POPULATION DENSITY, ENVIRONMENTAL SCARCITY AND DOMESTIC ARMED CONFLICTS, 1989-1995

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CERTIFICATE

This is to certify that the dissertation entitled **"POPULATION DENSITY, ENVIRONMENTAL SCARCITY AND DOMESTIC ARMED CONFLICTS, 1989-1995"**, submitted by **PUTTA V.V. SATYANARAYANA,** in partial fulfilment of the requirements for the award of the degree of **MASTER OF PHILOSOPHY**, is his work and has not been previously submitted for any other degree of this or any other university.

We therefore, recommend that this dissertation be placed before the examiners for evaluation.

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DEDICATED
TO
MY PARENTS

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INTRODUCTION

The end of the cold war and the ensuing search for a new security paradigm helped open the security debate to new issues. Much has now been written on how to stretch the concept of security to include the environment.[1] Numerous scholars have concluded that struggle over access to and control over natural resources has been an important cause of tensions and conflict, although there is no consensus on this issue. Several scholars have also questioned the general arguments about the role of resources and environmental factors in conflict. A major objection is that most of the literature is based on findings from the study of cases where both environmental stress and armed conflict are or have already been known to be present, thus making any conclusions from the research biased.

Most studies on the linkage between environmental change and domestic armed conflict focus on the relationship between conflict and degradation and depletion of renewable resources (agricultural land, forest cover, freshwater and fish stock). Many of the theoretical arguments regarding

[1] Arthur H. Westing (ed.), *Comprehensive Security for the Baltic: An Environmental Approach* (London: Sage, 1989), Norman Myers, *Ultimate Security: The Environmental Basis of Political Stability* (New York: W.W. Norton and Company Ltd., 1993).

these conflicts derive from the original work of Thomas Malthus.[2] Malthus postulated a profound notion that while food production grew linearly, population increases tended to be exponential. At some point the population would outstrip the capacity of the Earth to feed all the people. Around this intersection point conflict is said to be possible.[3]

Paul Ehrlich and Anne Ehrlich also perceived that the development of catastrophic military conflict arises from localised or global food shortages occasioned by over population.[4] Daniel Deudney outlines four scenarios linking environmental degradation to war (water, poverty, power and pollution wars), any of which could be precipitated or exacerbated by population pressure.[5]

Research on intrastate conflict triggered off by environmental problems is mainly based on case studies. Two groups have been prominent within the field of intrastate conflict set off by environmental problems: the 'Toronto

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[2] Thomas Malthus (New Edition), *An Essay on the Principle of Population* (Oxford: Oxford University Press, 1993).

[3] Ibid.

[4] Paul Ehrlich and Anne Ehrlich, *The Population explosion* (New York: Ballantine, 1991)

[5] Daniel Deudney, "Environment and Scarcity: Muddled Thinking", *Bulletin of Atomic Scientists,* Vol. 47, No. 3, pp.22-28.

Group' with Thomas Fraser Homer-Dixon as its key figure and the Swiss Environment and Conflict Project (ENCOP), directed by Gunther Bachler and Kurt Spillman. Both of these groups have proposed a series of case studies concerning the relationship between degradation of renewable resources and domestic armed conflict.

ENCOP published its final report in the form of three volumes. Volume I is a through review of theory. Volumes II and III are case studies. The study group discussed the linkage between environmental degradation and domestic armed conflict in relation to theories of over – and under – development, consumption and modernisation. Export-led growth strategies in non-industrialised countries have had serious consequences on the quality of land and its distribution. It is argued that the material basis for the conflicts caused by environmental degradation lies in the dialectic process between under development and socio-ecological heterogeneity and its influence on the transformation of renewable resources.[6]

Homer-Dixon on the other hand has developed his own model of how environmental scarcity leads to domestic armed conflict. Environmental scarcity is a core concept in Homer-Dixon's work. This concept is composed

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[6] Gunther Bachler, et.al., *Environmental Destruction as a Cause of War: Ecological Conflict in the Third World and Peaceful Ways of Resolving Them, Vol. I* (Zurich: Rwegger, 1996).

of three dimensions: supply induced scarcity, demand induced scarcity and structural scarcity.[7] Supply induced scarcity exists when resources are reduced and degraded faster than they can be renewed. This phenomenon is often referred to as the consumption of the resources 'capital'.[8] Demand induced scarcity is created by population growth or increased per capita consumption. Structural scarcity is due to unequal distribution of resources, when they are concentrated in the hands of a few people while the remaining population suffers from resource shortage. Both the Toronto Group and ENCOP applied their theoretical models to the individual cases separately and validated their models.[9]

If we have a quick glance at the literature, from the original work of Thomas Malthus's *An Essay on the Principle of Population to* Ehrlich's classic *The Population Bomb,* they assume the armed conflict deriving from localised

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[7] Thomas Homer-Dixon, "On the Threshold, Environmental Change As Cause of Acute Conflict", *International Security,* Vol. 16, No.2, pp.76-116.

[8] Thomas Homer-Dixon, et.al., "Environmental Change and Violent Conflict", *Scientific American,* Vol. 268, No.2, pp.38-45.

[9] Gunther Bachler, et.al., *Environmental Destruction as a Cause of War: Ecological Conflict in the Third World and Peaceful Ways of Resolving Them, Vol. II and III* (Zurich: Rwegger, 1996).

or global food shortages caused by over population.[10] Homer-Dixon's environmental conflict model also emphasises on population aspect of resource scarcity. Although most of these scholars recognise that there should be strong positive relationship between population growth, environmental scarcity and domestic armed conflict, the relationship remains unclear. Contradictory arguments also prevailed in the discourse and assumed negative and/or no relationship.

Norman Angell and Julian Simon are prominent in the 'negative or/and no relationship' category. These scholars posit that high population growth will not increase conflict and may even reduce it; indeed they deny that growing population produce negative pressure of any variety.

Though Angell acknowledged the proposition that conflict results from the search for raw materials needed by an increasing population, yet he does not see the relationship as necessary. He says that resource scarcity is solved by improving access to the resources in question. Resource capture only solves the problem temporarily because the need for resources changes over time. Instead Angell proposes lifting trade barriers so that states can gain

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[10] Thomas Malthus, note 2, Paul Ehrlich and Anne Ehrlich, *The Population Bomb* (New York: Ballantine, 1991).

access to materials peacefully and make use of comparative advantage. Thus, states and groups within states do not have to fight to gain what they need.[11]

On the other hand Julian Simon challenges the basic argument that population growth necessarily leads to resource scarcity. He argues that most resources are not truly fixed in the economic sense, therefore will not diminish as the result of a rising population. The ultimate scarce resource is human ingenuity, he argues. He agrees that population growth can lead to scarcity in the short run, but he believes that society can overcome this problem by improving technology to enhance productivity and efficiency, thereby outstripping the constraints imposed by an increasing population. Simon dismisses various connections that link population pressure to conflict. He posits that as long as population growth stimulates advances in technology, the economic motivation for capturing resources will diminish. Thus, wars driven by population growth may actually be less common in the future.[12]

Homer-Dixon also accepts that social improvements such as better markets and resource distribution, which are products of ingenuity, often

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[11] Norman Angell, *Raw Materials, Population Pressure and War* (New York: World Peace Foundation, 1936).

[12] Julian Simon, "Lebensraum: Paradoxically, Population Growth May Eventually End Wars", *Journal of Conflict Resolution,* Vol. 33, No. 1, pp.164-180, and Julian Simon, *The Ultimate Resource 2* (Princeton: Princeton University Press, 1996).

alleviate scarcity. But a society's capacity to make these improvements will be partly determined by scarcity itself, which is powerfully influenced by the society's physical context, he says. He underlined four factors that can limit the supply of social and technological ingenuity: market failure, social friction, shortage of capital and constraints on science. He perceives a world which would be bifurcated into societies which can maintain an adequate supply of ingenuity and those that cannot.[13]

Despite criticism of various aspects of the case studies, the idea that environmental scarcity is related to high potential for armed struggle remains a plausible assumption. High level of resource scarcity and the accompanying maldistribution of the resource with high population pressure produces discontent and clear grievances among groups in a society and are largely regarded as just causes for rebellion.

The purpose of this study is to make an overall assessment of the relationship between national population pressure and the probability of escalating domestic armed conflict. This study is concerned with static population pressure only, which is represented as high population density that may push states into chaos, because of spatial and environmental problems

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[13] Thomas Homer-Dixon, "The Ingenuity Gap: Can Poor Countries Adopt to Resource Scarcity?", *Population and Development Review,* Vol. 21, No.3, pp.587-612.

associated with over crowding. Thus, the study focuses on population pressure and the possibility of conflict escalation in all the states in the international system from 1989 to 1995.

Several theoretical implications follow from understanding the population – conflict nexus. First, if we determine whether population pressure influences conflict, that would help in constructing a full model of the environmental determinants of security. While resource scarcity and other environmental problems may increase intrastate conflicts, population pressure may be driving these problems. This is not to say that population pressure is the sole root cause of economic and environmental problems, but it may account for significant portion to them latter. Thus, if population pressure strongly conditions environmental problems, we must view those problems as intervening variables in the causal path to conflict rather than as autonomous factors (basic causal variables).

Second, much of the environmental security literature is based on the study of cases. The method used to identify the sample cases (process tracing method by Homer-Dixon) is subjected to criticism. This study would allow us to understand the nexus between population – environment and domestic armed conflicts. This empirical work offers few definitive conclusions. Rather these results offer some systematic empirical explanation to a field characterised by anecdotal evidence.

Third, while increase in global population over the past two decades has been slower than originally projected, the number of human beings on the Earth has grown dramatically. Furthermore, population projections envision significant population increases in future years. With the fixed available land and uncertain technological adjustments, growing population pressure led to some predictions on identifying locations where conflicts can occur. If population pressure is found to be linked to scarcity and conflict, validity of these studies can be judged. For instance Michael Klare argued that "increased competition over access to resources and internal warfare over valuable export commodities have produced a new geography of conflict, a reconfigured cartography in which resource flows rather than political and ideological divisions constitute the major fault lines."[14] Drawing on the lines of Samuel Huntington, he too identified some resource flow fault lines and identified possible flash points for resource conflict.[15]

To address the relationship between population density, resource scarcity and domestic armed conflict, we must first establish its existence, direction and magnitude. In chapter I, titled "Environmental Scarcity and Domestic Armed Conflict", I have made an attempt to present a critical

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[14] Michael T. Klare, "The New Geography of Conflict", *Foreign Affairs,* Vol. 80, No. 3, p.56.

[15] Ibid, p.55.

analysis of theory on scarcity and conflict with some substantial evidence. Chapter II, titled "Population Density: A Cause of Resource Scarcity", is a critical assessment of the relationship between population and environment based on statistical evidence. Chapter III titled "Population Density and Domestic Armed Conflict: A Quantitative Analysis", I have attempted to examine the relationship between population density and domestic armed conflicts. In this chapter I have analysed my empirical findings. It is followed by an overall conclusion. This dissertation also contains an appendix of data on population density of all the countries and domestic armed conflicts during the period of study.

CHAPTER I

Environmental Scarcity and Domestic Armed Conflict

Since 1945 the world has experience a clear increase in the incidence of domestic armed conflicts. Upto the mid 1970's this largely mirrored the growth of independent states in the international system, but from then on the number of conflicts increased faster than the number of emerging states.[1] Most domestic armed conflicts during this period have taken place in developing countries, several of them in areas suffering from severe environmental degradation such as the Horn of Africa and Central America.

This has brought about changes in the concept of national security. In 1977 Laster Brown asserted that a nation's security depended more on the health of its economy, its natural resource base, and its people than on its military preparedness.[2]

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[1] Nils Petter Gleditsch, "The New Security Environment: Towards a Democratic and Peaceful World?", *International Politik,* Vol. 54, No. 3, pp. 291-310, cited in Wencha House and Janja Ellingsem, "Beyond Environmental Scarcity: Casual Pathway to Conflict", *Journal of Peace Research,* Vol. 35, No. 3, 1998, p.299.

