of urbanization may improve, per capita income may increase, demand for ground water may increase, forest degradation may take place, solid wastes may increase and so on. Then the *impact* and *outcomes* on improved, worsened, or changed socio-economic welfare and environmental status are important indicators to examine. Equally important are to examine the *response* by the *state* or governments and the feedback of all these acting as *pressures* once again. Some examples of responses and *slate* actions are, meeting demands on provisioning of better health care, improved educational facility, income earning opportunities, monitoring pollution and hazardous environmental commissions and effluents, regulating ground and other water resources, introduction of forest protection committees under joint forest management, encouraging water user association and so on. Such a cyclical nexus between human development and environment are quantitatively analyzed now.

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