

Malthusian Pressures, Genocide, and Ecocide

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Historical models postulate that genocide cannot occur without the ideology and decisions of its authoritarian perpetrators and the indifference of bystanders. These models do not address genocidal risks from ecocide. Study objectives were to assess 1) the role of Malthusian pressures in recent genocides, 2) the role of ecocide and ecologic abuse in creating these pressures, and 3) strategies for prevention and deterrence. Analysis of reports, demographic studies, and time trends in recent genocides and recent ecocidal events from ecologic abuse suggests that Malthusian pressures and zero-sum rivalries over water, arable land, or natural resources by themselves do not lead to genocide. Such pressures may have exacerbated the political and socioeconomic predictors in Rwanda and Darfur, but not in former Yugoslavia. However, collapse of socioeconomic and governmental infrastructures following genocide can leave behind massive sustained damage to carrying capacity and sustainability. Surviving victims, if they return to their environments, will remain at risk for persecution. Ecocide—the large-scale destruction, depletion, or contamination of natural ecosystems—can result in widespread damage to health, survival, fertility, reproduction, and sustenance, and forced flight. International early warning and effective response systems are needed to deter or prevent political decisions to carry out genocide. Such systems must include long-term measures to resolve zero-sum conflicts over environmental resources and to prevent toxic risks to vulnerable populations and destruction of habitat by deliberate or wanton ecologic abuse, which itself should be redefined as a crime against humanity. *Key words:* ecocide; genocide; Malthusian pressures; Yugoslavia; Rwanda; Darfur; environmental degradation.

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the power is in your hands, and whatever a man desires to do . . . he can do, whether . . . good or evil—Maimonides, *Mishneh Torah, Book of Knowledge*,

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Boys Town Jerusalem Publishers: Jerusalem; 1963: 86b–88a

. . . let us beware of attempts to lay the blame for evil on whole peoples . . . the solution is to oppose most forcefully those who implant and nurture hatred in human minds and to support . . . those who want to break out of this vicious cycle and restore mutual respect and commitment to coexistence and cooperation.—V. Havel, *The Art of the Impossible. Politics as Morality in Practice*, Conclusion of the month of Bosnia and Herzegovina in the Czech Republic, Prague, October 13, 1995, Fromm International, 273 pp, 1998

In 1993, McMichael's *Planetary Overload: Global Environmental Change and the Health of the Human Species* provided a magisterial overview of the problems facing humankind from global warming, climate, population growth, air and water pollution, resource depletion, and toxic risks. In 1995, the mass killings in the Bosnian and Rwandan genocides reached their peaks, to be followed by Kosovo in 1998 and by Darfur—the first genocide of the 21st century. The word genocide does not appear once in the entire text of McMichael's book.¹

In 1983, Cesar Maltoni and Irving Selikoff, founders of the Collegium Ramazzini, escorted visitors to its first meeting to the Holocaust Museum in Carpi, Italy. This museum, near the plaque commemorating Bernardino Ramazzini, memorializes Italian Jews and members of the anti-Fascist Resistance sent to Fossoli, a transit station for shipment to Auschwitz, where they were sent to the gas chambers.

In 1998 the Collegium Ramazzini symposium on international health included a presentation on mass killing in the war in Sudan.² In 1999, the World Health Organization (WHO) published a statement advocating the development of a surveillance system for detecting genocide's early warning signs.³ In 2002, the Collegium's Conference on the Precautionary Principle called attention to the fact that genocide is the most extreme example of the acutely catastrophic human toll from delay in detection and reporting, and noted the role of suppression and repression biases in producing such delays.⁴ In April 2005, the Collegium Ramazzini and the World Medical Society issued statements calling for proactive intervention to stop the genocide in Darfur (by then, more than 150,000 dead).⁵ The Collegium condemned the use of the term "ethnic cleansing" as a euphemism and pretext for

delay in mobilizing effective measures to stop genocide—for reasons explored elsewhere.⁶

As researchers concerned with the prevention of risks from industrial and environmental exposures and their impacts on public health and environmental sustainability, we ask the following questions:

- Do Malthusian pressures and zero-sum rivalries for power over depleted, diminishing, or contaminated resources increase risks for genocide?
- Does genocide produce environmental degradation?
- Is it sufficient to address so-called “upstream” environmental predictors or indicators of carrying-capacity depletion without attention to the political determinants of genocide?
- If intervention prevents or stops genocide, how sustainable will the results be without attention to public health and environmental sustainability?
- Should ecocide—the heedless or deliberate large-scale destruction, depletion, or contamination of natural ecosystems that results in widespread damage to health, survival, fertility, reproduction, and sustenance—be considered a crime against humanity?

In the past 15–20 years, epidemiologists paid scant attention to these questions, despite the genocides in Bosnia, Kosovo, Rwanda and Darfur and various public health disasters from wanton ecologic abuse.

DEFINITIONS

We define Malthusian pressures as: “shortages resulting from depletion of or damage to safe water, arable or fertile land, essential nutrients, and natural resources, or access to these resources, such as through trade. Such shortages impair carrying capacity and support of life for populations residing in that environment.”