[2] Cited in Michael Renner, *Fighting for Survival: Environmental Decline, Social Conflict and the New Age of Insecurity* (London, New York: W.W. Norton and Company, 1996), p.11.

Now the concept of security has been stretched wide enough to incorporate the problems of environmental deterioration, population pressure and economic insecurity. Even the traditional model of security, i.e., militarised models, came under scrutiny. Robert Keohane and Joseph Nye for example, observed that "(n)o

longer can all issues be subordinated to military security: in particular, the 'energy crisis' of the 1970s drove home the policy makers that resource could very well be a high political issue".[3] In fact, the genocidal war against people is also 'ecocide' in so far as it attacks the source and resources of life itself, particularly so in the case of contemporary high technology military forces. This is true even in training, not just in combat operations.

This kind of shift in the thinking of security strategies has brought about changes in the national security policies. It is evident in the statement of US Senator Sam Nunn, Chairman of the Senate Armed Services Committee in 1990, that "there is a new and different threat to our national security emerging the destruction of our environment. I believe that one of our key national security objectives must be to reverse the accelerating pace of environmental

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[3] Quoted in Jeroen Warner, "Global Environmental Security: An Emerging "Concept of Control"?" in Phillip Scott and Sullivan (eds.), *Political Ecology: Science, Myth and Power* (London: Arnold, 2000).

destruction around the globe".[4] Mikhail Gorbachev asserted that "the relationship between man and the environment has become menacing. Problems of ecological security affect all, the rich and the poor. The threat from the sky is no longer missiles but global warming".[5] These statements are not mere exaggerations. The planet has been losing 26 billion tons of top soil and 60,000 square miles of tropical forests every year and 23,000 square miles land has been desertified to the extent that people won't be able to grow food again for decades at best.[6]

This chapter is largely aimed at looking into the question of how environmental scarcity leads to conflict. Theories on scarcity (how scarcity occurs) along with theories on conflict resurgence (when conflict arises) are examined. Then the causal link between scarcity and conflict is analysed. Cases that bring out the link are also briefly examined.

Environmental Scarcity: A Critical Understanding

Resource scarcity has become an omnipresent feature of human existence. In fact, scarcity of renewable resource has become so severe that it

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[4] Norman Myers, *Ultimate Security: The Environmental Basis of Political Stability* (London, New York: W.W. Norton and Company, 1993), p.5.

[5] Ibid, p.11.

[6] Ibdi, p.6.

has the potential to seriously threaten the very survival of human beings. Four distinct types of resource scarcity can be identified.

Physical scarcity means that a resource is available only in a finite quantity. Geographical scarcity implies that resources are unequally distributed, making some countries and regions dependent on others. Socio-economic scarcity refers to the unequal distribution of power to procure natural resources between or within societies. Resource scarcity is also caused by resource degradation and depletion. It pertains to failure of human beings to ensure the sustainable management of renewable resources, which have been traditionally regarded as plentiful.[7]

Physical and geographical resource scarcity, though they are also part of scarcity, cannot be considered as 'environmental scarcity', the term which denotes the scarcity of renewable resource of a geographical location. Renewable resource includes renewable 'goods' such as timber, and renewable 'services' such as regional hydrological cycles and a benign climate.

Environmental scarcity is the consequence of man made disturbances to the normal regeneration process of a renewable resource. This kind of scarcity can result from the overuse of a renewable resource or from pollution of the

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[7] Narottam Gann, "Rethinking Security: The Environmental Approach", *International Studies,* Vol. 38, No. 3, 2001, p.309.

resource base. According to Thomas Homer-Dixon, environmental scarcity encompasses scarcity of renewable resources, population growth and unequal social distribution of resources.[8] He named different types of scarcity as supply induced scarcity, demand induced scarcity and structural scarcity.[9]

Supply induced scarcity occurs when the resource base shrinks due to degradation of its quality and depletion in quantity. Supply induced scarcity is the product of three factors: a) the total population in the region; b) the per capita use of each technology available to the population; and c) the amount of resource consumption or degradation as a result of each unit use of technology.[10]

Demand induced scarcity could be due to two reasons 1) population growth, for instance, "over time a given flow of water might have to be divided among greater number of people"[11] and 2) increase in the per capita demand, it could be due to the change in consumption patterns, economic development

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[8] Thomas Homer-Dixon, et.al., "Environmental Change and Violent Conflict", *Scientific American,* Vol. 268, No. 2, 1993, p.40.

[9] Ibid.

[10] Thomas F. Homer-Dixon, *Environment, Scarcity and Violence,* (Princeton, New Jersey: Princeton University Press, 1999), p.48.

[11] Thomas Homer-Dixon, et.al., note 8, p.40.

and the technological innovations.[12] For instance, instance demand for water could be increased due to changing crop pattern.

The final cause is change in the distribution of a resource within a society. "Such a shift can concentrate supply in the hands of a few, subjecting the rest to extreme scarcity.[13] He calls it structural scarcity. Apart from these three types of scarcities Homer-Dixon also recognised that resource scarcity could be subjective. According to him "....it (resource scarcity) is determined not just by absolute physical limits, but also by preferences, beliefs and norms."[14] He illustrated this feature with the example of conflict between the Sandinista government and the Miskito Indians in Nicaragua.[15]

Two patterns of interactions among these three types of scarcity are identified a) resource capture and b) ecological migration. Resource capture occurs when there is "a fall in the quality and quantity of renewable resources can combine with population growth to encourage powerful groups within a

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[12] Thomas Homer-Dixon, note 10, p.50.

[13] Thomas Homer-Dixon, et.al., note 8, p.40.

[14] Thomas F. Homer-Dixon, "Environmental Scarcities and Violent Conflict: Evidences From Cases", *International Security,* Vol. 19, No. 1, 1994, p.9.

[15] Ibid.

society to shift resource distribution in their favour."[16] It produces environmental scarcity for poorer and weaker groups as powerful elites capture the resource. When "[U]nequal resource access can combine with population growth to cause migrations to regions that are ecologically fragile, such as steep upland slopes, areas at risk of desertification, and tropical rain forests" it is called as ecological migration.[17] This process aggravates scarcity because of high population density in these areas with improper knowledge and insufficient capital to protect local resources.

Scarcity and its interactions produce some common social effects, such as decreasing agricultural production, economic decline, mass migration from zones of environmental scarcity and weakening social institutions.[18] In order for these social effects to cause heightened grievances, "people must perceive a relative decrease in their standard of living compared with other groups or compared with their expectations, and they must see little chance of their aspirations being addressed under the status quo."[19]

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[16] Ibid, p.10.

[17] Ibid.

[18] Thomas F. Homer-Dixon, "On the Threshold, Environmental Change as Cause of Acute Conflict", *International Security,* Vol. 16, No. 2, 1991, pp.90-98.

[19] T.R. Gurr, *Minorities at Risk: A Global View of Ethno Political Conflicts* (Washington D.C.: US Institute of Peace, 1993), p.126.

If a society consists of groups with strong collective identities, these grievances can be translated into violence. When the normative justifications of collective action are absent among the constituents of the groups they will become part of civil society.[20] These groups are separate from state but engaged in dialogue and interaction with the state, presenting the demands of its constituents.[21]

Here the character of state plays an important role. If the state is representative and reacting to civil society groups, grievances remain low; if it is not reacting to them, grievances heighten.[22] When groups are able to mobilise enough resource to fight against state, violence will erupt.

As scarcity increases, groups focus on narrow survival strategies. It reduces the interaction of civil society with state and inter group relations become hostile as each group turns inward to focus on its own concerns. In this case society becomes unable to articulate its demands on the state due to the retreat of civil society. It gives an opportunity for powerful groups to grab

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[20] Augustine Ikelegbe, "Civil Society, Oil and Conflict in the Niger Delta Region of Nigeria: Ramifications of Civil Society for a Regional Resource Struggle", *The Journal of Modern African Studies,* Vol. 39, No. 3, p.459.

[21] Robert Putnam, *Making Democracy Work: Civil Traditions in Modern Italy* (Princeton, New Jersey: Princeton University Press, 1993).

[22] T.R. Gurr, note 19.

control of the state and use it for their own gain, which in turn leads to the decline of the state's legitimacy.[23]

Why Intra State Conflict

Conflicts between states caused by environmental scarcity are less likely. If we distinguish between renewable and non-renewable resources, most of the wars took place between states to access over natural resources are for non-renewable resources like oil and minerals. For instance out of twelve interstate conflicts involving resources listed by Arthur Westing ten instances are about access to oil or minerals.[24] Though, there are instances where wars took place to access over renewable resources, like the 1969 Soccer war between El Salvador and Honduras regarding cropland and the 1972-1973 Anglo-Icelandic Cod war regarding fishing,[25] evidence is not enough to support the notion that interstate conflict would occur over access to renewable resources.

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[23] Robert Putnam, note 21.

[24] Arthur Westing, "Appendix-2, Wars and Skirmishes Involving Natural Resources: A Selection From the Twentieth Century", in Arthur Westing (ed.), *Global Resources and International Conflict: Environmental Factors in strategic Policy and Action* (New York: Oxford University Press, 1986), pp.204-210.

[25] Ibid.

Two reasons are put forwarded to explain this phenomenon. First, non-renewable resources, like petroleum and mineral resources, can be more directly converted into state power than can renewable resources like agricultural land, fish and forests. Second, countries that are most dependent on renewable resources, and are therefore motivated to seize renewable resources from their neighbours, also tend to be poor. It lessens their capability for aggression.[26]

Against the backdrop of above discussion we can understand the crux of the 1990 declaration of the Bougainville Revolutionary Army, a secessionist group in Papua New Guinea, that reads "our land is being polluted, our water is being polluted, the air we breathe is being polluted with dangerous chemicals that are slowly killing us and destroying our land for future generations. Better that we die fighting than to be slowly poisoned".[27] Bougainville Revolutionary Army has fought a ferocious war of secession from Papua New Guinea since 1988. The conflict was triggered largely by the environmental devastation caused by a huge copper mine on the island of Bougainville that operated for

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[26] Thomas F. Homer-Dixon, note 14, pp.18,19.

[27] Michael Renner, note 2, p.52.

the virtually exclusive benefit of the Central government and foreign shareholders. It is a fine example of violent conflict induced by environmental scarcity – both because the environment is clearly identified as the primary, immediate cause of conflict and because the situation involved substantial violence.

The Panguna copper mine on the island has had a devastating effect on the local environment and the traditional way of life of its people. Operations at the mine, one of the world largest and the mainstay of the Papua New Guinea economy, began in 1972. Over the years, subsistence agriculture and traditional hunting and gathering suffered severely from the largely-scale strip mining operations. Mine tailings and pollutants covered vast areas of land, decimated harvests of cash and food crops including cocoa and bananas, and blocked and contaminated rivers leading to depleted fish stocks. All in all, about the one fifth of the island's total land area has been damaged. With additional mineral prospecting under way, local people began to fear that an even greater portion of the territory would eventually be destroyed by mining operations.[28]

[28] Volker Boge, "Bougainville: A 'Classical' Environmental Conflict?", Occasional Paper No. 3, Environment and Conflict Project (ENCOP), Born Switzerland, October 1992, cited in Michael Renner, note 2, p.55.

Bougainvilleans received few of the economic benefits of all this environmental destruction. The bulk of the profits from the mine went to the national government and foreign shareholders. Royalty payments to local landholders amounted to only 0.2 per cent of the cash revenue of the mine and compensation payments – for land leased and damage wrought – were seen as inadequate.[29] The concerns and demands of Bougainville's inhabitants were ignored by both the central government and the British and Australian owned company. Discontent continued to build, with local landowners in the forefront of opposition to the mine. By late 1988, a sabotage campaign had begun; it soon developed into guerrilla war that closed the mine in May 1989. Papua New Guinea lost 40 per cent of its foreign exchange earnings.[30]

The population of Bougainville is ethnically distinct from that of other parts of Papua New Guinea. Although secessionist aspirations existed before the Panguna mine opened, Volker Boge found that "it was only after the demands for environmental compensation had been refused that ideas of secession came in forefront".[31] Bougainville declared its independence in May 1990, an act not recognised by any other state. The conflict continued,

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[29] Ibid, p. 56.

[30] Ibid.

[31] Ibid.

bringing both fighting and intermittent cease-fires and talks. It remains unresolved.[32]

Likewise on July 6, 2000, thousands of farmers in the Yellow River basin of Eastern China clashed with police over a governmental plan to recapture runoff from a local reservoir for cities, industries and other users. The farmers had long relied on that runoff to irrigate their crops and a bad drought had made the supply more critical than ever. The incident took place in Shandong, the last province through which the Yellow River runs before reaching the sea. The river has been running dry in its lower reaches on and off since 1972, and the dry spells have lengthened markedly in recent years, including a record 226 days in 1977.[33]

Similarly there is intensifying friction in the lower portions of the Indus river, where Pakistan's Punjab and Sind provinces have been feuding over water for several years. On April 2001, protests in Karachi turned violent as demonstrators shouting 'give us water' clashed with police.[34]

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[32] Trevor Findlay, "Armed Conflict Prevention, Management and Resolution", in *SIPRI Year Book 1995: Armaments, Disarmaments and Internaional Security* (New York: Oxford University Press, 1995).

[33] Sandra L. Postel and Aaron T. Wolf, "Dehydrating Conflict", *Foreign Policy,* September/October 2001, p.61.

[34] Ibid.

These incidents give support to the fact that environmentally induced conflict is more likely within individual countries. It is due to the needs and interests of contending groups tied closely to land and environmental resources often remain unreconciled. Their contending interests are typically bound up with issues of ethnicity and economic development, of subsistence versus commercial operations. Governance structures are often incapable of adjudicating conflicting interests. They are favouring one group over another instead of harmonising the interests.

Environmental Scarcity and Violent Conflict: Evidence from Cases

The Philippines

Philippines had experienced a number of coup attempts in the past few years. Moreover, there is growing support for the New People's Army and other dissident groups. The Philippines Government Policy Advisory Group made an observation in 1987 on the cause behind the armed insurrections, that says, "deforestation and other forms of environmental degradation are one of the principal sources of social injustice in the country, and one of the causes of armed insurgency".[35] To understand this observation we have to look into the Philippines economy which is based on its environment.

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[35] Norman Myers, note 4, p. 85.

A sizeable share of the Philippines economy is environment based. The sectors of agriculture, forestry and fisheries contribute more than one-fourth of the Philippines gross national product, earn two-firths of export revenues and employ one-half of the labour force. But the overburdened natural resource base started reducing its contribution to the economy. For example, productive hard-wood forests, which once covered most of the country and generated 32 per cent of export earnings in 1967, have been reduced to 22 per cent of land area and generate only 5 per cent of export revenue.[36]

Two factors of the Philippines' environment and its economy are worth considering, one, shortage of farmlands and second, the hilly or mountainous character of the country. Due to population growth, nation wide the available amount of arable land per rural inhabitant has declined to less than one acre. It means that an average family of six persons must try to sustain itself off little more than five acres. It is predicted that four per cent annual increase in agricultural output is required to cope with population growth and nutritional needs of the country. But in past two decades only two per cent growth is recorded.

Hilly or mountainous character of the country combined with deteriorated volcanic soils and heavy tropical downpours made farmlands more

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[36] Ibid, p.87.

vulnerable to soil erosion. Since all the fertile low lands are already brought under cultivation, there is no wasteland left to bring under cultivation to cope with the growing demand for food. So the land less people started migrating to hilly and forest uplands, which led to progressive deforestation in those lands. These forests are the critical catchment zones that supply water for much of the country's hydropower energy and irrigation needs. Deforestation and consequent soil erosion which drives sedimentation in water bodies is affecting the most productive sector agricultural output. For instance though country reached rice self-sufficiency in 1974, it reverted to being a net importer in 1985.[37]

These factors combined with government's inaction inculcating frustration among people, consequently the ranks of the New People's Army are swelling and the enlarged insurgency is now enjoying broad support in the countryside. The rebels now control 20 per cent of the countryside.

The Philippines population is projected to surge from present 63 to 115 millions in 2020, and due to migration upland population is projected to

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[37] Norman Myers, "Environment and Security", *Foreign Policy,* Vol. 74, 1989, pp.26, 27.

increase from 17.8 millions in 1988 to 28.8 missions by 2005.[38] It presents a grim fact that there may be more internal insurrections in future.

Kenya

Throughout out the second half of the 20th century, the Horn of Africa has been the scene of, violent conflict occurring in all the countries of the region and involving most groups living in it. The phenomenon is usually dubbed as 'ethnic conflict', a label that is self-explanatory. This ethnic conflict has acquired political colour because the bone of contention is state power. If we see the origin and subsequent politicisation of ethnicity we can find out that acquiring state power has given chance to enjoy scarce resources. It is clearly evident in all the countries of the region, particularly so Kenya.

When Europeans laid foundations of commercial agriculture in Kenya a huge area of more than three million hectares of the best land was set aside for them, pushing out the African peasantry and lying the basis for the land problem that has haunted Kenya ever since. The "Mau Mau" rebellion in the early 1950s was the direct result of the severe land shortage experienced by Africans, particularly the Kenyans, due to the expropriation of their lands by settlers.

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[38] Ibid, p.27.

Of the total land of Kenya only ten per cent is of high potential for agriculture in the sense of having adequate rainfall and fertile soils. The rest is of medium potential. Agricultural activity is concentrated in the high and medium potential zones, which account for about eighteen per cent of the total land area and are inhibited by two-thirds of the country's population. Given the high rate of population growth, population density on arable land rose from 123 per square kilometre in 1979 to 209 in 1993.[39] Population pressure in the medium and high potential areas led to the spread of cultivation into semi-arid and arid areas. Arable land per capita fell from 0.2 hectares in 1965 to 0.1 hectares in 1987 and was predicted decline to 0.07 hectares by the end of the twentieth century.[40] So land has become the subject of massive litigation between individuals and of conflicting claims between ethnic groups. An example could be cited of the attacks by the Kalenjin against the Kikuyu in the rift valley in 1993.

Population growth also placed a heavy demand on agricultural production. To cope with the demand, cultivation is being extended into fragile and forestlands, resulting in a heavy loss of forest cover. Deforestation in turn contributes to the shortage of food supplies through land degradation

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[39] John Markakis, *Resource Conflict in the Horn of Africa* (London: Sage, 1998), p.75.

[40] Ibid, p. 76.

and soil erosion. Land in some parts of Kenya has already been exploited to such a degree as to limit severely the possibility of future productive use.

The Kenyan government's policy of wild life protection along with migration of cultivators to marginal lands has affected the mobile pastoralists who are grazing their animals in those lands. National parks, game reserves and sanctuaries account for 7.5 per cent of the total land area. These parks and sanctuaries located in semi-arid region where pastoralists used to roam. It has deprived many pastoralist groups in Kenya of valuable land and water resources where they traditionally hearded their animals. Though the government made promises to pastorals for free access to these sanctuaries, pressure was brought on the local people to change their mode of life by engaging in the tourist trade. The sharp contrast between the affluence of the tourists and the poverty of the local people has brought with it the potential for conflict. Ivory poaching and attacks on tourists in the reserve are a result.

The case of Kenya demonstrates how exclusion from state power leads to material and social deprivation. This is due to the control of the state on both production and distribution of materials and social resources. In the Horn of Africa, this tendency reached exaggerated proportions under the military regimes that ruled Sudan, Somalia and Ethiopia during the 1970s and 1980s, when the state acquired total control of the economy and all national assets. In those circumstances it became imperative to struggle for state power in order to

acquire a share of resources, especially for regions and ethnic groups already deprived due to the prevailing uneven pattern of development.

South Africa

In the case of South Africa, out of the total cultivable land approximately 86 per cent was owned by the white minority while the black majority subsisted on 14 per cent of the land.[41] The quality of land received by blacks is the most marginally productive land. This uneven distribution of land was often combined with absolute short falls in agricultural inputs, such as capital, fertilisers, veterinary services and new agricultural technology.

If we see the population growth patterns, the black population is growing at a rate of three per cent while white population's growth rate is constant.[42] This kind of growth pattern has resulted in more severe scarcity of land in case of blacks and exacerbated the differentials in land availability per capita.

This problem is further accentuated by the degradation of soil quality due to the overuse of agro chemicals and acid rain. Soil erosion is also

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[41] Val Percival and Thomas Homer-Dixon, "Environmental Scarcity and Violent Conflict: The Case of South Africa", *Journal of Peace Research,* Vol. 35, No.3, 1998, p.283.

[42] Ibid, Table-I, p.283.

threatening. It was estimated that 25 per cent of the topsoil was eroded since 1900 in South Africa. Deforestation, which disrupts key eco-system links, and the scarcity and degradation of water resources have also become problems. 12 to 16 million people lack potable water supplies and half the country's population lacks adequate sanitation. Seventy per cent of the urban blacks do not have access to running water and are forced to rely on severely contaminated river systems for their daily use.[43]

All these conditions – growth in population density, water scarcity and soil erosion – made subsistence and survival difficult for blacks. So environmental scarcity worked as a push factor, making them migrate to urban areas. This ecological migration resulted in resource scarcity in urban black townships which were built on sites not useful to the white community. An estimated 25 per cent of the population of informal settlers have no access to piped water, 46.5 per cent have no access to electricity and 48 per cent lack adequate sanitation facilities.[44]

These uncontrolled influxes resulted in social segmentation, as subgroups emerged within the community that posed a potential threat to the authority hitherto exercised by the slumlords. Due to their limited ability to

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[43] Ibid, p.286.

[44] Ibid, p.290.

provide infrastructure to their community, slumlords often try to maintain power by pointing to resources in neighbouring townships and informal settlements, and by mobilising their community to seize them. This type of mobilisation has produced devastating levels of violence.

Between September 1984 and the end of 1989 an estimated 3,500 people died in political violence throughout the South Africa. After Nelson Mandela's release from incarceration, in February 1990 until December 1993, political violence killed an estimated 12,000 people – an annual rate four times higher than that prior to 1990. In 1992 alone 20,000 deaths occurred in criminal and political clashes.[45]

Conclusion

Concern about human security, as old as human history, has now been agnified by the unprecedented scale of environmental degradation. The cases presented above illuminate the fact that environmental scarcity causes violent conflict. Moreover, it is clear that though on the surface conflict may seem to revolve around ethnic, religious, cultural or linguistic divisions, but in reality resource depletion and environmental degradation are the factors that are magnifying these conflicts. Furthermore, these conflicts tend to be sub-

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[45] Ibid, Table-V, p.291.

national. That is why the fighting is done as often by guerrilla groups, paramilitary forces, vigilante squads as by regular, uniformed soldiers.

The frequency of these conflicts will probably increase in the forthcoming decades as scarcities rapidly worsen in many parts of the world. The evidence presented thus far suggests that there are significant causal links between the scarcity of renewable resource and violence. But the factors that cause scarcity have not been examined thoroughly in this chapter. Broadly, these factors can be identified as population density and unequal distribution of resource. Since population density is a persisting problem these days, it is going to be addressed elaborately in the next chapter.

CHAPTER II

Population Density: A Cause of Resource Scarcity

The human impact on the planet has increased significantly these days, not only because of the huge increase in the human population but also because of the new technology that has been invented to meet the needs of the growing population. As a result, serious new environmental problems have emerged, such as global climate change, world wide loss of bio-diversity, forests, and wetlands, decline of coastal ocean quality and degradation of the world's fresh water and ecological system.

These effects of population growth are recent, but assertions that population growth could affect human welfare are not. In 1798, Thomas Malthus warned about the tendency for population to grow exponentially while food supply grew arithmetically.[1] He saw a world where human numbers would continually press against available food supplies.