The recognized definition of genocide is⁷ “. . . any of the following acts committed with intent to destroy, in whole or in part, a national, ethnic, racial, or religious group, as such:

- a. killing members of the group;
- b. causing serious bodily or mental harm to members of the group;
- c. deliberately inflicting on the group conditions of life calculated to bring about its physical destruction in whole or in part;
- d. imposing measures intended to prevent births within the group;
- e. forcibly transferring children of the group to another group.

We define ecocide as the heedless or deliberate large-scale destruction, depletion, or contamination of natural ecosystems that results in widespread damage to health, survival, fertility, reproduction and sustenance.⁸

Since World War II, there have been over 50 genocides, politicides, and other instances of mass murder that have resulted in the deaths of at least 84 million people.⁹ Harff and Gurr have identified socioeconomic and political predictors of genocide^{10,11} and Stanton has presented an eight-stage general model.¹² Evidence-based case-control models in which genocidal states are the cases and non-genocidal states are the comparisons confirm the observation of historians that there are predictors of impending genocide: authoritarian rule, a strong dependence on the military, an ideology of conquest, extermination or exclusion, past genocidal massacres with impunity supported by political elites, a relatively vulnerable minority group, low risk of outside intervention, lack of openness to the outside world, and most ominously, denial of past genocides and mass incitement using hate language.^{10–12} Our working premise is that genocide

E-mail exchange:

Malthusian Pressures are NOT Determinants

I would think that determinants of genocide also would include:

- (a) Economic conditions that appeal to easy fixes and casting of blame
- (b) Perceived population overload for available scarce resources
- (c) Access to nature’s services (i.e., water, air, fertile soil)

Soskolne, 30.8.06 23:26 EST

These determinants (according to Barbara Harff, U.S. Naval Academy), one of the foremost experts on early warning, and Valentino) don’t prove to be significant either as predictors, correlates, or causes

They don’t apply to many of the major genocides of the twentieth century (Turkey’s (1905, 1915) and Germany’s (1930s) economies were roaring ahead, and there was no scarcity of resources, real or perceived in Turkey, Germany, Rwanda, or Cambodia).

Stanton 1.09.06 17:56

The issues examined in this paper were framed in an extraordinary email exchange between Professors Colin Soskolne and Gregory Stanton and included in a presentation on the subject at the ISEE Conference in Paris on 2.9.06.

results from political choices, usually by authoritarian regimes driven by exclusionary zero-sum ideologies,¹³ that Malthusian pressures may in certain cases exacerbate the risks associated with these known political predictors, and that ecocide itself may create these Malthusian pressures.

METHODS

To address the above questions, we summarize the histories of the genocides in former Yugoslavia, Rwanda, and Darfur, present data on population/land ratios and review and examine recent studies by others on Malthusian pressures and genocide and ecocide from wanton ecologic abuse.

FINDINGS

In Yugoslavia, Rwanda, and Darfur, there were prodromal periods during which warning signs, early reports, incitement, and episodic violence preceded organized mass murder, rapes, expulsions, and pillaging.

Former Yugoslavia (Bosnia and Kosovo)

Yugoslavia (population: 23,000,000; 92.6 persons/km²) was prosperous, developed, modern, industrialized, and rich in natural resources. Though there were socioeconomic tensions at local levels where there were declines in the Serbian percentage of the population,¹⁴ former Yugoslavia was considered to be a late Cold War era success story, and Sarajevo hosted the Winter Olympics in 1984.¹⁵

The socioeconomic tensions were aggravated by religious and political rivalries between Christians and Moslems dating back to the last Crusade of the 14th century. In the 1990s, Serbian and Croatian nationalist elites stirred up these tensions, with the former using “hate language”—incitement to motivate followers to increasingly violent actions—starting in 1991, with an estimated 200,000 dead on all sides, culminating in the organized slaughter of 8,000 Bosnian Moslems by Bosnian Serb military regulars on July 12–13, 1995.¹⁶ There were major breakdowns in the economic infrastructure and environmental quality preceding and following the overt outbreak of what perpetrators, and later, outside observers, called “ethnic cleansing,” a euphemism for the mass atrocities of genocide, i.e., expulsions, plundering, mass murders, summary executions, executions, rapes, and castrations.

In 1998 Serbian troops and militias responded to a Kosovar independence movement with genocidal massacres aimed at driving Kosovar Muslims out of Kosovo. Over 800,000 Kosovar Muslims fled, mostly across the border with Albania. NATO bombing in Bosnia in 1995–96 and in Kosovo and Serbia in 1998–99 forced Serbia to negotiate peace agreements that allowed

NATO troops into Bosnia and Kosovo.