The impact of human activity on the environment was negligible three thousand years ago when less than 100 million people inhabited the planet.

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[1] T.R.Malthus, "An Essay on the Principle of Population" in Nico Nelissen, et.al., (eds.), *Classics in Environmental Studies: An Overview of Classic Texts in Environmental Studies* (The Hague: International Books, 1997), pp. 29-38.

But the collective impact of the six billion plus people living on the Earth today is tremendous.

There is a basic philosophical division in the study of population and environment, that is often characterised (caricatured) as a debate between 'cornucopians' (optimists) and 'neo-Malthusians' (pessimists). Cornucopians believe that people have the creative capacity to overcome potential environmental harm resulting from a growing population and intense economic activity. Neo-Malthusians foresee potential political, social and environmental deterioration.

Cornucopians can point to the general improvements in human health and life expectancy, rising per capita incomes, remarkable advances in food production, and technical innovations that can reduce environmental pollution. Even some see population growth as a stimulant to human innovation and genius. Neo-Malthusians make their case by pointing to rapid world population growth, the growing concentration of carbon dioxide in the atmosphere, the declining health of the oceans, reductions in bio-diversity, and degradation of land.

This chapter is broadly intended to look into the question of whether population density causes environmental scarcity or not. Theories establishing the relationship between population density and environmental scarcity are

briefly examined. Then the causal link between population density and resource scarcity is analysed with the support of some statistical findings.

Conceptual Models of Population and Environment

To study population, resource and environmental systems scholars have developed a number of models. Though these models cannot predict whether or when population density and human activities will be constrained by shortages in food, water and other resources, they have helped define the debate about the role of population density in environmental degradation.

Malthus developed for the first time the idea that population and environment are related. Though he did not address population–environment relations specifically, his focus was on land use and food production. But his perspective emphasises the reciprocal, linear and direct relationships that exist between population and the environment.

Malthus noted that population grows geometrically, while the food supply can only increase arithmetically. Population growth he theorised would ultimately be constrained by the amount of land available for food production. He described a feedback process in the population-environment relationship, in

which overpopulation would produce wide spread famine, illness and death, and reduce population size.[2]

Though Malthus did not foresee the important technological advances that have accompanied modernisation, his ideas have influenced much of the subsequent discourse on population-environment relations, including numerous descriptive studies on demographic and ecological trends. His idea also has had an influence on the development of the concept of 'carrying capacity' (the maximum number of animals of one or more species that can be supported by a particular habitat or area during the least favourable part of the year) which has led to several global and national projections and modelling exercises.

Donella Meadows, in her 'limits to growth' model, also neglected human innovation and resourcefulness, which would improve the technology of food production, recycling of resources and pollution control to avoid the possible resource scarcity. She has used five variables (population, food, industrialisation, non-renewable resources and pollution) to prepare projections on population growth, economic development and industrialisation. In all her scenarios of future population growth and economic development, population growth and industrialisation projection curves surged upward and then fell

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[2] Ibid.

sharply. This is described as 'overshoot and collapse'.[3] This has given way to forecasts of more gradual environmental deterioration over a longer period of time.

Paul Ehrlich and J.P. Holdren defined the population environment–relationship in a formula. They asserted that three basic factors combine to determine the impact of human society on the environment: the number of people, the average individual's level of consumption or affluence, and the technology used to produce agricultural and industrial outputs.[4] This relationship is presented in a simplified equation:

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[3] Donella H. Meadows, et.al., *The Limits to Growth: A Report for the Club of Rome's Project on the Predicament of Mankind,* (2nd ed.) (New York: Signet, 1974).

[4] Paul R. Ehrlich, Anne H. Ehrlich and Gretchen C. Daily, *The Stark and the Plow: The Equity Answer to the Human Dilemma* (New York: A Grosset/Putnam book, 1995) pp.26,27, and Paul R. Ehrlich and Anne H. Ehrlich, *The Population Explosion* (New York: Simon and Schuster, 1990), pp.58,59.

Environmental Impact = Population x Affluence x Technology[5]

or

$$I = P \times A \times T$$

That is, the impact (I) on the environment is a product of:

P – The number of people, or population size;

A – The affluence of each individual or per capita consumption of goods and services; and

T – Technology or more precisely, the quantity of resources consumed and pollution generated during production and consumption per unit of goods and services.

So the I = PAT equation treats the combined interactions among population, consumption and technology as important determinant of environment change rather than addressing only their independent affects.

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[5] Ibid.

The other models like "Mauritius Model" and "RIVM" (National Institute of Public Health and the Environment) are projection of future scenarios based on the current levels of population growth and economic activities. Using the Mauritius data, researchers developed a model that incorporated interactions and feed back effects among labour force, population, economic development, resources and other factors. The model includes two types of feed back: balances (the relationship between the supply and demand of goods or resources) and influences for example the effect of living standards on fertility or labour productivity. This model shows that changes in one or more variables can resolve conflicting trends in other variables.[6]

The above discussion shows that the existing scientific literature on population-environment interactions tends to support the idea that population density does alter environment though not directly or in a linear fashion. This relationship is explained in the following pages with the help of some statistical findings.

Population Density – Effects on Environment

It can be understandable from common sense that when population grows rapidly, it demands more and more from nature – more food, more

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[6] Cited in Robert Livernash and Eric Rodenburg, "Population Change, Resources and the Environment", *Population Bulletin,* Vol. 53, No. 1, March 1998, p.6.

water, more energy. At the same time, both increasing consumption and pollution by growing human numbers reduce nature's productivity. Thus "rapid population growth burns nature's candle at both ends."[7]

Nature has the quality of resilience. Even when renewable resources are overused or degraded, many can restore themselves eventually if they are given enough time. But if human beings exploit natural resources faster than they can regenerate, nature cannot renew itself. The danger is that ever-increasing human demand is exceeding the rate of renewal of land, forests, and fresh water. Some experts even conclude that some resources, such as soils and fish, are already overexploited.[8]

The impact of population pressure touches virtually all the specific ways that human beings interact with the environment. These include:

- Agriculture
- Forests
- Fresh water

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[7] Population Reports, Series M, No.10, *The Environment and Population Growth: Decade for Action,* Johns Hopkins University, Vol. XX, No.2, May 1992, p.3

[8] D.H. Meadows, et.al., *Beyond the Limits* (Past Mills, Vermant: Chelsea Green Publishing, 1992).

- Oceans
- Minerals
- Energy and
- Urban growth.[9]

Beyond these concerns, population pressure also contributes to environmental change affecting the earth as a whole – the atmosphere and climate, biological diversity, and ultimately, the question of how many people the earth can sustain.

Agriculture and Population Density

At a basic level each person has minimum food requirements, and therefore increasing population density increases the overall amount of food needed. Current levels of population growth in developing countries of 2 to 3 per cent per annum accounts for roughly 4 to 5 per cent of annual growth in food demand.[10]

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[9] Laster R. Brown, Gary Gardner and Brian Halweil, *Beyond Malthus: Sixteen Dimensions of the Population Problem* (World Watch Paper 143: September 1998).

[10] Population Reports, Series M, No.13, *Winning the Food Race,* Johns Hopkins University, Vol. XXV, No. 4, December 1997, pp.3,4.

Population density affects the environmental conditions necessary for food production. To meet the needs of growing population, farmers are cultivating areas that are dry, hilly or rocky or have thin and weak soils. Farming causes such soil to lose its nutrients and to be carried away by water or wind. As a result, areas that once could support small numbers of people or be used for livestock grazing become degraded and eventually lose all productivity.

For instance, in densely populated areas of Indonesia, the search for farmland has forced peasants to cultivate steep slopes, which have poor soils easily washed away in heavy rains. In some districts of Java upto half of cultivated land is seriously eroding. This problem is likely to increase during this decade as Java's rural population grows by a projected 5 million people from its current level.[11]

As population density increases in Africa's marginal areas, farmers are pushed onto semi-arid rangelands that previously supported only nomadic tribes, providing supplementary fodder and water for their livestock during droughts. Since these lands are now under cultivation, the livestock that once

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[11] Population Reports, Series M, No.10, note 7, p.12.

depended on them often suffer large losses during dry periods – 50 per cent to 90 per cent reported in one district of Kenya.[12]

Another impact of higher population density on food production is the use of animal dung for fuel rather than for fertiliser. As more and more land is cleared for crops, trees and other vegetation become scarce, and farm families turn to use dung as firewood rather than fertiliser. It is estimated that world wide about 20 million metric tons of grain, which can feed 100 million people for a year, are lost annually due to dung burning.[13]

Cropland and Population Density

Since 1950 cropland has increased by some 19 per cent, but global population has grown by 132 per cent, seven times faster. Largely as a result, grain area per person has fallen by half since 1950, from 0.24 to 0.12 hectares.[14]

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[12] L.M. Talbot, "Demographic Factors in Resource Depletion and Environmental Degradation in East African Rangeland", *Population and Development Review,* Vol.12, No.3, September 1986, pp.441-541.

[13] N. Myers, "Population, Environment and Conflict", *Environment Conservation,* Vol. 14, No. 1, Spring 1987, pp.15-22.

[14] Laster Brown, note 9, p.31.

The concern is that the increasing population pressure will push many nations below the 600 square meter threshold in coming decades. In Asia alone, where cropland per person stands at 800 square meters, 16 countries are poised to cross this threshold by 2050.[15] So raising population density on a fixed base of land can result in rural landlessness. In Bangladesh, for instance, landlessness among rural households rose from 35 per cent in 1960 to 53 per cent in the early 1990s.[16]

This rural landlessness leads to poverty which induces a variety of behaviours that can promote environmental degradation. For instance, a farmer living in poverty can easily let the immediate need to produce food outweigh the long-term benefits of conserving his land. Overplanting – planting too many crops within a growing season – is a serious problem in many areas. Farm families whose land becomes degraded through overplanting may move on in search of other land to cultivate or may migrate to urban areas. An estimated 200,000 square kilometres of land are degraded every years because of overplanting, some 70,000 square kilometres are abandoned annually as a result.[17]

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[15] Ibid.

[16] Ibid.

[17] Cited in Robert Livernash and Eric Rodenburg, note 6, p.14.

To tackle rural poverty governments are often resorting to subsidies, which have unintended and negative consequences. They lead to wasteful resource use, environmental damage, and growing financial strains on government budgets. For instance, electricity subsidies in the Ludhiana district in Northwestern India encouraged excessive use of ground water for irrigation. Water tables dropped significantly in recent decades, by about 0.8 meters per year.[18]

Fresh Water and Population Density

As more people are added to the world's population, the amount of water available per person decreases. High population density causes much stress beyond the level that water supplies can serve. Many communities are draining water from acquifers faster than the acquifers can replenish themselves. A high density of population also exacerbates water shortages indirectly by contributing to degradation and deforestation. Weakened soils and deforested land retain less moisture and lead to reduced rainfall.[19]

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[18] Ibid, p.15.

[19] Malin Falkenmark, "Landscape as Life Support Provider Water-Related Limitations", in A Report of the Population Summit of the World's Scientific Academies, *Population: The Complex Reality* (London: The Royal Society, 1994), pp.103-116.

Evidence of water stress can be seen as rivers are drained dry and as water tables fall. The Yellow River in China has run dry for a greater part of each year since 1985, with the dry period becoming progressively longer. In 1997, it failed to make it to sea for 226 days.[20]

High density of population endangers water quality through other routes. High concentration of people makes it difficult to dispose of household wastes without polluting local water supplies. In addition, a growing population demands more goods and food and thus increases wastes from industrial and agricultural production, often to be discharged or drained into rivers, lakes, or acquifiers. For instance, a lake may be able to absorb the sewage of 500 people but will suddenly cease to support plants and fish if the polluting population grows to 505 people. This has happened in case of Laguna Lake in the Philippines, which has become heavily polluted by Manila's sewage, chemical wastes from about 900 factories, and fertiliser and pesticide runoff. As a result, fish catches dropped from 320,000 metric tons in 1964 to 128,000 metric tons in 1982.[21]

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[20] Sandra L. Postel and Aaron T. Wolf, "Dehydrating Conflict", *Foreign Policy,* September/October, 2001, p.61.

[21] Population Reports, Series M, No.10, note 7, p.17.

Forest Cover and Population Density

In an analysis of 43 countries in the humid tropics, geographer Alan Grainger found an association between declining forest cover and increasing population density.[22] Population density come both from outside the forests and from within. Outside the forests, as population density rises on agricultural land, forests become the last available areas for new cultivation. To grow their crops, landless peasants migrating from urban area or crowded rural areas have few options but to clear the forests.

Within forests, forest peoples traditionally have made their living by slash-and-burn, or shifting, cultivation. They clear small plots, cultivate them for two to three years, and then move on to repeat the process. Tropical forests have thin soils that lose nutrients after about three years of cultivation. If the forest is allowed to grow back over 10 to 20 years, and if population density is less (less the 40 people per square kilometre) shifting cultivation is sustainable.[23]

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[22] Cited in Robert Livernash and Eric Rodenburg, note 6,p.23.

[23] Norman Myers, "The World's Forests and Human Populations: The Environmental Interactions", in Kingsley Davis and Mikhail S. Bernstam, *Resources, Environment, and Population: Present Knowledge, Future Options* (New York: Oxford University Press, 1991) pp.237-251.

When population density increases, however, people must return to the same plot more often. They cannot allow the land to remain fallow long enough to regenerate. Assuming a 20 year period is needed for cleared forest to regenerate, a doubling of the population means that 5 per cent more forest cover must be cleared in each 2 to 3 year growing cycle.[24]

The Oceans and Population Density

About 60 per cent of the world's people live within 100 kilometres of ocean coasts. Coastal population densities reach more than 500 people per square kilometre in several Asian countries, more than twice the density inland.[25] As these large, concentrated populations grow even larger, efforts to produce food for them results in over fishing. Most types of fish eaten by humans are being caught at close to their maximum sustainable yield. Any further increase in the fish catch would mean that fish stocks will not be able to replenish themselves. Already fish stocks have declined in some areas.[26] The catch of Atlantic Cod has fallen by some 70 per cent since peaking in 1968.

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[24] Ibid.

[25] Population Reports No.10, Note-7, p.19.

[26] Paul R. Ehrlich and Anne H. Ehrlich, *Population, Resources, Environment: Issues in Human Ecology* (San Francisco: W.H. Freeman and Company, 1970) pp.101-109.

Since 1970, Blue Fin Tuna stocks in the West Atlantic have dropped 80 per cent.[27]

Growing population density in coastal regions is also reducing the productive capacity of oceans. Growing human settlements are destroying the coastal areas that serve as hatcheries for 90 per cent of the world's fish catch. Many families living near Jakarta, Indonesia used to make their living from fishing. With a doubling of the city's population density between 1970 and 1990, coastal waters became filled with untreated sewage and industrial waste. Fish catches have dwindled, and the few that remain are unsafe to eat.[28]

Conclusion

The signs of environmental stress growing as the population pressure increases – worn-out farmlands, eroded hill slopes, polluted water, smoke filled air – are becoming common feature. While population density increases, it puts stress on local ecosystems beyond their ability to renew themselves or to absorb wastes. When the population is scattered, soils and forests can replenish themselves over time. As population density increases more pressure is put on the land to grow more food, produce fuel wood and meet other needs.

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[27] Laster R. Brown, Note-9, pp.25-27.

[28] Population Reports No.15, *Population and the Environment: The Global Challenge,* Johns Hopkins University, Vol. XXVIII, No.3, February 2001, pp.15-18.

High population density cripples the people's ability to migrate over large areas or to practice traditional farming practices such as rotating crops and allowing land to remain follow for up to 20 years.

Population pressure is also causing the creation of giant, fast expanding cities throughout the developing world. Such concentrations of people growing so rapidly can overwhelm municipal services such as water supply and sanitation. In theory, dense settlements should enable local governments to provide energy, water, sanitation and other services efficiently. In practice, however, such efficiencies are rarely possible because cities grow too fast for services to keep up.

So it can be said that population density and environmental scarcity are directly related. Changes (from lower to higher) in the population density levels lead to stress on natural resources and renewable resource scarcity as a consequence.

CHAPTER III

Population Density and Domestic Armed Conflict: A Quantitative Analysis

The study of the relationship between population density and domestic armed conflict has long historical roots and crosses disciplinary boundaries. The previous chapters have examined the theories that support this relationship. Existing scholarship has advanced two major hypotheses linking population growth and environmental degradation to civil strife: (1) deprivation and (2) state weakness.

The deprivation hypothesis claims that population growth and resultant environmental pressures can impoverish individuals, thereby inspiring them to take up arms against their governments. The state weakness hypothesis agrees that population growth and environmental degradation can provide individuals with incentives to engage in violence, but also asserts that impoverished individuals are unlikely to engage in armed struggle unless those pressures also increase the opportunity for organised violence by weakening the capacity of governments to maintain order.

Another set of arguments labelled as 'state exploitation', have been put forwarded by Colin H. Kahl. He argues that demographic and environmental stress can some times lead to civil strife, initiated by state elites who seek to

capitalise on scarcities of natural resources and related social grievances to advance their parochial interests.[1]

Although there is a fair amount of literature concerning the connection between population growth and armed conflict, the empirical support to prove this relationship is scant. It is the case study approach that largely dominates the literature. The reliability of the process tracing method to identify the cases is also subjected to criticism. It is because no allowance is made for controlling the relationship between the independent and the dependent variables.

Though this literature is subjected to criticism it suggests a link between the two phenomena, i.e., population growth and domestic armed conflicts. Based on this literature, this dissertation adopts the working hypothesis that countries with high population density are more likely to experience domestic armed conflict than countries with low population density due to greater scarcity of resources in the former.

In this chapter the relationship between two variables (population density and domestic armed conflicts) is studied through an analysis of population density and domestic armed conflicts in 202 countries over the

[1] Colin H. Kahl, "Population Growth, Environmental Degradation, and State – Sponsored violence: The Case of Kenya, 1991-1993", *International Security*, Vol. 23, No. 2, Fall 1998, pp. 80-119.

1989-1995 period. The starting date represents the end of cold war as well as the availability of data on domestic armed conflicts, whereas the end date represents the present limits of my data collection. The population density data is taken from *Demographic Year Books* from 1989-1995 published by the United Nations.[2] Data on domestic armed conflicts is taken from Peter Wallensteen and Margereta Sollenberg's "Armed Conflict, 1989-2000" in the *Journal of Peace Research.*[3]

In order to run the correlation between the variables, the countries have been divided into three categories. The first category is of low population

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[2] United Nations, *Demographic Year Book – 1989,* United Nations Annual Publication, 45th issue (New York: UN, 1991),
United Nations, *Demographic Year Book – 1990,* United Nations Annual Publication, 42nd issue (New York: UN, 1992),
United Nations, *Demographic Year Book – 1991,* United Nations Annual Publication, 43rd issue (New York: UN, 1992),
United Nations, *Demographic Year Book – 1992,* United Nations Annual Publication, 44th issue (New York: UN, 1994),
United Nations, *Demographic Year Book – 1993,* United Nations Annual Publication, 5th issue (New York: UN, 1995),
United Nations, *Demographic Year Book – 1994,* United Nations Annual Publication, 46th issue (New York: UN, 1996),
United Nations, *Demographic Year Book – 1995,* United Nations Annual Publication, 47th issue (New York: UN, 1997).

[3] Peter Wallensteen and Margareta Sollenberg, "Armed Conflict, 1989-2000", *Journal of Peace Research,* Vol. 38, No. 5, 2001, pp.629-644.

density states with a population density less than or equal to 50 per sq. km. The second category is of medium population density states, consisting of those countries that have a population density of more than 50 and less than or equal to 300 per sq. km. The third category is of high population density states that have a population density of more than 300 per sq. km.

An armed conflict is defined as a "contested incompatibility which concerns government and/or territory where the use of armed force between two parties, of which at least one is the government of a state, results in at least 25 battle related deaths."[4]

The separate elements of the definition are explained as follows:

Use of armed force: use of arms in order to promote the parties' general position in the conflict, resulting in deaths.

Arms: any material means, e.g. manufactured weapons but also sticks, stones, fire and water.

25 deaths: a minimum of 25 battle related deaths per year and per incompatibility

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[4] This definition and the subsequent explanation of the elements of definition are reproduced from Peter Wallensteen and Margareta Sollenberg's, "Armed Conflict, 1989-2000", *Journal of Peace Research,* Vol. 38, No. 5, 2001, p.643.

Party: a government of a state or any opposition organisation or alliance of opposition organisations.

Government: the party controlling the capital of the state.

Opposition organisation: any non governmental group of people having announced a name for their group and using armed force.

State: an internationally recognised sovereign government controlling a specified territory, or an internationally unrecognised government controlling a specified territory whose sovereignty is not disputed by another internationally recognised sovereign government previously controlling the same territory.

Incompatibility concerning government and/or territory: the incompatibility, as stated by the parties, must concern government and/or territory.

Incompatibility: the stated generally incompatible positions.

Incompatibility concerning government: incompatibility concerning type of political system, the replacement of the central government or the change of its composition.

Incompatibility concerning territory: incompatibility concerning the status of a territory, e.g., the change of the state in control of a certain territory (intrastate conflict).

Subsets of armed conflicts are defined as follows:

Minor Armed Conflict: at least 25 battle-related deaths per year and fewer than 1,000 battle-related deaths during the course of the conflict.

Intermediate Armed Conflict: at least 25 battle-related deaths per year and an accumulated total of at least 1,000 deaths, but fewer than 1,000 per year. (when conflicts appear as intermediate armed conflicts after 1989, they have in most cases been reactivated after a period of relative inactivity.)

Major Armed Conflict: at least 1,000 or more than that battle-related deaths per year. (It is referred as war by Peter Wallensteen and Margareta Sollengerg.)

Empirical Findings

Table 1: *Correlation* between low population density and domestic armed conflict 1989-1995.

	Density 1989	*Density 1990*	*Density 1991*	*Density 1992*	*Density 1993*	*Density 1994*	*Density 1995*
Conflicts 1989	0.0683 (88)						
Conflicts 1990		0.0375 (87)					
Conflicts 1991			0.1557 (83)				
Conflicts 1992				0.0418 (81)			
Conflicts 1993					0.1248 (76)		
Conflicts 1994						-0.0792 (78)	
Conflicts 1995							0.0981 (74)

Table 2: *Correlation* between medium population density and domestic armed conflict 1989-1995.

	Density 1989	*Density 1990*	*Density 1991*	*Density 1992*	*Density 1993*	*Density 1994*	*Density 1995*
Conflicts 1989	0.155 (88)						
Conflicts 1990		0.2345 (87)					
Conflicts 1991			0.1435 (84)				
Conflicts 1992				0.0963 (87)			
Conflicts 1993					0.1864 (95)		
Conflicts 1994						0.1239 (92)	
Conflicts 1995							0.1436 (91)

Table 3: *Correlation* between high population density and domestic armed conflict 1989-1995.

	Density 1989	*Density 1990*	*Density 1991*	*Density 1992*	*Density 1993*	*Density 1994*	*Density 1995*
Conflicts 1989	-0.0698 (25)						
Conflicts 1990		-0.0622 (25)					
Conflicts 1991			-0.0634 (26)				
Conflicts 1992				-0.0618 (27)			
Conflicts 1993					*		
Conflicts 1994						*	
Conflicts 1995							*

* Conflicts have not taken place during this period in this category of countries.

Table 4: *Correlation* between population density and domestic armed conflict 1989-1995.