Since the Kosovo conflict, some 100,000 Roma have fled mass persecution by Kosovar Moslems. They fled into Mitrovica, a region in Kosovo where they were exposed to lead and other heavy metals in the soil, food, and air from what was perhaps the most badly controlled smelter in Europe (see environmental refugees below). NATO bombing of industrial installations, sensitive political and military sites, and communication centers and bridges halted the killing in Bosnia in 1995–96 and in Kosovo in 1998, but also produced environmental and economic destruction and contamination of land, water sources, and aquifers over and above that resulting from the war itself—an outcome that raised vexing legal questions.¹⁷

What was lacking in former Yugoslavia was responsible political leadership and earlier international intervention, not more water, arable land, food, natural resources, or access to the outside world. Whatever the inequities and injustices were in former Yugoslavia, we cannot attribute what the International Criminal Tribunal for the former Yugoslavia has called genocide¹⁸ to so-called Malthusian pressures, but rather to the conscious decisions of political, military, religious, and cultural or intellectual elites, whose outlooks were shaped by their divisive heritages.

Rwanda

This country (population: 5,397,000; 316/km² in 1995) had a history of Belgian colonial rule and longstanding subordination of the majority (85%) Hutu to political and economic domination by the less numerous Tutsis. This domination was reversed following the Belgian exit in the early 1960s, when Hutu governments took power and imposed quotas that limited Tutsi opportunities for education and positions in government service and the army. Preceding the genocide, there had been rapid population growth and an increasing population/land ratio, an agricultural economy dependent mainly on hilly land for food and cash crops, and a large expatriate Tutsi refugee population, which had fled in the early 1960s to Burundi and Uganda. Much of the Rwandan population lived at the edge of subsistence.¹⁹

Increasing population/resource ratios in a primarily agricultural economy for growing food and cash crops may have contributed to the buildup of ethnic tension in the 1990s, following an invasion by Rwandan Tutsi forces from Uganda. The civil war culminated in a peace agreement, the Arusha Accords (1993), which were never implemented. The Accords would have resulted in power-sharing with the Tutsi rebel forces, which was a direct threat to control by the Hutu power elite. In the months prior to the 1994 genocide, the Hutu political elite used national radio to incite hatred and violence against Tutsis and Hutu moderates.²⁰

CUMULATIVE DEATHS

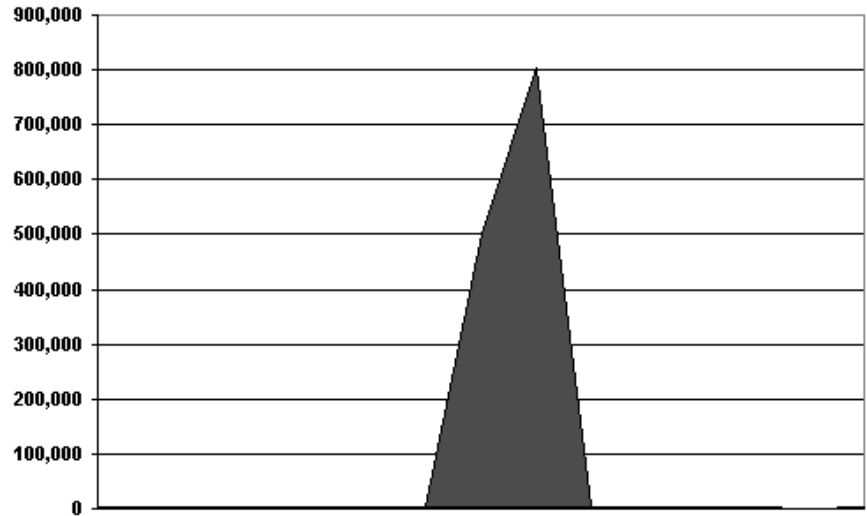


Figure 1—Rwanda genocide timeline.

	Jan 1990	July 1990	Jan 1991	July 1991	Jan 1992	July 1992	Jan 1993	July 1993	Jan 1994	July 1994	Jan 1995	July 1995	1996	1997	1998	
Warning Indicators		—————→														
Killing									————→							
First Reporting									————→							
Response								+	+++	++	+					
Effective response												+	+		+	

The leadership mobilized tens of thousands of men and women in Hutu militias and trained them to use machetes to slaughter 800,000 men, women and children in a three-to-four-month campaign of extermination. (Figure 1). But, after Kofi Annan, then UN Under Secretary for Peace Keeping Affairs, ordered UN troops to hold back from intervening as the mass killings began, the UN Security Council ordered the withdrawal of the 2,500 UN peacekeepers placed in Rwanda to enforce the Arusha Accords. Only a Tutsi military victory stopped the genocide and the country-wide chaos, destruction, and breakdown of the activities of everyday life. General Dallaire's account provides strong evidence for the case that early dispatch of several thousand armed UN forces in March or April 1994 following the broadcasting of hate language on Rwandan radio could have prevented the genocide, and even after the killing began, could have greatly reduced the horrific toll of death and suffering.²¹

Diamond²² has argued that "Modern Rwanda illustrates a case where Malthus's worst-case scenario does

seem to have been right," because Rwanda's genocide was caused by too many people fighting over too little arable land, and "ancient hatred" tribal conflicts by themselves were not sufficient as a prime cause. Diamond postulates that a rapid population increase that produced intrafamilial tensions in which young men could not acquire farms, adult children could not leave home, farm size declined precipitously, and gross inequalities engendered internecine jealousy. Diamond's is a common ecological determinist explanation given for the Rwandan genocide, but it is problematic. Population pressures may contribute to socioeconomic stress and tensions, but there is nothing inherently deterministic in the relationships, or between such pressures and genocide, unless national leaders opt for exclusionary, exterminationist ideologies as "solutions" to these stresses and conflicts. In Rwanda, once its leaders made this choice, it was mass incitement on the national radio which was that country's most toxic exposure.