	Density 1989	*Density 1990*	*Density 1991*	*Density 1992*	*Density 1993*	*Density 1994*	*Density 1995*
Conflicts 1989	-0.182						
Conflicts 1990		-0.103					
Conflicts 1991			-0.280				
Conflicts 1992				-0.061			
Conflicts 1993					-0.202		
Conflicts 1994						-0.052	
Conflicts 1995							-0.303

Table 5: Number and percentage of total conflicts between 1989-1995

	1989	1990	1991	1992	1993	1994	1995	Total % within all categories of Conflicts
Low Density Countries	19 (44.2%)	21 (48.8%)	18 (38.3%)	20 (45.5%)	15 (42.9%)	16 (45.7%)	10 (37%)	119 (43.4%)
Medium Density Countries	23 (53.5%)	21 (48.8%)	28 (59.6%)	23 (52.3%)	20 (57.1%)	19 (54.3%)	17 (63%)	151 (55.1%)
High Density Countries	1 (2.3%)	1 (2.3%)	1 (2.1%)	1 (2.3%)	*	*	*	4 (1.5%)
Total % of conflicts within respective years	43 (100%)	43 (100%)	47 (100%)	44 (100%)	35 (100%)	35 (100%)	27 (100%)	274 (100%)

*No Conflict

Table 6: Number and percentage of minor conflicts between 1989-1995

	1989	1990	1991	1992	1993	1994	1995	Total % within Minor Conflicts category
Low Density Countries	6 (40%)	8 (53.3%)	4 (25%)	8 (42.1%)	4 (30.8%)	7 (50%)	2 (20%)	39 (38.2%)
Medium Density Countries	9 (60%)	7 (46.7%)	12 (75%)	11 (57.9%)	9 (69.2%)	7 (50%)	8 (80%)	63 (61.8%)
High Density Countries	*	*	*	*	*	*	*	*
Total % of conflicts within respective years	15 (100%)	15 (100%)	16 (100%)	19 (100%)	13 (100%)	14 (100%)	10 (100%)	102 (100%)

*No Conflict

Table 7: Number and percentage of intermediate conflicts between 1989-1995

	1989	1990	1991	1992	1993	1994	1995	Total % within Intermediate Conflicts category
Low Density Countries	3 (25%)	2 (18.2%)	3 (25%)	4 (44.4%)	7 (46.7%)	5 (33.3%)	5 (41.7%)	29 (33.7%)
Medium Density Countries	8 (66.7%)	8 (72.7%)	8 (66.7%)	4 (44.4%)	8 (53.3%)	10 (66.7%)	7 (58.3%)	53 (61.6%)
High Density Countries	1 (8.3%)	1 (9.1%)	1 (8.3%)	1 (11.1%)	*	*	*	4 (4.7%)
Total % of conflicts within respective years	12 (100%)	11 (100%)	12 (100%)	9 (100%)	15 (100%)	15 (100%)	12 (100%)	86 (100%)

*No Conflict

Table 8: Number and percentage of major conflicts between 1989-1995

	1989	1990	1991	1992	1993	1994	1995	Total % within Major Conflicts category
Low Density Countries	10 (62.5%)	11 (64.7%)	11 (57.9%)	8 (50%)	4 (57.1%)	4 (66.7%)	3 (60%)	51 (59.3%)
Medium Density Countries	6 (37.5%)	6 (35.3%)	8 (42.1%)	8 (50%)	3 (49.9%)	2 (33.3%)	2 (40%)	35 (40.7%)
High Density Countries	*	*	*	*	*	*	*	*
Total % of conflicts within respective years	16 (100%)	17 (100%)	19 (100%)	16 (100%)	7 (100%)	6 (100%)	5 (100%)	86 (100%)

*No Conflict

Data Analysis

Table 1 shows the correlation between low population density and domestic armed conflicts between 1989-1995. If we examine the coefficient score carefully, Table 1 shows that all the figures are near about zero. In 1989 it is 0.0683, in 1990 it is 0.0325, in 1992, 0.0418 and in 1995, 0.0981. In one year there is a negative relation (-0.0792) but it is negligible because it is also near about zero. The two years 1991 and 1993 which are showing some significant relation are also very close to zero. Thus, these results suggest that low population density is very weakly correlated to domestic armed conflicts.

Table 2 shows the correlation between medium population density and domestic armed conflicts between 1989-1995. This table shows some significance in the coefficient score. Though the figures in this table are also near about zero they are slightly more suggestive then low population density category. In this table 1990 is having a significant score 0.2345, which requires special attention. Since this is the only year having a significant correlation, it is insufficient to explain the relationship between the variables.

Here it is noteworthy to mention that the coefficients are in the expected direction, those related to low population density and domestic armed conflict being less significant than for medium population density and domestic armed conflict. This is line with the working hypothesis.

Table 3 contains the coefficient score for high population density states and domestic armed conflicts during the study period. Surprisingly, all the coefficient scores are in negative value. But these negative values are also insignificant since they are near about zero. In 1989 it is –0.0698, in 1990 it is –0.0622, in 1991 it is –0.0634 and in 1992 it –0.0618. Coefficient cannot be tabulated for the years 1993, 1994 and 1995 since no domestic armed conflict took place during this period in this category country of countries.

Here it must be pointed out that the coefficient score for domestic armed conflict in high population density countries is not in line with expectations. Instead of showing a better correlation than the two former categories it is showing negative values. According to our hypothesis these coefficient score supposed to be more significant than those for medium and low population density categories. But the coefficient score for high population density countries are actually more *insignificant*.

Table 4 explains the correlation between population density and domestic armed conflicts between 1989-1995. To run the correlation between population density and domestic armed conflicts only those countries were taken which have experienced the conflict. Even then, the coefficient score shows the negative relationship between the variables. All the figures in this table are in negative. In 1991, 1993 and 1995 the coefficient score shows a significant negative relationship. In 1989 it is -

0.182, in 1990 it is -0.103, in 1991-0.280, in 1992 it is -0.061, in 1993 it is -0.202, in 1994 it is -0.052 and in 1995 it is -0.303. These results suggest that population density and domestic armed conflict are not correlated even in the countries where conflicts are currently existing or have recently occurred.

Table 5 explains the number and percentage of total conflicts that occurred in the period of study. If we proceed year by year, except 1990 in all the years of study low population density countries have recorded less domestic armed conflicts than medium population density countries. Out of a total of 43 domestic armed conflicts in 1989, 19 occurred in low population density countries and 23 conflicts in medium population density countries. In 1991 out of 47, 18 and 28; in 1992 out of 44, 20 and 23; in 1993 out of 35, 15 and 20; in 1994 out of 35, 16 and 19; and in 1995 out of 27, 10 and 17 conflicts occurred in low population density and medium population density countries respectively. In 1990 both low and medium population density countries recorded 21 conflicts each. But high population density countries recorded one conflict in each year from 1989 to 1992 and no conflict in 1993, 1994 and 1995. When we study the tables of population density and intensity of conflicts, we can find that the four domestic armed conflicts that occurred in high population density countries between 1989 to 1992 were all Intermediate conflicts.

The same trend is evident in the percentages also. Out of total 274 domestic armed conflicts occurred during the period, 119 conflicts (43.4 per cent) occurred in low population density countries, 151 (55.1 per cent) conflicts occurred in medium population density countries, and only four conflicts (1.5 per cent) occurred in high population density countries. This trend suggests that population density does not have any impact on the escalation of domestic armed conflict within a country.

Table 6 reveals the total number and percentage of minor intensity conflicts in the period of study. If we go year by year, except for 1990 and 1994 in all the years of study low population density countries have recorded less minor intensity conflicts than medium population density countries. Out of a total of 15 conflicts in 1989, 6 minor intensity conflicts occurred in low population density countries and 9 in medium population density countries. In 1991 out of 16, 4 and 12; in 1992 out of 19, 8 and 11; in 1993 out of 13, 4 and 9; and in 1995 out of 10, 2 and 8 minor conflicts occurred in low and medium population density countries respectively. In 1990, low population density countries recorded more minor conflicts (8) than medium population density countries (7). In 1994, both low and medium population density countries recorded 7 minor conflicts each. High population density countries recorded no domestic armed conflicts of minor intensity in the whole period of study.

The same trend is evident in the percentages also. Out of total 102 minor intensity domestic armed conflicts that occurred during the period, 39 (38.2 per cent) conflicts occurred in low population density countries, 63 (61.8 per cent) conflicts occurred in medium population density countries and no conflict occurred in high population density countries. This would suggest that medium population density countries are far more likely to experience minor intensity domestic armed conflicts than the other two categories of countries.

Table 7 lays out the number and percentage of intermediate intensity domestic armed conflicts that occurred in the period of study. If we look at the results year by year, except for 1992 in all the years of study again low population density countries have recorded less conflicts than medium population density countries. Out of a total of 12 conflicts in 1989, 3 conflicts occurred in low population density countries and 8 conflicts in medium population density countries. In 1990 out of 11, 2 and 8; in 1991 out of 12, 3 and 8; in 1993 out of 15, 7 and 8; in 1994 out of 15, 5 and 10; and in 1995 out of 12, 5 and 7 intermediate intensity conflicts occurred in low and medium population density countries respectively. In 1992, out of 9 intermediate conflicts both low and medium population density countries recorded 4 conflicts each. High population density countries recorded one

conflict in each year from 1989 to 1992 and no conflict in 1993, 1994 and 1995.

The same trend is evident in the percentages also. Out of the 86 intermediate conflicts that occurred during the period, 29 conflicts (33.7 per cent) occurred in low population density countries, 53 conflicts (61.6 per cent) occurred in medium population density countries and only 4 conflicts (4.7 per cent) occurred in high population density countries. This again suggests that medium population density countries are more likely to experience domestic armed conflicts of intermediate intensity than the other two categories of countries.

Table 8 shows the number and percentage of major conflicts that occurred in the period of study. If we see year by year, except for 1992 and 1995 in all the years of study low population density countries have recorded more high intensity (major) conflicts than medium population density countries. Out of a total of16 conflicts in 1989, 10 conflicts occurred in low population density countries and 6 conflicts in medium population density countries. In 1990 out of 17, 11 and 6; in 1991 out of 19, 11 and 8; in 1993 out of 7, 4 and 3; and in 1994 out of 6, 4 and 2 major conflicts occurred in low and medium population density countries respectively. In 1992, out of 16 major conflicts both low and medium population countries recorded 8

conflicts each. Surprisingly, high population density countries recorded no major domestic armed conflict in whole period of study.

The same trend is evident in the percentages also. Out of total 86 major conflicts that occurred during the period, 51 conflicts (53.9 per cent) occurred in low population density countries, 35 conflicts (40.7 per cent) occurred in medium population density countries and no conflict occurred in high population density countries. This would suggest that low population density countries are more likely to experience major domestic armed conflicts than other two categories of countries.

Conclusion

When we look into the coefficient score in the first three tables, we can see that all the results obtained are insignificant. When we compare the three categories we find that the results are not in the expected direction.

According to the hypothesis, the coefficient should become more significant while going from low population density to high population density countries. When we see the actual figures, the results are in the expected direction while moving from low population density countries to medium population density countries. But while moving to high population density countries, the results are in the opposite direction. It means that high

population density has nothing to do with domestic armed conflict. Even in the low and medium population density countries, although the coefficient is somewhat significant it is not considerable since it is close to zero.

Even if we take only those countries in which domestic armed conflict has occurred, the relationship between population density and armed conflict is negative. Surprisingly, this coefficient score more strongly suggests that population density and domestic armed conflicts are not related.

When we divide the domestic armed conflicts by intensity into minor(low intensity), intermediate (medium intensity) and major (high intensity) some interesting results emerge. Medium population density countries are experiencing most of domestic armed conflicts of minor and intermediate intensity. Surprisingly, the most violent domestic armed conflicts are occurring in low population density countries. The only domestic armed conflicts that have occurred in high population density countries are medium intensity (intermediate) conflicts. One more surprising fact is that these medium intensity (intermediate) conflicts have occurred in Bangladesh, which is one of the standard case studies on which the environment and security debate has been based. So it can be concluded that the variable population density does not have significant impact on domestic armed conflict.

CONCLUSION

Recent case studies investigating the relationship between environmental scarcity and armed conflict have underlined the importance of depletion and degradation of renewable resources, combined with population pressure and unequal distribution of land or income, as sources of domestic armed conflict. Scholars belonging to this school of thinking have theorised that in countries lacking sufficient technological, social and political ingenuity, population pressure and environmental pressures can generate scarcities of renewable resources. These scholars have argued that population growth can lead to scarcity by increasing the demand for resources; environmental depletion and degradation can generate scarcity by decreasing their supply; and a skewed distribution of resources can produce a condition of structural scarcity by concentrating a resource in the hands of a few and subjecting the rest to greater scarcity.

Population pressure is assumed as the major source of all these developments, since it has been a persistent problem in many parts of the world. It is found that population pressure is the root cause for all other problems, such as unequal distribution of resources.

There are some scholars who dismiss the notion that demographic and environmental pressures pose a serious threat to political stability in the

developing world. They believe that societies are able to come up with adequate ingenuity to overcome the problem of resource scarcity. In particular they view Robert Kaplan's writings of the 'coming anarchy' brought on by population growth and environmental degradation as excessively pessimistic.[1]

In this study of the relationship between population density, environmental scarcity and domestic armed conflict, I have tested the linkage between two variables, i.e., population density and domestic armed conflicts, in three different ways. First, I have used three different measures of population density, i.e., low, medium and high densities, and for domestic armed conflicts to test the link. Then I have tested the hypothesis by analysing those countries that are currently experiencing or have recently experienced domestic armed conflict. Finally, I have used three different measures of intensity of conflicts, i.e., minor, intermediate and major, along with three different measures of population density.

Theoretically, countries with high population density are supposed to be more prone to domestic armed conflicts. But the empirical results have shown a very weak (or no) relationship between population density and domestic armed conflicts.

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[1] Robert D. Kaplan, "The Coming Anarchy", *The Atlantic Monthly,* Vol. 273, No. 2, February 1994, pp. 44-76.

Comparing different measures of density, it appears that there is some relationship between the variables (population density and domestic armed conflicts) in countries with medium population density. But in an overall comparison, since the coefficient is close to 'zero' in all three measures of population density, it can be said that these two variables, i.e., population density and domestic armed conflicts, are not directly correlated. So population density is not an important factor in domestic armed conflict. This is true at all the three population density levels.

The second also shows no relationship between the variables. Here it is worth mentioning that, though these countries have experienced domestic armed conflict, the coefficient nevertheless shows that there is no relationship with population density.

In the third test, it is seen that medium population density countries have experienced and are experiencing a large number of domestic armed conflicts than the other two categories. But the surprising thing is that low density countries are experiencing more number of major (high intensity) domestic armed conflicts than other two population density categories. In fact, among high population density category countries only Bangladesh has experienced domestic armed conflict, that to at the intermediate level. Bangladesh is one of the most important cases studied by the environment and security research groups.

So these three types of tests necessarily suggest that the relationship between population density and domestic armed conflict is not direct and that population density does not have a significant impact in escalating domestic armed conflict.

Therefore, it becomes necessary to consider other variables, such as the per capita availability of resources, the level of economic development, the existence of a number of cohesive ethnic groups, the rate of resource depletion and degradation and most importantly the level of available technology, to see the possibility of escalation of conflict. Here it is worth considering Marc Levy's argument that "better research and better advice can grow out of an understanding that environmental factors interact with a variety of other factors to spawn violent conflict".[2] It seems that this is particularly true in case of demographic and environmental sources of violence. The empirical results of this study suggest that demographic pressure is neither a necessary nor wholly sufficient explanation of civil strife. Strife can certainly occur in the absence of demographic pressure, and all countries experiencing significant population pressure do not descend into chaos. Rather, population density may produce conflict only in certain institutional, social and economic contexts.

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[2] Marc Levy, "Is the Environment a National Security Issue?", *International Security*, Vol. 20, No. 2, Fall 1995, p. 58.

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APPENDIX

Country Name	Density 1989	No. Con. 1989	Int. Con. 1989	Density 1990	No. Con. 1990	Int. Con. 1990	Density 1991	No. Con. 1991	Int. Con. 1991	Density 1992	No. Con. 1992	Int. Con. 1992	Density 1993	No. Con. 1993	Int. Con. 1993	Density 1994	No. Con. 1994	Int. Con. 1994	Density 1995	No. Con. 1995	Int. Con. 1995
Algeria	10	0		10	0		11	0		11	1	MI	11	1	MA	11	1	MA	12	1	MA
Angola	8	1	MA	8	1	MA	8	1	MA	9	2	MI MI	8	1	MA	9	2	MA MI	9 NA	1	IN
Benin	41	0		42	0		43	0		45	0		46	0		48	0		49	0	
Botswana	2	0		2	0		2	0		2	0		2	0		2	0		3	0	
British Indian Ocean Territory	32	0		32	0		26	0		26	0		26	0		26	0		NA	0	
Burkina	32	0		33	0		34	0		35	0		35	0		36	0		37	0	
Burundi	190	0		196	1	MI	202	1	MI	208	1	MI	214	0		220	0		215	1	MI
Cameroon	24	0		25	0		26	0		26	0		26	0		27	0		28	0	
Cape Verde	91	0		92	0		95	0		95	0		92	0		94	0		97	0	
Central African Republic	5	0		5	0		5	0		5	0		5	0		5	0		5	0	
Chad	4	1	IN	4	1	MA	5	1	MI	5	1	MI	5	1	MI	5	1	MI	5	0	
Comoras	225	1	MI	246	0		255	0		262	0		272	0		282	0		292	0	
Congo	6	0		7	0		7	0		7	0		7	0		7	0		8	0	
Cote d' Ivorie	38	0		37	0		39	0		40	0		41	0		42	0		44	0	
Djibouti	17	0		18	0		18	1	MI	20	1	MI	24	1	MI	24	1	MI	25	0	
Egypt	53	0		53	0		55	0		55	1	MI	56	1	MI	58	1	MI	59	1	MI
Equatarial Guniea	12	0		12	0		13	0		30	0		14	0		14	0		14	0	
Ethiopia	41	3	MA MA MI	40	3	MA MA MI	44	3	MA MA MI	45	0		NA	0 0 0		NA	0		51	0	
Gabon	4	0		4	0		5	0		5	0		5	0			0		5	0	
Gambia	74	0		76	0		78	0		80	0		92	0		96	0		99	0	
Ghana	61	0		63	0		65	0		67	0		69	0		71	0		73	0	
Guniea	27	0		23	0		24	0		25	0		26	0		26	0		27	0	
Guinea Bissou	27	0		27	0		27	0		28	0		28	0		29	0		30	0	

Continued...

Kenya	43	0		43	0		45	0		44	0		48	0		50	0		53	0	
Lesotho	56	0		58	0		60	0		60	0		64	0		66	0		68	0	
Liberia	23	1	MI	23	1	MA	24	1	IN	23	1	MA	24	1	IN	24	1	IN	25	1	IN
Liberian Arab Jamahiriya	2	0		3	0		3	0		3	0		3	0		3	0		3	0	
Madagascar	20	0		19	0		20	0		22	0		24	0		24	0		25	0	
Malawi	68	0		70	0		72	0		74	0		77	0		80	0		83	0	
Mali	6	0		7	1	MI	8	0		8	0		8	0		8	1	MI	9	0	
Mauritania	2	1	MI	2	1	MI	2	0		2	0		2	0		2	0		2	0	
Mauritius	535	0		531	0		536	0		532	0		535	0		541	0		550	0	
Island of Mauritius	553	0		556	0		574	0		563	0		589	0		NA	0		583	0	
Rodrigues	356	0		364	0			0		331	0		NA	0		NA	0		334	0	
Morocco	55	1	IN	56	0		58	0		59	0		58	0		60	0		61	0	
Mozambique	19	1	MA	20	1	MA	20	1	MA	19	1	MA	90	0		21	0		22	0	
Namibia	2	0		2	0		2	0		2	0		2	0		2	0		2	0	
Niger	5	0		6	1	MI	6	1	MI	7	1	MI	7	0		7	1	MI	7	0	
Nigeria	118	0		117	0		121	0		125	0		114	0		117	0		121	0	
Reunion	238	0		239	0		242	0		249	0		252	0		257	0		260	0	
Rwanda	265	0		273	1	MI	284	1	MA	286	1	MA	287	1	IN	294	1	IN	302	0	
St. Helonaex Rep.	57	0			0		27	0		NA	0		53	0		54	0		54	0	
Sao Tome and Principe	120	0		126	0		129	0		129	0		127	0		129	0		132	0	
Senegal	36	0		37	1	MI	38	0		39	1	IN	40	1	MI	41	0		42	1	MI
Seychelles	239	0		241	0		149	0		158	0		159	0		162	0		165	0	
Sierra Leone	56	0		58	0		59	1	IN	61	1	IN	60	1	MI	61	1	IN	63	1	IN
Somalia	12	1	MA	12	1	MA	12	1	MA	14	1	MA	14	1	IN	14	1	IN	15	1	IN
South Africa	28	1	MA	29	1	MA	30	1	MA	33	1	MA	32	1	MA	33	0		34	0	
Sudan	10	1	MA	10	1	MA	10	1	MA	11	1	MA	11	1	IN	12	1	IN	11	1	MA
Swaziland	44	0		44	0		47	0		46	0		47	0		48	0		52	0	
Togo	59	0		62	0		64	1	IN	66	0		68	0		69	0		73	0	
Tunisia	49	0		50	0		51	0		51	0		52	0		53	0		54	0	
Uganda	75	1	MA	80	1	IN	83	1	MA	77	0		83	0		86	1	MI	88	1	MI

Continued...

United Rep. Of Tanzania	26	0		27	0		30	0		31	0		32	0		33	0		34	0	
Tanganyika	26	0		26	0		NA	0		NA	0		NA	0		NA	0		NA	0	
Zanzibar	261	0		269	0		NA	0		NA	0		NA	0		NA	0		NA	0	
Western Sahara	1	0		1	0		1	0		1	0		1	0		1	0		1	0	
Zaire	15	0		15	0		16	0		17	0		18	0		18	0		19	0	
Zambia	10	0		11	0		12	0		11	0		12	0		12	0		12	0	
Zimbabwe	23	0		24	0		26	0		27	0		27	0		29	0		29	0	
Anguilla	80	0		81	0		73	0		83	0		96	0		83	0		83	0	
Antigua and Barbuda	195	0		175	0		173	0		150	0		147	0		147	0		149	0	
Aruba	NA	0		311	0		306	0		321	0		358	0		358	0		363	0	
Bahamas	18	0		18	0		19	0		19	0		19	0		20	0		20	0	
Barbadas	595	0		594	0		593	0		602	0		613	0		607	0		614	0	
Belize	8	0		8	0		8	0		9	0		9	0		9	0		10	0	
Bermuda	1097	0		1144	0		1155	0		1170	0		1189	0		1189	0		1189	0	
British Virgin Islands	82	0		87	0		85	0		111	0		118	0		118	0		126	0	
Canada	3	0		3	0		3	0		3	0		3	0		3	0		3	0	
Cayman Islandas	84	0		105	0		100	0		112	0		110	0		114	0		117	0	
Costa Rica	57	0		59	0		60	0		62	0		63	0		60	0		65	0	
Cuba	95	0		96	0		97	0		98	0		98	0		99	0		100	0	
Dominica	107	0		110	0		111	0		96	0		95	0		95	0		95	0	
Dominican Rep.	144	0		147	0		150	0		153	0		156	0		159	0		162	0	
El Salvador	247	1	MA	250	1	MA	256	1	IN	256	0		262	0		268	0		274	0	
Grenada	296	0		248	0		244	0		265	0		267	0		267	0		267	0	
Guadeloupe	199	0		201	0		202	0		235	0		242	0		247	0		251	0	
Guatemala	82	1	IN	84	1	IN	87	1	IN	89	1	MA	91	1	IN	95	1	IN	98	1	IN
Haiti	202	0		215	0		239	1	MI	244	0		249	0		254	0		259	0	
Honduras	44	0		46	0		47	0		48	0		50	0		51	0		53	0	
Jamica	216	0		220	0		215	0		225	0		219	0		227	0		230	0	
Martinique	300	0		310	0		311	0		334	0		337	0		340	0		344	0	

Continued...