The population density of Rwanda is less than that of The Netherlands (392/ km²) or South Korea (480

TABLE 1 Darfur Time Line

January 21, 2003	Sudan accused of genocide in Darfur.
February 2003	Rebels in western region of Darfur rise up against government, claiming the region is being neglected by Khartoum.
March 2003	Fighting breaks out in Darfur between government forces and rebels. Refugees start fleeing into Chad (Penketh, 2005). Ceasefire breaks down in Darfur.
April 24, 2003	Forty-four Sudanese killed, 22 hurt in tribal clashes in Darfur.
May 7, 2003	Deadly attacks against Masalit civilians.
May 21, 2003	Burning villages, torture, and displacement in Jabal Marra.
January 2004	Aid agencies' response begins in earnest to help thousands of displaced.
April 2, 2004	UN says "scorched-earth" campaign of ethnic cleansing by Janjaweed militias against Darfur's black African population is taking place.
May 4, 2004	UN officials describe Darfur as one of the worst humanitarian crises in the world.
May 7, 2004	Two human rights reports find Sudanese government and Arab militias carrying out massive human rights violations which "may constitute war crimes and/or crimes against humanity."
September 2004	U.S. Secretary of State Colin Powell describes Darfur killings as "genocide." Estimates: 30,000–50,000 killed.
September 18, 2004	Security Council threatens sanctions against Khartoum and requests UN set up genocide inquiry.
January 2005	UN report accuses the government and militias of systematic abuses in Darfur, but stops short of calling the violence genocide.
March 2005	UN Security Council authorizes sanctions against those who violate ceasefire in Darfur. Council also votes to refer those accused of war crimes in Darfur to International Criminal Court.
April 2005	International donors pledge \$4.5bn (£2.38bn) in aid to help southern Sudan to recover from decades of civil war.
May 2005	Estimates killed: 150,000–300,000.
May 2006	Estimates killed: 450,000 (Eric Reeves, Quantifying Genocide in Darfur, < www.sudanreeves.org >).

people/ km²) and somewhat greater than that of Belgium (341 people/km²), all of which produce more food than their people consume—because of advances in mechanization, irrigation, crop cultivation, and fertilizer use. India, with 336 persons/km², despite major population increases, now produces more food than it consumes, although in the latter case, horrible occupational and environmental risks remain in agriculture. It has been argued that simple population/land pressures in Rwanda should not have resulted in Malthusian collapse even with subsistence agriculture.²³ We suggest these pressures would have been even less of a factor had Rwanda's leaders abandoned conflict, introduced modernization of agriculture, and created new jobs for the young in new industries, as well as investing in education and in family planning programs. Malthusian pressures may have exacerbated prior patterns of socioeconomic tension and violence. But a responsible Hutu leadership opting for the foregoing solutions could have prevented the genocide in the first place.

Darfur

In Darfur in western Sudan (estimated total population of 6 million in a land area about the size of Spain; population density approximately 25–50 persons/km² in the most populated areas),^{24,25} some observers trace the origins of the outbreak of organized mass killing to regional Malthusian pressures and zero-sum rivalries over water and land between nomadic herders, mostly Arab, and farmers, mostly black Africans, which broke out in the late 1990s. Severe droughts in the 1980s, rapid population growth, and desertification from reduced rainfall and overgrazing were so-called upstream triggers for political unrest, attacks on government outposts, and later, armed conflict. However, there is also strong evidence of planning by the Sudanese government in Khartoum to "Arabize" Sudan, which led to a 20-year civil war in the South that cost two million lives, and that resulted in the forced displacement and genocide of black Africans in Darfur (Table 1). In 2002–03, attacks by rebel armed groups in

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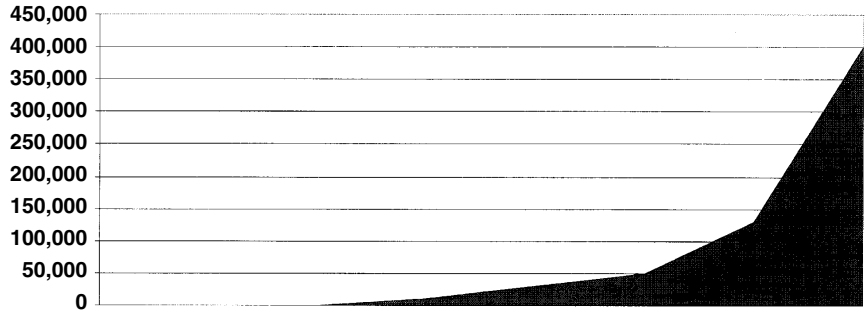


Figure 2—Darfur genocide timeline.

	Jan - June 2001	July - Dec 2001	Jan - June 2002	July - Dec 2002	Jan - June 2003	July - Dec 2003	Jan - June 2004	July - Dec 2004	Jan - June 2005	July - Dec 2005	Jan - June 2006
Warning Indicators											
Killing			→								
Deportation											
First Reporting			→								
Reports							☆☆☆	☆☆☆☆			
Response						☆		☆ ☆ ☆			
Effective response											

Darfur on Sudanese government forces increased and low-intensity warfare broke out. Afterwards, a genocidal campaign supported by the Sudanese government produced forced migration, destruction of villages, mass rape, pillaging and killing, reportedly totaling at least 250,000, if not many more—up to 450,000 (see citation of Reeves in Table 1).

In Darfur, as in Rwanda, non-interference by international agencies signaled acquiescence with decisions by national leaders to commit genocide. The role of the UN and its member countries is driven by Security Council directives/votes. But the story of Darfur shows how a powerful country (e.g., China) seeking to exploit Sudan’s major untapped oil reserves undermined international support for outside pressure on the Sudanese government to stop support for systematic mass killing, rape and pillaging by the Janjaweed²⁷ (see below).

A token force of several thousand African Union “monitors” has lacked the mandate to protect civilian lives. In August 2006, the UN Security Council passed Resolution 1706, authorizing over 20,000 UN peacekeepers in Darfur, but the Sudanese government

blocked their deployment and the UN has failed to implement the resolution. Major Western powers have failed to do even what they did belatedly in Bosnia and Kosovo. In Darfur, as in Rwanda, the dispatch of a well-armed UN or African force with a robust mandate to protect civilians could have stopped the genocide.²⁸

DO MALTHUSIAN PRESSURES INCREASE RISKS FOR GENOCIDE?

Based on our examination of the genocides in Yugoslavia, Rwanda, and Darfur, Malthusian pressures have not forced the hands of the perpetrators. Genocide is not possible and does not happen without conscious decisions by political and military elites. In Yugoslavia, so-called Malthusian pressures did not appear to have any discernible role, whereas in Rwanda and Darfur they may have had indirect roles as pretexts for dominant elites to maintain and amass power, but do not account for their decisions to carry out genocide. In all three genocides examined here, the outbreak of organized mass violence directed at vulnerable groups was fed by incitement and took on a

momentum of its own. The experience in Bosnia and Kosovo showed that outside action to stop genocide depended on the political will of outside interveners to use armed force, if necessary, to stop genocide, rather than empty diplomatic threats. It is reasonable to infer that the mass killing, rapes, and expulsions could have been stopped in Rwanda and Darfur by effective use of force by outsiders.

Genocidal ideologies that use pseudo-environmental rationales such as “ethnic cleansing” or “*Lebensraum*” as pretexts for mass expulsions and other mass atrocities have no basis in actual economic and demographic data. Careful analysis of data shows that high population/land ratios are often associated with economic and social well-being rather than decline^{29–30}—a point we discuss below.

Malthusian pressures do not lead inexorably to genocidal decisions by perpetrators, even if they are sometimes used as ideological excuses. Malthusian pressures were not the main impetus for the Holocaust, the largest genocide of all time.

Nevertheless, we note warnings that in future years Malthusian pressures can be expected to generate tensions—and conflict—over access to essential sources of water, food, or energy, and these could lead to zero-sum conflicts and provide pretexts for initiating such conflicts. Will the risks for such conflicts increase among the third of the world’s population now subject to water shortages, or energy shortfalls from rapid industrial growth, and explosive growth in use of the private automobile and urban sprawl, ever-increasing competition for carbon-based fuels, unmet demands for protein-vitamin nutrients resulting from depletion of more than two-thirds of the world’s fisheries, and the growth of megacities dependent on external supplies of food and energy?^{31,32}

DOES GENOCIDE INCREASE MALTHUSIAN PRESSURES?

In the former Yugoslavia, Rwanda, and Darfur, the massive killings, expulsions, and destruction left in their aftermaths weakened political and economic systems necessary to provide essential needs in agriculture, public health, industry, transport, social organization, and environmental protection. Zero-sum win–lose strategies resulted in lose–lose outcomes for perpetrators, initiators, and followers, as well as for survivors in the victim groups. Rapid social collapse, occurring over a period of just a few months, together with widespread environmental degradation, affected the perpetrators—even if they were not defeated—as well as the remnant survivor populations. In the aftermath of the genocides, social, economic, and health status deteriorated for the Bosnian Serbs, Bosnian Muslims, and Croats; for Kosovar Albanians, Serbs, and Roma; and for Tutsis and Hutus. The same dire outcome is likely both for

Darfur’s black African ethnic groups and for rural Arab Sudanese during and after the genocidal conflict, although there is an economic boom in Khartoum, the capital city of Sudan, from massive oil revenues.³³

DO MALTHUSIAN PRESSURES PRODUCE ENVIRONMENTAL REFUGEES?