Mexico	43	0		44	0		45	0		46	0		47	0		47	1	MI	46	0	
Montserrat	128	0		124	0		116	0		108	0		108	0		108	0		108	0	
Netherlands	239	0		236	0		236	0		219	0		244	0		246	0		249	0	
Nicaragua	29	1	IN	30	0		31	0		32	0		33	0		34	0		35	0	
Panama	31	2	MI	31	0		33	0		33	0		34	0		34	0		35	0	
Puerto Rico	411	0		405	0		405	0		404	0		407	0		410	0		414	0	
Saint Kitts and Nevis	190	0		170	0		169	0		161	0		161	0		157	0		157	0	
Saint Lucia	238	0		242	0		246	0		220	0		223	0		227	0		234	0	
St. Vincent & the Grenadines	283	0		299	0		302	0		281	0		284	0		286	0		285	0	
Trinidad and Tobago	246	0		239	1	MI	244	0		247	0		246	0		245	0		255	0	
United States	27	0		27	0		26	0		30	0		28	0		28	0		28	0	
United States-Virgin Islands	326	0		342	0		345	0		308	0		300	0		300	0		303	0	
Argentina	12	0		12	0		12	0		12	0		12	0		12	0		12	0	
Bolivia	7	0		7	0		7	0		7	0		6	0		7	0		7	0	
Brazil	17	0		18	0		18	0		18	0		18	0		18	0		18	0	
Chile	17	0		17	0		18	0		18	0		18	0		18	0		19	0	
Calombia	27	0		29	0		30	0		29	0		30	0		30	0		31	0	
Ecuador	37	0		38	0		38	0		38	0		39	0		40	0		40	1	MI
French Guiana	1	0		1	0		1	0		1	0		2	0		2	0		2	0	
Guigana	5	0		4	0		4	0		4	0		4	0		4	0		4	0	
Paraguay	10	1	MI	11	0		11	0		11	0		11	0		12	0		12	0	
Peru	17	1	MA	17	1	MA	17	1	MA	17	1	MA	17	1	IN	18	1	IN	18	1	IN
Uruguay	17	0		17	0		18	0		18	0		18	0		18	0		18	0	
Venezuela	21	0		22	0		22	0		22	1	MI	23	0		23	0		24	0	
Afghanistan	24	1	MA	25	1	MA	25	1	MA	29	1	MA	27	1	MA	29	1	MA	31	1	MA
Bahrain	721	0		742	0		762	0		786	0		77	0		791	0		844	0	
Bangladesh	740	1	IN	803	1	IN	825	1	IN	828	1	IN	800	0		818	0		836	0	
Bhutan	32	0		32	0		33	0		34	0		34	0		34	0		35	0	

Contunued...

Brunei Darussalam	43	0		46	0		47	0		47	0		48	0		49	0		49	0	
Cambodia	44	1	MA	46	1	IN	47	1	IN	50	1	IN	51	1	IN	53	1	IN	54	1	IN
China	117	0		120	0		120	0		124	0		125	0		126	0		127	0	
Cyprus	75	0		76	0		77	0		77	0		78	0		79	0		80	0	
Democratic Yemen	7	0		NA	0			0		NA	0		NA	0		NA	0		NA	0	
East Timor	49	0		50	0		51	0		53	0		53	0		54	0		55	0	
Hong Kong	5520	0		5551	0		5657	0		5406	0		5506	0		5639	0		5758	0	
India	247	6	MA MI MI MI MI MI	252	5	MA MA MI MI MI	258	6	MA MA MA MI MI MI	265	6	MA MA IN MI MI MI	274	8	MA IN IN MI MI MI MI MI	279	5	IN IN MI MI MI	285	4	IN MI MI
Indonesia	94	2	IN MI	94	1	MA	99	1	IN	100	1	IN	99	0		101	0		102	0	
Iran	33	0		33	1	IN	34	1	IN	35	1	IN	39	2	IN IN	37	0		41	0	
Iraq	42	1	IN	43	1	IN	45	2	MA MA	44	2	IN IN	44	2	IN IN	45	1	IN	47	1	IN
Israel	217	1	IN	224	1	IN	236	1	IN	247	1	IN	250	1	IN	251	1	IN	263	1	IN
Japan	326	0		327	0		328	0		329	0		327	0		331	0		331	0	
Jordan	42	0		41	0		42	0		44	0		51	0		53	0		56	0	
Korea	294	0		293	0		NA	0			0		NA	0		NA	0		NA	0	
Korea, Dem. People's Rep.	186	0		181	0		NA	0		188	0		191	0		195	0		198	0	
Korea, Rep. of	428	0		432	0		437	0		440	0		444	0		448	0		452	0	
Kuwait	115	0		120	0		118	0		111	0		80	0		91	0		95	0	
Lebanon	279	1	MA	260	1	MA	264	0		273	0		270	0		280	0		289	0	
Macau	27994	0		29962	0		31063	0		20772	0		21560	0		22111	0		23194	0	

Continued...

Maldives	691	0		722	0		748	0		762	0		800	0		825	0		852	0	
Mongolia	1	0		1	0		1	0		1	0		1	0		2	0		2	0	
Myanmar	60	2	IN IN	62	3	IN IN MI	63	4	IN IN MI MI	65	5	MA IN MI MI MI	66	2	IN	67	3	MA IN MI	69	2	IN IN
Nepal	131	0		134	0		139	0		146	0		148	0		145	0		149	0	
Oman	7	0		7	0		7	0		8	0		9	0		10	0		10	0	
Pakistan	137	0		141	0		145	0		150	0		154	0		159	0		163	1	
Philipines	200	1	MA	205	1	MA	210	1	MA	214	1	MA	219	1	IN	223	2	IN MI	234	1	MI
Qator	38	0		33	0		35	0		41	0		51	0		49	0		50	0	
Saudi Arabia	7	0		7	0		7	0		7	0		8	0		8	0		8	0	
Singapore	4345	0		4859	0		4471	0		4560	0		4650	0		4741	0		4833	0	
Srilanka	256	2	MA MA	259	2	MA IN	263	1	MA	265	1	MA	269	1	MA	272	1	IN	280	1	MA
Syrian Arab Republic	63	0		65	0		70	0		70	0		72	0		75	0		77	0	
Thailand	108	0		111	0		111	0		113	0		114	0		116	0		117	0	
Turkey	73	1	IN	75	1	IN	78	2	IN MI	76	2	MA MI	78	1	MA	79	1	MA	80	1	MA
United Arab Emerates	18	0		19	0		19	0		20	0		24	0		22	0		28	0	
Viet Nam	198	0		200	0		206	0		209	0		215	0		219	0		225	0	
Yemen	40	0		47	0		49	0		51	0		53	0		24	1	MA	27	0	
Albania	111	0		113	0		115	0		117	0		112	0		119	0		127	0	
Andorra	111	0		114	0		127	0		132	0		135	0		143	0		150	0	
Austria	91	0		92	0		93	0		94	0		95	0		96	0		96	0	
Belgium	325	0		323	0		323	0		328	0		328	0		330	0		331	0	
Bulgeria	81	0		81	0		81	0		81	0		76	0		76	0		76	0	
Channel Islands	703	0		710	0		733	0		733	0		749	0		754	0		759	0	
Jersey	706	0		763	0		755	0		750	0		744	0		NA	0		728	0	
Denmark	119	0		119	0		120	0		120	0		120	0		121	0		121	0	

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Faeroe Islands	34	0		34	0		34	0		34	0		34	0		34	0	
Finland	15	0		15	0		15	0		15	0		15	0		15	0	
France	102	0		102	0		103	0		104	0		104	0		105	0	
Germany, Democratic Rep.	154	0		150	0		150	0		145	0		150	0		150	0	
Germany, Federal Rep. of	249	0		254	0		258	0		261	0		246	0		246	0	
Gibraltar	5115	0		5083	0		5000	0		5167	0		4667	0		4667	0	
Greece	76	0		76	0		76	0		78	0		78	0		79	0	
Hungary	114	0		113	0		111	0		111	0		111	0		110	0	
Ireland	50	0		50	0		50	0			0		51	0		51	0	
Isle of Man	107	0		108	0		119	0		123	0		123	0		128	0	
Italy	191	0		189	0		189	0		188	0		189	0		190	0	
Liechtenstein	174	0		178	0		175	0		185	0		188	0		192	0	
Luxembourg	142	0		144	0		144	0		151	0		147	0		155	0	
Malta	1109	0		1120	0		NA	0		1136	0		1142	0		1152	0	
Monaco	2830	0		2850	0		2800	0		2800	0		3100	0		2080	0	
	0			0			0			0						5		
Netherlands	363	0		366	0		369	0		372	0		375	0		377	0	
Narway	13	0		13	0		13	0		13	0		13	0		13	0	
Poland	121	0		122	0		118	0		119	0		119	0		119	0	
Portugal	113	0		114	0		115	0		107	0		107	0		107	0	
Romania	97	1	MI	98	0		98	0		96	0		95	0		95	0	
San Marino	383	0		385	0		377	0		391	0		393	0		402	0	
Spain	77	0		77	0		77	1	MI	77	1	MI	77	0		77	0	
Sweden	19	0		19	0		19	0		19	0		19	0		20	0	
Switzerland	161	0		163	0		164	0		167	0		168	0		169	0	
United Kingdom	234	1	IN	234	1	IN	235	1	IN	237	1	IN	238	1	IN	238	0	
Yugoslavia	93	0		93	0		94	2	MA	94	0		103	0		103	0	
Yugoslavia	93	0		93	0		94	2	MI	94	0		103	0		103	0	
American Samea	192	0		196	0		191	0		251	0		256	0		266	0	

Continued...

Australia	2	0		2	0		2	0		2	0		2	0		2	0		2	0			
Cook Islands	88	0		77	0		76	0		72	0		81	0		81	0		81	0			
Fiji	40	0		42	0		42	0		41	0		41	0		43	0		44	0			
French Polynesia	45	0		52	0		53	0		51	0		53	0		54	0		55	0			
Guam	223	0		220	0		220	0		254	0		262	0		266	0		272	0			
Kiribati	93	0		91	0		91	0		102	0		105	0		106	0		109	0			
Nauru	415	0		457	0		429	0		476	0		476	0		524	0		514	0			
New Caledonia	9	0		NA	0		9	0		10	0		10	0		10	0		10	0			
New Zeland	12	0		12	0		12	0		13	0		13	0		13	0		13	0			
Niue	14	0		12	0		12	0		8	0		8	0		8	0		8	0			
Pacific Islands	95	0		99	0		NA	0		35	0		35	0		NA	0		NA	0			
Papua New Guinea	8	1	MI	8	1	MI	8	0		8	1	MI	8	1	MI	9	1	MI	9	1	MI		
Samoa	60	0		58	0		60	0		56	0		59	0		58	0		60	0			
Salmon Islands	11	0		11	0		11	0		12	0		12	0		13	0		13	0			
Tonga	159	0		127	0		126	0		130	0		131	0		131	0		131	0			
Tuvalu	348	0		373	0		346	0		462	0		346	0		346	0		385	0			
Vanuatu	13	0		12	0		13	0		13	0		13	0		14	0		14	0			
Wallis and Futuna Islands	62	0		89	0		90	0		70	0		70	0		70	0		70	0			
USSR	13	0		13	0		NA	0		NA	0		NA	0		NA	0		NA	0			

Density – Population Density.
No.Con. – Number of Conflicts.
In.Con. – Intensity of Conflict.
NA – Data not Available.
MI – Minor Conflict.
IN – Intermediate Conflict.
MA – Major Conflict.