Environmental refugees fleeing from drought, desertification, declining soil fertility, erosion and flooding, deforestation, and global warming join political refugees searching for safe havens. Their numbers may reach 25–50 million in the next five years, a number exceeding even “persons of concern”—refugees (estimated $n = 19$ million by UN High Commissioner for Refugees) fleeing persecution and violation from wars and other armed conflicts.³⁴ Furthermore, the unrest and instability produced by environmental degradation, together with population growth, may create sociopolitical predictors of mass migration such as the desperate attempts to reach Europe by Africans today. Conversely, as happened with the Roma who fled to a region whose air and earth are massively contaminated with lead and other toxic agents from a smelter, populations fleeing genocidal campaigns may be driven into environments that produce major toxic risks. To this day, aid agencies have been unable to mobilize the requisite international will to carry out emergency relocation of thousands of Roma children and adults trapped in the cycle of exposure → treatment → re-exposure.^{35,36}

Humanitarian relief, including provision of water, food and shelter, elementary sanitation, and emergency medical care, is essential for refugees, survivors and other victims. Practically, we suggest that current international and regional resources and manpower for emergency first responders for mass natural disasters should be made available for early prevention of genocide and subsequent risk management, and abatement. Because the victims of genocidal campaigns and persecution—unlike environmental refugees, are often faced with continued enmity, such relief will not be effective unless it is accompanied by security protection for those still at risk of murder, rape, pillaging, and forced expulsions.

ECOCIDE AND GENOCIDE: CAN LARGE-SCALE WANTON ECOLOGIC ABUSE PRODUCE GENOCIDAL OUTCOMES?

Saddam Hussein’s draining of the marshlands of southeastern Iraq in the 1990s to punish 500,000 Marshland Arabs for rebelling against his rule is a well-known example of ecocide clearly associated with genocidal intent. The draining was deliberately intended to destroy the way of life of the marshland Arabs, force out-migration, and pauperize them, and not for some presumably beneficial purpose such as economic devel-

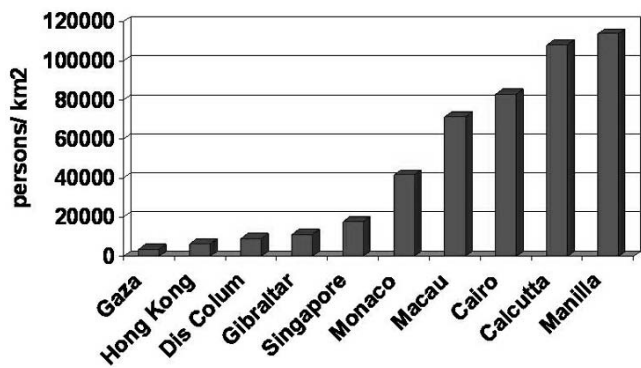


Figure 3—Population densities in the Middle East, Asia, North America, and Europe: selected cities.

opment. Here, use of ecocide as a deliberate mechanism for bringing about genocide violated the clause in the UN Genocide Convention that defines genocide as “deliberately inflicting on [a] group conditions of life calculated to bring about its physical destruction in whole or in part” with the intent “to destroy, in whole or in part, a national, ethnic, racial or religious group, as such.”³⁷

But what is the status of actions with ecocidal consequences without evidence of deliberate intent to harm and destroy a group? Our work in genocide prediction and prevention leads us to address the ethics and implications of four troubling questions for global public health in an era of ecotoxic risks resulting from wanton environmental abuse, and the creation of large populations of environmental refugees. Such ecotoxic risks become Malthusian pressures by destroying carrying capacity and sustainability, and thereby reducing resource/population ratios.

First, should wanton toxic negligence that results in contamination or depletion of air, food, and water be considered as a new crime against humanity, especially if marginalized communities are the victims and deaths and damage to fertility are the outcomes?³⁸

Second, if so, should the perpetrators of such destruction be held accountable for this new crime of ecocide, which would not be genocide because the specific intent to destroy a group is absent, with the *mens rea*—the intent to commit a crime—being recklessness of the kind subject to civil and criminal prosecution? According to Westra, —“knowledge” or “willful blindness”—i.e., knowingly producing or exporting dangerous products, if it subjects populations to risks shown to exist elsewhere, should be considered a crime against humanity.³⁹ Already, one multinational oil company, Talisman, has been accused of collaborating on a plan with the Sudanese government for the security of oil-fields, with Talisman hiring its own advisers to coordinate military strategy with the government. Talisman mapped out areas intended for exploration and discussed how to exclude civilians from those areas. Faced

with mounting criticism, Talisman sold its interests in Sudan to Petronas, the Malaysian oil giant.⁴⁰ A recent court ruling against Talisman held that corporations may be held liable under international law for crimes against humanity, overruling the defendant’s claim that case law from the International Criminal Tribunals for Yugoslavia (ICTY) and Rwanda (ICTR) did not reflect customary international law because those courts were created under special circumstances. But the Court held that the ICTY and ICTR Statutes and the decisions of their Tribunals confirm the principle that customary international law (*jus cogens*) applies to private actors in addition to state actors.⁴¹

Third, is there a need for preventive intervention in situations that are likely to result in massive damage to health and habitat—including death, disease, damage to fertility and reproduction, loss of food sources, or destruction of land, air, and water sources, including failure to apply reasonable controls on emissions or disposal of toxics. Examples of such scenarios already exist in Ecuador, Indonesia, and Iryan Jaya, and in North America. In Ecuador, air, water, and land quality in the vicinity of refineries operated by Texaco–Chevron has reportedly rendered an area humanly uninhabitable as a result of negligent recovery and waste control processes, with catastrophic effects on respiratory health and human fertility.⁴² In Iryan Jaya, Indonesia, one of the world’s largest gold mines reportedly dumps so much cyanide and other chemicals into the area’s watershed that the local population’s health has been detrimentally affected.⁴³ The Canadian government promotes the export of chrysotile asbestos—a permanent residual contaminant with enduring health risks, to Indonesian manufacturers of asbestos products.⁴⁴ In North America, St. James Hydropower and nearby industries have contaminated the Saguenay–Lac St-Jean region with mercury and aluminum and paper pulp byproducts that are suspected causes of increased risks for neurogenetic disorders in both Quebecois and the Aboriginal Innu nation. In Mohawk and some other Native American territories in the United States and Canada, multiple contaminants have been dumped in the waterways and have damaged the flora and fauna. Reproductive human health has been severely impaired and some groups no longer have potable water sources.⁴⁵

Conservation of human and ecologic biodiversity has been identified as being essential to human health,⁴⁶ but prevention of genocidal type outcomes—i.e., destruction of entire populations—from ecocidal practices needs to be recognized as central to translation of protection into policy.

Fourth, what are the ethical responsibilities and roles of epidemiologists brought in as consultants to assess these situations? When Rafael Lemkin invented the term “genocide,” these problems were present, but had not reached the dimensions and scale seen today. In the

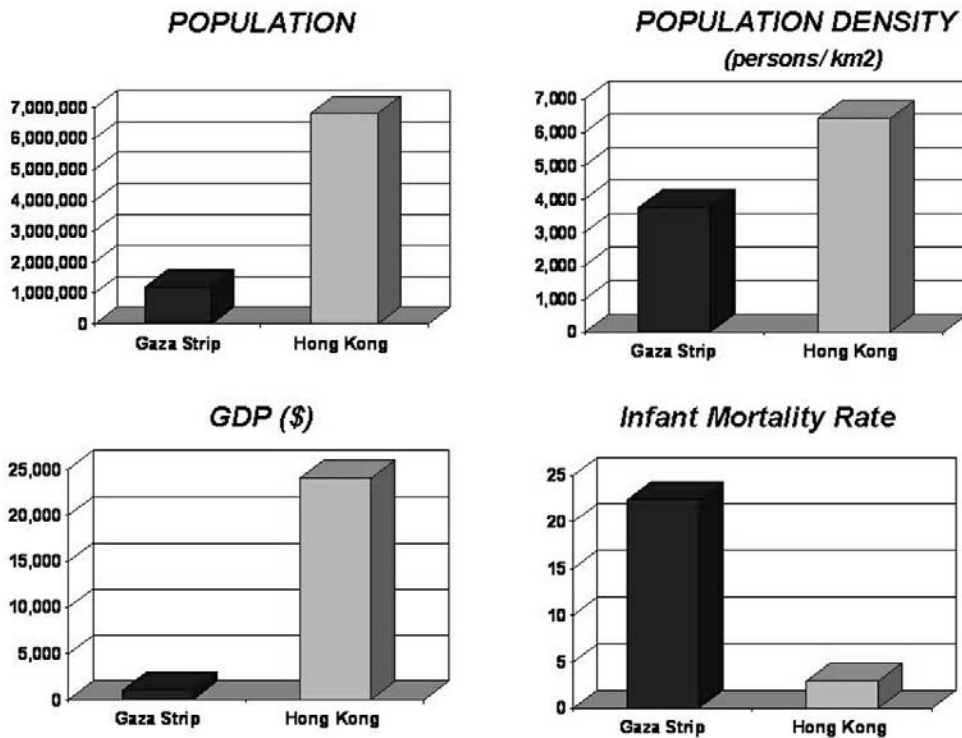


Figure 4—Comparison of the Gaza Strip with Hong Kong.

1930s, certain medical scientists provided pseudo-scientific, ethically flawed eugenic paradigms that led to forced sterilization of inmates of mental institutions in the United States, Scandinavia, Germany, and other countries. Next, the Nazis gassed the mentally impaired, Jews, and Romas, and other “defectives.” Nazi doctors participated in the gassings, or condoned them, or looked the other way.⁴⁷ In our time, what is the ethical and medicolegal culpability of consultants who engage in toxicologic greenwashing? Such consultants sometimes profess a false ignorance concerning the presence of exposures producing these effects, or equate absence of evidence with evidence of absence, or manufacture doubt concerning the validity of the scientific evidence for the effects of these exposures.^{48,49}

POPULATION, ENVIRONMENT, AND GENOCIDE: WHAT ARE THE RELATIONSHIPS?

In both relative and absolute terms, the 20th century was the most violent in history. The death toll from genocide, massacres, forced starvation, expulsions, and other atrocities is estimated to have exceeded 170 million. The proportion of non-combatant deaths increased from 5% of the total death toll in World War I to 60% during World War II—to 80% in the 1970s and 1980s.⁵⁰ The large majority of the current 20 million refugees are women and children. But the relationships between population/land ratios or population/resource ratios and the risks they pose for environmental conflicts, wars, and genocide, do not appear to be predictable using simple deterministic

models, as shown by the fact that highly populated resource-poor trading states can be very prosperous (e.g., Hong Kong, Singapore, the Low Countries) and relatively uncrowded resource-rich geopolitical entities can be very unstable, dangerous settings. Figures 3 and 4 show that such simplistic ratios bear no relationship to well-being and prosperity. Furthermore, as we have noted, population/land–resource ratios can be disrupted by ecotoxic damage to the latter.

Ehrlich’s famous equation⁵¹ in which impact = population × affluence × technology, and Rees’s term, the “ecological footprint”⁵² have generated research⁵³ to address the question: will worldwide or regional rapid population growth, increasing debt ratios for generating natural resources, consumption, affluence, technology, and asymmetries in population growth and access to essential resources increase risks for conflict, war, and genocide in the coming years? The evidence so far, suggested by Urdal’s research on conflict and war in general, is that “Countries experiencing high rates of population growth, high rates of urbanization, or large refugee populations do not face greater risks of internal armed conflict, [and that] . . . scarcity of potential cropland may have a pacifying effect . . . [but] . . . where land scarcity combines with high rates of population growth, the risk of armed conflict increases somewhat.”⁵⁴

CONCLUSIONS

Security Council Resolution 1674, approved on April 28, 2006, specifies an international responsibility to protect vulnerable populations from genocide.⁵⁵ The

well-being of future generations depends upon the degree to which political leaders, public health experts, economists, ecologists, environmentalists, and stakeholders can develop models of risk that permit prediction and prevention of conflict and genocide.

Our review suggests the following conclusions.

1. Genocide results from the ideology and decisions of perpetrators and the indecision and inaction of bystanders—i.e., the leaders of countries and international organizations. The risks for its occurrence are predictable and preventable.

2. Malthusian pressures—and zero-sum rivalries over water, arable land, or natural resources by themselves—do not exacerbate risks from the outbreak of conflict, war, or genocide, but may exacerbate risks from the above the outbreak of conflict. Addressing these pressures, though essential, by itself does not ensure prevention of genocide.

3. Experts in epidemiology, environmental sciences, ecology, and international law need to develop and establish an international system for surveillance, early warning, and preplanned active interventions triggered by the known political predictors of genocide. Early-warning systems without preplanned intervention policies will be ineffectual at stopping genocides. Early detection and reporting needs to be defined by international bodies, be contiguous with early intervention, provide intervention personnel and forces with a general mandate before the events occur and be appropriate to the phase of the genocide: early phase (prodromal period), genocide phase (killing is occurring), post-genocide phase (disaster management)

4. Because ecocide may result in outcomes associated with genocide, there is a need to update and broaden classic definitions of crimes against humanity to include destruction of health and habitat of populations—especially marginalized communities—through wanton or reckless industrial and environmental destruction, depletion or contamination.

5. Interventions to prevent conflict and genocide should develop methods for identifying when Malthusian or zero-sum environmental conflict pressures may strengthen the hands of perpetrators of genocide.

In conclusion, Malthusian pressures do not “explain,” “predict,” or “determine” genocide. But ecocide can produce genocide-like outcomes—with or without the intent to destroy populations. Genocide and ecocide are created by human choice. Human choice must end both.

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Note added in proof:

As this paper went to press, the *New York Times* reported that a vast underground lake the size of Lake Erie had been discovered beneath the barren soil of northern Darfur. The report was found not to be true—the lake was extinct. But it provided an opportunity for experts to ask whether the bloodshed would be stopped by addressing water scarcity—the upstream Malthusian pressure implicated as a trigger for the first conflicts in Darfur. Pogreen reported that experts were of the opinion that the discovery of vast water reserves could either be a godsend or a curse. “Like all resources water can be used for good or ill,” said Alex de Waal, a scholar who has studied the impact of climate variation in Sudan and who witnessed the 1984–85 famine that is often cited as the beginning of the ecologic crisis gripping Darfur. “It can be a blessing or also a curse. If the government acts true to form and tries to create some sort of oasis in the desert and control who settles there, that would simply be an extension of the crisis, not a solution.” Pogreen noted: “A scientific explanation for the problem (environmental degradation) along with a tidy technological solution (irrigation) gratifies the modern humanitarian impulse. The history of Sudan, a grim chronicle of civil war, famine, coups and despotism, gives ample reason to be skeptical.”

In short, removing the Malthusian pressures would not stop the genocide.

<<http://www.iht.com/articles/2007/07/22/news/22pogreen.php?page=1>>, July 21, 2007, A godsend for Darfur, or a curse? Lydia Pogreen).